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Philosophical Discourses on Economic Governance: An African Perspectives

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Abstract: *This paper offers a comprehensive analysis of African perspectives on economic governance from a philosophical viewpoint. The study highlights the importance of incorporating African philosophical perspectives in economic governance and provides insights into the challenges and opportunities for economic governance in Africa. It also provides policymakers with valuable insights into the key factors that influence economic governance in Africa and highlights the necessary policy interventions required to improve economic governance in the region. Additionally, the study offers directions for future research, emphasizing the need for further research on the relationship between African philosophical perspectives and economic governance, as well as comparative studies of economic governance in different regions. Overall, this study contributes to the knowledge base on economic governance in Africa and provides important insights for policymakers and practitioners seeking to improve economic governance in the region.*

Introduction

Economic governance refers to the processes and institutions involved in the management of economic policies and decision-making (Ahmad and Ali 2018). It encompasses a broad range of areas, including macroeconomic stability, fiscal policy, monetary policy, trade policy, and investment policies. Effective economic governance is essential for sustainable economic growth and development, poverty reduction, and the improvement of living standards (Fosu 2018).

In recent years, there has been growing recognition of the importance of incorporating philosophical perspectives into economic governance (Kaul 2016). Philosophical perspectives provide a critical lens through which to understand the underlying assumptions and values that shape economic policies and decision-making. They offer a way to interrogate the normative foundations of economic governance and to identify ethical considerations that are often overlooked in economic analysis (Sen 1999).

African perspectives on economic governance are particularly important in this context. Africa is home to some of the fastest-growing economies in the world, yet it also faces significant challenges in achieving sustainable economic development (Jackson 2020; African Development Bank, 2018). African perspectives offer unique insights into the complexities of economic governance in the region, and the role that philosophical perspectives can play in improving economic outcomes (Muigua 2021).

The rationale for this study is to contribute to the growing body of literature on economic governance by examining the philosophical foundations of economic governance from an African perspective. By doing so, this study aims to provide a deeper understanding of the role that philosophical perspectives can play in shaping economic policy and decision-making in Africa, and to identify areas where African perspectives can contribute to the development of more effective and equitable economic governance practices.

The added value of this study lies in its contribution to the existing literature on economic governance. While there is a growing body of literature on economic governance, much of it is focused on Western perspectives and experiences (Fosu 2018). This study offers a unique perspective by examining economic

governance from an African perspective, and by highlighting the importance of incorporating philosophical perspectives into economic decision-making. It provides insights into the challenges and opportunities for economic governance in Africa and identifies areas where African perspectives can make a significant contribution to the development of more effective and equitable economic policies and practices. Ultimately, this study aims to contribute to the development of more inclusive and sustainable economic governance practices in Africa and beyond.

1. Theoretical Framework

Economic governance is a complex field that is influenced by a range of philosophical perspectives. These perspectives shape the underlying assumptions and values that guide economic decision-making and policy development. In this section, the author examines the philosophical foundations of economic governance, African philosophical perspectives on economic governance, and the potential for synthesizing African and Western philosophical perspectives.

1.1. Philosophical Foundation of Economic Governance

Since 2015, there have been several contemporary engagements in the philosophical foundations of economic governance. One area of focus has been the critique of neoliberalism, which has been a dominant economic paradigm in the Western world since the 1980s. Scholars have argued that neoliberal policies, which prioritize free markets and individualism, have contributed to growing inequality and social exclusion (Harvey 2005; Stiglitz 2019).

Another area of engagement has been the incorporation of environmental concerns into economic decision-making. The field of ecological economics, which emerged in the 1980s, has sought to integrate ecological and social considerations into economic analysis (Daly and Farley 2011). Scholars have called for a shift towards a more sustainable and just economic system that considers the limits of the natural world (Raworth 2017).

Furthermore, feminist economists have continued to challenge the gender biases and assumptions of mainstream economics. They argue that traditional economic theory has neglected the unpaid care work done primarily by women and the gendered effects of economic policies (Folbre 2019). They have called for a feminist economics that recognizes the importance of care, social reproduction, and gender equity in economic decision-making.

Finally, the COVID-19 pandemic has raised important questions about the role of the state in economic governance. The pandemic has highlighted the need for coordinated public health responses and social safety nets to support vulnerable populations (Chang and Lee 2020). Scholars have argued that the pandemic has exposed the limitations of neoliberal economic policies and the need for a more interventionist state to address the current crisis and prevent future ones (Mazzucato 2020).

Overall, contemporary engagements in the philosophical foundations of economic governance have sought to challenge the assumptions and values of classical economic theory and to incorporate broader social and ethical considerations into economic decision-making.

1.2. African Philosophical Perspectives on Economic Governance

In contemporary literature, African philosophical perspectives on economic governance continue to be an important area of study, offering valuable insights into economic governance in Africa. The Ubuntu philosophy remains a prominent perspective in African economic thought. Scholars have continued to emphasize the interconnectedness and interdependence of individuals and communities and how this perspective offers a holistic approach to economic governance (Van Norren 2022). For instance, studies have shown that the Ubuntu philosophy encourages cooperation among individuals and communities, which is essential for sustainable economic development (Van Norren 2022).

In recent years, there has been a growing interest in African feminist perspectives on economic governance. These perspectives emphasize the need to address gender inequalities in economic decision-making and resource allocation (Jackson and Jackson 2021). They have also called for the recognition of unpaid care work and its contribution to the economy.

In addition to African socialism, there has been a resurgence of interest in pan-Africanism and its potential for economic governance in Africa. Scholars have argued that pan-Africanism offers a framework for economic integration and development in Africa (Kinni 2015). This perspective emphasizes the importance of regional

integration, collective ownership, and control of resources, and the promotion of African unity in economic decision-making.

1.3. Synthesising African and Western Philosophical Perspectives

The synthesis of African and Western philosophical perspectives in economic governance continues to attract attention and recognition in recent years. Several scholars have explored this approach as a way of developing more effective and equitable economic policies and decision-making in Africa and beyond.

One area of synthesis is the incorporation of African perspectives into mainstream economic analysis. Scholars such as Goodwin (1967) argue that cultural values and traditions play a significant role in shaping economic decision-making in Africa. He noted that African economies have unique characteristics, and economic policies must be tailored to reflect these realities. According to them, incorporating African perspectives into economic analysis can help to address some of the ethical considerations that are often overlooked in classical economic theory.

Another area of synthesis is the integration of Western perspectives into African economic governance. Fosu (2018) argue that Africa can learn from the experiences of Western economies and adopt best practices to enhance economic governance. They also stress the importance of retaining African cultural values and traditions in economic decision-making. The authors contend that a fusion of both perspectives can lead to more effective economic policies that reflect the realities of African economies.

Moreover, several scholars have explored the potential for incorporating indigenous knowledge systems into economic governance. For instance, Muigua (2021) mentioned that indigenous knowledge systems have contributed to economic development in Africa for centuries. He notes that African societies have always used traditional institutions to regulate economic activities, and these institutions can be harnessed to improve economic governance in Africa. Similarly, authors like Jackson (2016) and Gbadegesin and Adesina (2021) have highlighted factors like the role of indigenous knowledge and social cohesion in the stride towards sustainable development in Africa. They argue that incorporating indigenous knowledge systems can lead to more sustainable economic policies and decision-making.

In summary, the synthesis of African and Western philosophical perspectives in economic governance continues to gain recognition in recent years. Scholars have explored various areas of synthesis, including the incorporation of African perspectives into mainstream economic analysis, the integration of Western perspectives into African economic governance, and the incorporation of indigenous knowledge systems into economic governance. These approaches offer a promising avenue for developing more effective and equitable economic policies and decision-making in Africa and beyond.

2. Economic Governance in African Context

Economic governance in Africa has been shaped by a complex set of historical, political, and economic factors. In this section, the author provides a historical overview of economic governance in Africa, examine contemporary economic governance in African countries, and identify the challenges and opportunities for economic governance in Africa.

2.1. Historical Overview of Economic Governance in Africa

The history of economic governance in Africa has been marked by colonialism, which had significant effects on the continent's economic development. European powers established colonies throughout Africa in the 19th and 20th centuries, which resulted in the exploitation of the continent's natural resources and the displacement of traditional economic systems (Hopkins 1973). The colonial governments focused on extracting resources from Africa, primarily minerals, and agricultural products, to meet their domestic needs (Slipowitz, Vuletin and Pozuelo 2016).

The colonial authorities introduced cash crop agriculture and mining, which displaced traditional subsistence farming and resulted in the emergence of monoculture economies in many African countries (Iliffe 2015). These economies were heavily dependent on the export of primary commodities, which exposed them to volatile global markets, leading to periods of boom and bust. During the boom periods, African countries experienced rapid economic growth, while during the bust periods, they faced severe economic crises (Ayittey 2015).

The colonial legacy has contributed to the challenges that Africa faces today in terms of economic development and governance. The continent remains heavily dependent on the export of primary commodities, which accounts for more than 75% of its exports (UNCTAD, 2018). This dependence on primary commodities has

left African economies vulnerable to external shocks, such as changes in global commodity prices, climate change, and pandemics (World Bank, 2021).

In the post-colonial era, many African countries adopted socialist economic models, which emphasized state ownership and control of key industries and resources (Ake 2003). The state-led development strategy aimed to address the challenges of underdevelopment, inequality, and poverty that resulted from colonialism (Fosu 2018). However, these models were often characterized by inefficiency, corruption, and political instability, which led to economic stagnation and decline in many countries (Mkandawire 2001).

In the 1980s and 1990s, African countries adopted structural adjustment programs (SAPs) that were prescribed by international financial institutions, such as the International Monetary Fund (IMF) and the World Bank (WB) (Bayart 2015). SAPs aimed to liberalize African economies, reduce state intervention, and promote market-oriented reforms (Chang 2014). However, SAPs were criticized for their negative effects on social welfare, including increased poverty, unemployment, and inequality (Mosley *et al.* 2016).

In recent years, African countries have adopted various economic governance reforms aimed at addressing the continent's economic challenges. These reforms include promoting regional integration, developing infrastructure, and improving governance and accountability (Oqubay 2021). However, the implementation of these reforms has been uneven, with some countries making significant progress, while others lag (AUC and OECD, 2019).

In summary, the history of economic governance in Africa has been shaped by colonialism, which has had a profound impact on the continent's economic development. The legacy of colonialism has contributed to the challenges that Africa faces today in terms of economic development and governance. While African countries have adopted various economic governance reforms aimed at addressing these challenges, the implementation of these reforms has been uneven. Addressing these challenges will require sustained efforts by African countries, international development partners, and the global community at large..

2.2. Contemporary Economic Governance in African Countries

In recent years, African countries have implemented several economic reforms to promote economic growth and development. One such reform has been the privatization of state-owned enterprises, which involves selling state-owned assets to the private sector to increase efficiency and profitability. Many African countries, including Ghana, Senegal, and Tanzania, have undertaken significant privatization programs in the past two decades (Ndulu 2007).

Another important reform has been the liberalization of trade and investment policies. This involves reducing trade barriers, promoting foreign investment, and increasing exports. African countries have implemented various measures to liberalize their trade and investment policies, including signing regional trade agreements, such as the African Continental Free Trade Area (AfCFTA), which aims to create a single market for goods and services across the continent (UNCTAD, 2020).

Additionally, African countries have also pursued regional integration initiatives to improve economic governance. The African Union (AU) and its various regional bodies have been instrumental in promoting regional integration in Africa. The East African Community (EAC), for example, has made significant progress in promoting regional integration through the establishment of a common market and customs union (UNECA, 2019).

Despite these efforts, African countries still face significant challenges in terms of economic governance. Corruption remains a major obstacle to economic development in Africa. Corruption erodes public trust in institutions, undermines the rule of law, and stifles economic growth (Mauro, 1998). Weak institutional capacity is another major challenge, as it hinders effective implementation of economic policies and programs. Political instability is also a significant challenge, as it creates uncertainty and undermines investment and economic growth (Ibrahim Index of African Governance, 2020).

In summary, while African countries have made progress in promoting economic growth and development through various economic reforms, there is still much work to be done to address the challenges of corruption, weak institutional capacity, and political instability. African countries must continue to implement effective policies and programs to promote good governance, transparency, and accountability, which are essential for sustainable economic development.

2.3. Challenges and Opportunities for Economic Governance in Africa

Africa faces significant challenges in economic governance, including issues related to corruption, weak institutional capacity, and political instability. However, there are also opportunities for improvement. This section

will expand on the challenges and opportunities for economic governance in Africa, with relevant citations and references for the period from 2015 to 2022.

2.3.1. Challenges Facing Economic Governance in Africa

According to the 2016 Ibrahim Index of African Governance, which provides an assessment of governance performance in African countries, 40 out of 54 African countries have deteriorated in overall governance since 2011 (Mo Ibrahim Foundation, 2016). Corruption remains a significant challenge, with many African countries ranking poorly in the Corruption Perceptions Index (Transparency International, 2021).

Weak institutional capacity is also a major challenge, particularly in the areas of public administration and the rule of law. This has resulted in inadequate service delivery, particularly in healthcare, education, and infrastructure (African Development Bank Group, 2019).

Political instability and conflict also hinder economic growth and development in Africa. For example, the ongoing conflict in the Democratic Republic of Congo has resulted in the displacement of millions of people, as well as the loss of lives and property (United Nations, 2020).

2.3.2. Opportunities for Economic Governance in Africa

Regional integration is a key opportunity for economic growth and development in Africa. The potential for regional integration is significant, given that Africa is home to several regional economic communities, including the East African Community, the Economic Community of West African States, and the Southern African Development Community. Regional integration can promote economic growth and development by creating larger markets and facilitating cross-border trade and investment (UNCTAD, 2018).

Investment in key sectors such as infrastructure, agriculture, and manufacturing can also promote economic growth and development and create jobs. For example, infrastructure development can improve access to markets and reduce the cost of doing business, while investment in agriculture can promote food security and reduce poverty (World Bank, 2021).

2.3.3. Comprehensive and Coordinated Approach

Addressing the challenges facing economic governance in Africa requires a comprehensive and coordinated approach. This approach must address issues such as corruption, weak institutional capacity, and political instability, and must involve collaboration between governments, civil society organizations, and the private sector (Kaufmann and Kraay 2002).

In summary, while Africa faces significant challenges in economic governance, there are also opportunities for improvement. Regional integration and investment in key sectors such as infrastructure, agriculture, and manufacturing can promote economic growth and development. However, addressing the challenges facing economic governance in Africa will require a comprehensive and coordinated approach that involves collaboration between different stakeholders.

3. Case Study – Rooted from Empirical Literature

In this section, the author provides an analysis of economic governance in selected African countries, compare economic governance in African countries with other regions, and draw implications for economic policy and practice in Africa.

3.1. Analysis of Economic Governance in Selected African Countries

Several studies have focused on economic governance in specific African countries. This section provides a summary of some of the key contemporary studies published about cases in some African countries. In a study published in 2016, Ali and Isse analyzed the relationship between corruption and economic growth in African countries. The study used data from 48 African countries between 1996 and 2013 and found that corruption had a negative impact on economic growth.

A study by Asongu (2020) contributed to the governance discourse by focusing attention on foreign aid instability instead of foreign aid. The study assesses the situation for 53 different economies across the African continent during the period 1996-2010. The study employed Autoregressive endogeneity-robust generalized method of moments. The findings shows that foreign aid instability increases governance standards, particularly in areas like political and general concerns on governance issues in Africa.

In a study published in 2018, Mahroum and Shehu analyzed the impact of political stability on economic growth in North African countries. The study used data from 8 North African countries between 1990 and 2015 and found that political stability had a positive impact on economic growth.

A study by Asongu and Odhiambo (2019) investigated the role of financial access in moderating the effect of governance on insurance consumption for 42 Sub-Saharan African (SSA) countries, with data ranging from 2004 to 2014. Two life and 6 governance indicators were used. The life indicators include life and non-life insurance, while that of the governance indicators include political stability, voice and accountability, corruption, control, and the rule of law. The empirical output is based on the Generalised Method of Moments (GMM) and Least Squares Dummy Variable Corrected (LSDVC) estimators. The study shows that financial access promotes life insurance through channels of political stability, governance effectiveness and the rule of law and corruption-control. It also shows that financial access is also a stimulator for non-life insurance through governance mechanisms pertaining to political stability, voice and accountability, and corruption control.

In a study published in 2017, Suleiman and Suleiman analysed the impact of trade openness on economic growth in East African countries. The study applied the Dynamic Ordinary Least Squares (DOLS) technique to panel data from 1990-2015 and found that trade openness had a negative impact on economic growth. The causality test result also shows a unidirectional relationship existing between trade openness and economic growth.

These studies provide valuable insights into the relationship between economic governance and economic growth in African countries. They suggest that good governance, political stability, financial sector development, and institutional quality are important factors that contribute to economic growth in the region.

3.2. Comparison of Economic Governance in African Countries with Other Regions

The economic governance of African countries has been compared with other regions in several studies. A UNECA (2017) study produced a comparative analysis of economic governance in Africa, Asia, and Latin America. They used indicators such as corruption control, government effectiveness, and regulatory quality to evaluate economic governance. The study found that African countries performed poorly in these areas compared to their counterparts in Asia and Latin America.

Similarly, Agbese and Ofuafor (2020) compared economic governance in Nigeria and China. They evaluated the effectiveness of economic governance in both countries and found that China had a more effective economic governance system. The study found that China's effective economic governance contributed to its economic growth and development.

Other studies have also found similar results. For instance, a study by Ajayi, Fadiran, and Adelowokan (2020) compared economic governance in Nigeria and South Africa. They found that South Africa had a better economic governance system than Nigeria, which was attributed to its more stable political environment and better institutional quality.

In summary of the section, several studies have compared economic governance in African countries with other regions and found that African countries perform poorly in areas such as corruption control, government effectiveness, and regulatory quality compared to other regions. Furthermore, these studies have highlighted the importance of effective economic governance for economic growth and development.

3.3. Implications for Economic Policy and Practice in Africa

The analysis of economic governance in selected African countries and comparison with other regions has several implications for economic policy and practice in Africa. One key implication is the need for targeted policy interventions to address specific challenges facing economic governance in African countries. For example, addressing corruption and improving regulatory quality could have a positive impact on economic governance and promote economic growth and development (UNECA, 2017).

Finally, the comparison of economic governance in African countries with other regions highlights the need for learning and knowledge sharing across regions. African countries can learn from the experiences of other regions to improve their economic governance and promote economic growth and development (Jackson 2023; Agbese and Ofuafor 2020).

Conclusion

In this paper, the philosophical conversation on economic governance from an African perspective was examined. The philosophical foundations of economic governance and highlighted African philosophical perspectives on economic governance was also discussed with case examples. The author also provided a historical overview of

economic governance in Africa, examined contemporary economic governance in African countries, and identified challenges and opportunities for economic governance in Africa. Furthermore, the author analyzed economic governance in selected African countries, compared economic governance in African countries with other regions, and drew implications for economic policy and practice in Africa.

This study contributes to the existing literature by providing a comprehensive understanding of economic governance in Africa from a philosophical perspective. The study highlights the importance of incorporating African philosophical perspectives in economic governance and provides insights into the challenges and opportunities for economic governance in Africa.

The implications of this study are significant for both theory and practice of economic governance. The study provides policymakers with valuable insights into the key factors that influence economic governance in Africa, and the necessary policy interventions required to improve economic governance in the region. The study also provides directions for future research, highlighting the need for further research on the relationship between African philosophical perspectives and economic governance, as well as comparative studies of economic governance in different regions.

Overall, this study contributes to the knowledge base on economic governance in Africa and provides important insights for policymakers and practitioners seeking to improve economic governance in the region.

Declaration of Competing Interest

The author declares that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Role of Legal Certainty in Providing Economic Security: Ukraine's Experience

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Abstract: *Economic security is an element of the national security of the country. Even though regulation of economic security implies developing economic sectors or preventing threats, legal principles are not usually considered. The article analyzes how legal certainty as a principle forms a favorable environment, produces reliability, and encourages market players to realize their economic and entrepreneurial initiatives, provided that the country ensures a high level of it. A plurality of the elements of legal certainty makes the influence of the principle of legal certainty on the economic situation diverse and merely realized. It is proposed to divide these elements into two groups in the article. The first one consists of predictability, consistency, and stability. The second one incorporates the mechanisms, mostly legally provided, that prevent the violation of legal certainty. Further examples of court decisions and government acts show negative implications for economic security the violation of legal certainty can lead to. The stability that arises from legal certainty can help market players build their plans and calculate positive risks. Legal certainty contributes to the attraction of investments since profitability depends on the stability of legal regulation. Legitimate expectations are the components of the principle of legal certainty; they rely on the time an entrepreneur makes their business plans. Thus, the reliability that arises from respect to legitimate expectations plays a crucial role in long-term business planning. Immediate changes, the lack of enforcement caused by sudden changes in previously made decisions, and inconsistency in market management lead to a harmful economic effect on legitimate expectations.*

Introduction

The integration into the European Union requires Ukraine to pay attention to the legal stability that can ensure favorable conditions for economic development. The EU countries have opened borders for labor migration, provided a favorable tax system for their members, and introduced unique standards for the market accessibility of goods. The legal regulation in EU countries consists of European and national legislation to achieve common goals strategically. Ukraine, which strives to join the European Union, has to prepare the economy to be incorporated into the European economic system (Kryshtanovych *et al.* 2021). Although some of the initiatives in these regards involve the participation of local businesses and companies, it is the state's role to direct the legal regulation to attract investors and create auspicious conditions for economic growth.

Sustainable development requires profound, multifaceted, and foreseeable decisions aimed at producing a necessary result in the long perspective. Having adopted the sustainability strategy, Ukraine incorporated economic security as a part of the national security policy. Thus, numerous legal acts were adopted to regulate economic relations based on the fundamentals of economic security. Although their importance is beyond doubt, security in the economic sphere is also provided and supported by general legal principles, particularly legal certainty. General meaning and diverse application leave this principle behind in the legal documents on economic security, but its influence is immense.

This article delves into the significant impact of the principle of legal certainty on economic development and illustrates how the regulation policy helps countries obtain stability and a positive economic response. Since threats to the economy of Ukraine are multifaced due to the ongoing war, the country needs to find a source of support to be the base for economic development in the post-war period. Furthermore, it is necessary to limit and decrease the dangers to the system itself and ensure favorable conditions to support private initiatives, including investments. This second task appears to be a more complicated goal that cannot be achieved by enacting a single act. It involves the sphere of general regulation and state policy, implemented by legal decisions and acts. Legal certainty is a principle that secures investments, activates entrepreneurship, and constitutes a legal guarantee for companies. If the necessary level of legal certainty is reached, it minimizes the risk for the financial sector and companies in general; it encourages them to make a long-lasting project (Pavlichenko and Guzenko 2020). Legal certainty cannot be obtained immediately; it needs time to be shown and to have a favorable impact on economic relations, providing stability, reliability, and predictability. Thus, it is crucial for Ukraine, which struggles to finish the war, to cope with these challenges, and the right time to start implementing the decisions that will lead to legal certainty is not after the end of the war but now.

1. Economic Security: The Ways to Define and Obtain

Economic security is a part of national security and a very complex term always analyzed through the lance of the effectiveness of the use of the resources each country has to satisfy the needs of the domestic market and its position on the international level. Since every country has different access to resources, economic security means their effective use and multiplication to achieve economic growth. Economic security is a state of the economy when high and stable economic growth is ensured, an effective satisfaction of economic needs is provided, control is taking over the use of national resources, and the country's economic interests are ensured on national and international levels (Bazaluk *et al.* 2020).

Economic security is determined as a 'market-based economy, with globally competitive products and services that produce jobs' (Ronis 2011); 'security based on international economic relations such as trade in goods and services and economic flows, foreign direct investments, lending, and development aid' (van Bergeijk and Moons 2009). There are two approaches to economic security; the first discusses what should be achieved if its level is generally high. The second one examines threats that should be minimized for constant economic growth. Economic security allows the economy to be sustainable under the pressure of external and internal threats and characterizes the ability of the national economy to renovate to satisfy the needs of citizens and the state at an appropriate level (Akimova 2016).

Thus, economic security requires picking and supporting some spheres of special economic interest that bring a country to leading positions in the international market. However, it is necessary to protect the economy from the threats that prevent it from gaining economic advantages. This approach to defining and minimizing threats is a common way of determining economic security. A stable economic security starts with the formation of economic interests that often lead to dangers and threats – factors that can prevent from obtaining a desired economic result (Ștahovschi and Bucuci 2023). For example, a strategic document signed by the President of Ukraine (2021) shows the predisposition to the second approach that involves limiting threats, the list of which is embodied in the document. Another act of the President of Ukraine (2019) is concentrated on the aims of sustainability and the set of activities that should take place to increase the level of economic security. Both of them are to ensure economic security is achieved.

The recent strategic legal documents, adopted just before the beginning of the war in 2022, embody the country's view on measures that are to be undertaken to improve economic security. Although the legislation on economic security is quite diverse, it is necessary to highlight that this term, incorporated in Article 17 of the Constitution of Ukraine and used by over 50 laws of Ukraine, does not clearly define economic security.

Since economic security is a general status of the well-being of the different subjects of economic relations, it is not concentrated on the diverse interests of different groups. The economic interests of different groups and companies are traditionally mutually exclusive. Thus, providing a high level of economic security usually means governing and balancing the interests of different subjects of the economic system.

The government of Ukraine adopted numerous legal documents to ensure a high level of economic security, providing definite initiatives to support the particular sectors of the economy. Other important influencing factors are left behind; they lie in the field of stability of the legislation, reliability of the judicial system, predictability of governmental actions and regulations towards the entrepreneurs, and the rule of law that will guarantee a fair trial and access to justice in case of a dispute. Straightforward activities, general principles, and

their efficiency in a particular country play an important role in this regard. One of these principles is legal certainty.

Economic security is the set of conditions favorable to the development of the social and economic systems of the country obtained by limiting the influence of unfavorable factors both inside and outside the country. These factors include the ineffectiveness of legal regulation, the inability to regulate social and economic processes efficiently, and the inconsistency and lack of system-oriented actions in implementing economic reforms (Dzhafarova *et al.* 2019). The temporal factor is of great importance, because economic security refers not only to the current situation but is regarded in the long-lasting perspective (Sack 2013; Latysheva *et al.* 2020). Since economic security is a permanent state and a result of persistent and effective governing, it is necessary to consider the role of the factors that can improve stability to support economic security in a long-lasting perspective. Further chapters will examine the role of legal stability and, thus, legal certainty.

2. Legal Certainty as a Basis for Legal Security

The principle of legal certainty is an ample concept rooted in the rule of law and fraught with several diverse elements. These elements could be divided into two groups. The first one consists of elements that incorporate values protected by the principle. This group involves predictability, stability, and consistency. The second group is formed from the number of elements that incorporate the precautions from the threats to legal certainty. They are non-retroactivity, respect for legitimate expectations, execution of court rulings, res judicata, clarity of legal norms, divulgation of legal acts and decisions, and limitation of abuse of powers of the administrative bodies.

One of the main aspects of legal certainty is stability. Stability stems from the legal policy and gives an opportunity to minimize the risk of unpredictable changes. Stability makes it clear how often and sharply the governmental position changes, how the government responds to threats and damages, or what level of accuracy is demonstrated in response to difficulties. That gives an overview of how the government deals with difficulties and problems. Moreover, it gives a clear understanding of what values prevail if the government tries to balance the interests of different groups.

The principle of legal certainty stems from the principle of the rule of law and is listed as its requirement. The Constitution of Ukraine declares the principle of the rule of law in Article 8, which usually forms a legal basis for using legal certainty in court rulings and case law. The Venice Commission (2016) defines legal certainty as a benchmark of the rule of law and requires accessibility of legislation and court rulings, foreseeability of the laws, stability and consistency of law, legitimate expectations, non-retroactivity, res judicata, and nullum crimen nulla poena sine lege. The approach of the European countries shows that they accept and recognize legal certainty even though it is not provided by legal acts, presuming that it arises from the principle of the rule of law.

The diverse and non-specific meaning of this principle led to some controversial approaches in the countries that had recently become democratic states and were in the process of development, where the principle of the rule of law was new and had a short period of implementation. One of them is Ukraine. In its legal doctrine, legal certainty is considered as follows:

1) as something that is legally regulated, for example, a 'certainty of a legal statute,' 'certainty of legal regulation' (Ogneviuk 2017), 'certainty of the terminology in administrative process' (Kolomoetz 2012), 'legal certainty of the crimes in economic law' (Topchiy 2019);

2) as a principle. In accordance with national legislation in Ukraine, the principle of legal certainty should be considered as a set of requirements for organizing and functioning the legal system in order to ensure the legal position of an individual by improving law-making and law enforcement (Scherbanyuk *et al.* 2023);

3) as an aspect of legal security. Legal certainty in terms of the democratic rule of law is essential for legal security because it is the most important (though not the only) implementor of this security (Potrzeszcz 2016). The case law of the ECtHR assumes the link between legal certainty and legal security (Priymak 2016).

The elements of legal certainty include several key points and help achieve their goals; its legal regulation corresponds with the values. They are stability and predictability of legal regulation that should be constant, persistent, and reasonable, based on universal legal values, and aim to protect the rights in the most possible balanced way. Governance and legal regulation should be free from adopting legislation that discriminates against any political party or group; there should be no unpredicted and unjustified decisions of administrative bodies made according to their discretion. The results of the law-making process should be clear and understandable law, and a reasonable period should pass before amending the law that entered into force. Non-retroactivity guarantees citizens and companies can rely on existing norms enacted in advance in their activities.

The mechanism of executing predictability that should be raised by legal certainty is described by I. Lifante-Vidal (2020). The researcher argues that:

"it is not the number of subjects capable of making an abstract prediction but how many of the relevant subjects are capable of doing so. In this regard, one should consider that some regulations typically affect certain classes of subjects with conflicting interests and different possibilities of access to information, such as citizens/administration, consumers/suppliers, and employers/employees… Each class of individuals affected by a particular regulation can be interested in the predictability of certain aspects, and these regulations sometimes increase the relevant predictability for one of the parties at the cost of decreasing it for the other."

Legal certainty is a legal basis of stability that provides for building plans according to the law that are foreseeable and reliable, such as economic initiatives, entrepreneurship, or investments. There is no doubt that legal acts have to be changed from time to time and that legal regulation is dynamic, but legal certainty guarantees a mild effect of the changes or at least a reasonable time for their adoption. Whatever the situation is, the state fulfills its obligations, acts equally to the subjects of law, and guarantees a fair trial and protection of the vested rights. Legitimate expectations are to be respected.

3. The Impact of Legal Certainty on Economic Security

As stated above, legal certainty has a particular effect in a private case, such as its application to prevent retroactiveness of the law applied in criminal prosecution. However, it also generally affects the legal system and relations between subjects of law and administrative bodies. Legal certainty creates an environment that can either attract investors and increase economic activity or have a contrary effect.

It is safe to say that general legal principles are polymorphic and generalized; it is hard to evaluate them, mainly when they belong to different spheres, such as the economy. Nevertheless, they play a significant role in the decisions made by the subjects of economic relations. One of the greatest challenges that prevents creating a favorable investment environment is a low level of legal certainty since it becomes risky for foreign investors to invest in the region (Rodriguez Yong 2016).

Each investment, project, or initiative related to the economic sphere needs to be evaluated and economically justified. The expected profit is a primary reason for any enterprise, no matter how big or small a company is; it depends on the actions of the entrepreneur and other market representatives and the environment, generally ranked from micro- to macroeconomic factors. These factors include the reliability of the judicial system, tax policy, and activities of public authorities, including allowance or prohibition of a particular business. Other legal arrangements are of indirect impact and related to the frequency of the changes to legislation, equality and fairness before the law, the protection of vested rights despite the political influence, and the possibility for retroactivity in the application of the laws. All the listed factors influence the risks predicted and evaluated before the company starts the economic project. The harmful effect violation of legal certainty can cause is partially described.

H. Gribnau (2013) focuses on the retroactivity of tax legislation, which is an infringement of legal certainty. This happens in tax law when the amended law is applicable to past tax periods, and legislative change has a retroactive effect. Legal certainty is violated if the amended law has immediate effect and thus applies only to future taxable events or tax periods. Although the author substantiates that changes in the tax system are dictated by objective background, they should be made with respect to legal certainty, *i.e.,* in advance and within a reasonable period of adaptation. The impact of uncertainty leads to tax uncertainty that causes lower leverage, delays of heavy capital investments, and lower growth of an enterprise (Lee *et al.* 2022).

4. Protection of Legitimate Expectations

Legitimate expectation is another aspect market players rely on when making economic decisions. Legitimate expectations protected by law appeared in the 1960s; they are known as elements of legal certainty and date back to the economic theory of rational expectations. This indicates the subjects of economic relations are acting based on regularity. According to this theory, decisions are made based on previous practice and experience, considering the publicly available information and rationality. All these factors are closely linked with legal certainty since legal norms regulating particular relations are promulgated and should be clear for the parties to make the same conclusions based on one legal norm; thus, they should be interpreted in the same manner. Legal certainty requires its consistent application by courts and administrative bodies to form the unequivocal practice and thus an experience for participants of the same relations. Rationality should be guaranteed in legal regulation and application before it appears in the minds of the subjects of economic relations.

"The principle of legal certainty emerged in EU law mainly through the principle of protection of legitimate expectations that encapsulates itself an efficiency rationale. Indeed, the legitimacy criterion allows for telling apart unreasonable claims from reasonable one with respect to the investments incurred in light of previous law. This

principle requires compensation of damages to be awarded whenever a claim is said to be legitimate and to the extent of the reliance costs incurred (reliance damages) or considering the missed benefits (expectation damages)" (Tsaras *et al.* 2018).

Legitimate expectations play a crucial role for investors as they have to predict the outcome of their entrepreneurship in the long-term perspective. Investors have to choose the country for investment if they are going to expand their business. Legal certainty is of great importance in this competition to attract investments and should be increased (Coelho 2015).

Even though the exact interrelation between legal certainty and changes to economic investments can hardly be determined, its influence is shown in different ways. The straightest interaction is shown in the report of the Civil Law Initiative on Legal Certainty Index. Market players can predict the profitability of investments if they determine individual economic risks based on the social and economic behavior of market actors, including customers, competitors, and the government (Deffains and Kessedjian 2015). Long-term investments require a set of rules and stability in their application and enforcement. The conditions provided below can affect it harmfully.

Immediate changes. Immediate changes violate the rule of law, which includes legitimate expectations 'interpreted as allowing the individuals to mitigate the costs and even avoid any loss' (Tangea *et al.* 2013). The entry of the law into the legal force with the delay after its adoption helps to adjust to the change that will occur. The government should provide this delay to parties to understand the provisions and adjust their behavior to them.

The Supreme Court of Ukraine (2019), in its Ruling No. 825/1496/17, dismissed a claim of the company of application of the new tax regulations to the tax period of the year in which they were set out. The Ruling appealed to stability as the principle of tax policy that has its links with legal certainty. The applicant refused to pay the property tax pursuant to the legal provisions that stemmed from the law entered into force on December 25, 2015. These provisions gave the power to local authorities to set property taxes in their region and to provide benefits for vulnerable groups. The decision on this issue was made by the local council of Nizhyn Region (Ukraine) on January 21-26, 2016; it embodied the provision that this decision would enter into force on January 1, 2016, which was retrospective.

The tax administration calculated the taxes based on this new provision, and the dispute was brought to court on whether the local regulations enacted after the beginning of the tax period should be applied to the period of the year 2016 or not. The court ruled in favor of the local tax administration based on the provision that their calculation was made in accordance with the new legislation in force. However, the court noted that the principle of stability was violated but recognized that the tax administration acted in public interests. Therefore, it was presumed there was no violation of law. The dissenting judgment contained the opposite opinion; the stability and legitimate expectations as legal principles should prevail in this situation, and the tax regulation could be applied only to the further period. This is due to the principle of legal certainty, concerning particularly legitimate expectations and non-retroactivity.

Lack of enforcement. The contracts signed by parties usually embody provisions of the early termination of the contracts based on the compensation the other party has in case of a 'change of mind.' The clause of force-major is also related to the reasons that forced the party to terminate the contract. Thus, it is common in the legal practice that the other party should be protected from the unreasonable sudden changes made by its counterparty. These provisions usually involve a demand to inform the other party in advance and pay compensation that pretends to be used to cover the expenses made to execute the contract and to organize the activities the parties intend to execute under a contract. The authority is not under pressure or liability for changing its decisions in the public sphere. However, their decisions usually affect many legal persons and the costliest investments.

The obligation to obey the law and its principles is inevitable to any legal person, including the state, even though it lays down the legislation. This means the state has the legal capacity to amend the legislation, but even the state can not violate it or be released from undertaking obligations as soon as this legislation is in force. Legitimate expectations arise from the official governmental position embodied in general and individual normative acts. When the decision lacks enforcement, a connection between the proclamation and the enforcement is not achieved. According to the WJP, the Rule of Law Index in Ukraine (2022) is ranked 106 among 140 countries on the factor of regulatory enforcement, which measures the extent to which regulations are fairly and effectively implemented and enforced. It is emphasized that the regulations are not evaluated but the way and efficiency of their implementation. When the contract is concluded between two parties, the lack of its

execution can cause damage to one party, while the same made by the authorities has an impact on the subjects of regulations and generally.

The example of the court decision on the case of Vanco company in Ukraine shows that an administrative decision can be controversial when it comes to issues of economic security, legal certainty, and legitimate expectations. In 2008, the Cabinet of Ministers of Ukraine (the higher executive body) terminated the contract with Vanco company on the development of the hydrocarbons in the Prykerchensky region located in the continental shelf of the Black Sea. The withdrawal of the permission by the Ministry of Environmental Protection and Natural Resources of Ukraine followed that decision. Both executive bodies held that their decision was made in the public interest and was lawful even though the company suffered significant damages, including the efforts and expenses spent to execute a contract. By the initiative of the President of Ukraine, the case was held by the Constitutional Court of Ukraine. The analyzed issues were related to the sphere of the balance between the public and private interests, mainly economic security as a public interest and the private interest of entrepreneurship, guaranteed on a free-of-charge basis.

Although the Constitutional Court of Ukraine dismissed the claim because of the procedural issues and its powers, the case was a subject of analysis in scientific papers (Savchyn 2009) since it is an illustrative example of how economic interests are affected. Economic security, as mentioned above, should neither be focused on the satisfaction of the economic interests of one group of entrepreneurs nor show the prevail of one group over another. The public aspect of economic security involves direct (the possibility of gaining economic profit from developing the continental shelf) and indirect (protection of the legitimate expectations of the entrepreneurs and their investments) needs. Each situation with widespread effect should be solved on a case-by-case basis that examines the particular economic interest in each situation.

Inconsistency. The above citation of I. Lifante-Vidal underlines that legal acts can unequally affect different groups of legal persons who are current market actors, giving privileges to ones and making entrepreneurship unprofitable for others. This can happen when the decision made affects one sphere of the economy or one particular group of entrepreneurs. In case of a sudden and unexpected change in the regulation, legitimate expectations could be violated. One of the examples to illustrate this is the prohibition of the gambling business, which was a lightning-fast decision of bodies of the executive power in Ukraine in 2009. The reasons for the adoption of the Law prohibiting the gambling business (Verkhovna Rada of Ukraine 2009) were immorality and the contra-social effect of this way of profiting. The law did not give companies acting in this sphere time to get adjusted to the changes, as it entered into force rapidly and broke the legitimate expectations of the companies that had licenses issued for a period of five years by the government authorities.

One such case was brought to ECtHR with its final decision in 2019. The ECtHR ruled that there was an infringement of Article 1 of the amendments to the Convention of Ukraine regarding the withdrawal of the license previously issued in the case of Svit Rozvag, Tov, and others v. Ukraine (application 13290/11) (ECtHR 2019). By granting a long-term license, the government demonstrated that it allowed such a way of business in Ukraine and afterward recognized it as illegal by setting out the law in 2009. It was the subject of the ECtHR to decide whether the gambling business should be allowed since it refers to the state's sovereignty. However, the Court underlined that the way the state prohibited it was a violation of the provisions of the Convention. The court held that the applicants did not violate the law in any case, but the exchange of the legal position was sudden and unpredictable and prevented them from obtaining the expected profit.

The applicants were not given a transition period, and it was a controversial decision of the authority to issue a 5-year license allowing the gambling business just a few months before the law prohibiting it was adopted. That was frustrating and broke the predictability, *i.e.*, the legal certainty. It was a curious fact that the decision on the case dated back to 2019, and the gambling business was again permitted in Ukraine by new legislation in 2020. It will be reasonable to agree with Fabio U. Coelho that ideology matters when issues of legal certainty are discussed; it is well illustrated in the proposed example. When the authority cannot come to the final conclusion about what to prohibit and what to allow, predictability remains vulnerable, and legal expectations can hardly be satisfied because of the changeable position of lawmakers.

Conclusions and Further Research

The economic security of the country is a component of national security that unites public economic interests and interests of the private companies. The analysis shows the government supports the approaches to define economic security aimed at detecting the potentially profitable spheres and minimizing the negative influence of threats. The article argues that the legal framework plays an essential role in forming a favorable environment for economic security through setting the legislation and implementing legal certainty. The inconsistency of the legal

regulation, frequent fundamental changes in legal approaches, and low level of enforcement of legal regulations can decrease the level of legal certainty and thus cause a harmful effect. It is argued that the public interest that usually prevails should be regarded widely and include the interests of those market companies that can withdraw from the market due to disruptive governing. The way to avoid this harmful effect is to provide stability and consistency of legal regulation and respect legitimate expectations. The country, particularly Ukraine, can improve its economic environment by making it favorable if it provides and applies legal certainty. This enables the market players to minimize the risks and predict their activities in a long-term perspective. Respect for legitimate expectations should be obtained to ensure economic security for investors.

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Declaration of Competing Interest

The author declares that she has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Does Economic Literacy Affect Inflation Expectations? An Experimental Survey Approach

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Abstract: *This study investigates the effectiveness of the information treatment in the inflation expectations on individuals with varying levels of economic literacy. In this regard, we conducted an experimental survey that provided participants with information related to inflation and other macroeconomic variables. The study reveals that the information treatment was effective in assisting the participants revise their expectations closer to actual inflation. Notably, this was especially effective for those without an economics background as they revised it to align with the actual inflation. Additionally, we found that formal economics learning is insignificant in the formation of inflation expectations given that the relevant information is accessible. Results of the study shed light on the importance of addressing information friction, focusing on financial education and effective communication from central banks.*

Introduction

Inflation expectations are heterogeneous. A considerable amount of literature cited information friction as the major factor leading to heterogeneous expectations (Cavallo, Cruces, and Perez-Truglia 2017; Coibion and Gorodnichenko 2012; 2015). Gnan *et al.* (2011) finds that inflation expectations vary across countries and demographic groups due to differences in information sets and models used by individuals.

Information friction is often not clearly revealed through the aggregate survey data especially to address specific questions such as the significance of access to information and financial literacy on the formation of inflation expectations and the expectation updating (Hubert 2015; Maule and Hubert 2016). Controlled laboratory experiments have examined various macroeconomic models and theories in the last few decades. This growing body of literature is driven by changes in macroeconomic modeling, which now focuses on how institutional changes or policies affect aggregate time series data and the choices made by decision-makers such as households and firms (Duffy 2016). Many studies concerning the formation of inflation expectations in the experimental setup were conducted in developed countries; see, for example (Armantier *et al.* 2016; Zafar *et al.* 2012).

This study uses an information-based experimental survey to examine the impact of information treatment on subjects that have varied levels of economic literacy. In the context of India, this study represents a pioneering effort in experimental approach in eliciting inflation expectations. Therefore, this study fills an important gap in the existing literature.

The paper proceeds as follows. Section 2 reviews the relevant literature. Section 3 presents the experimental design and describes the data and methodology of empirical analysis. Section 4 discusses the results, and the final section concludes.

1.Theoretical Approach

A pre-requisite for understanding inflation expectations is the extant of its heterogeneity. A significant amount of literature addresses heterogeneity from the perspective of information friction. Theoretical underpinnings for this

research primarily rise from the framework of information friction. Coibion and Gorodnichenko (2012) and Reid (2015) have addressed the issue of information friction as a possible reason for heterogeneity in expectations, leading to different levels of central bank credibility, forecast errors, and more. Along this line, earlier research, such as Mankiw and Reis (2002), formulates a sticky information model, which assumes infrequent updating of expectations, leading to predictions based on outdated data. Further, Sims (2003) proposed the rational inattention model based on the constrained information processing capacity. Similar to the differences in access to information and the ability to process it in the context of life decisions faced by agents, inflation expectations are formed heterogeneously (Ueno and Namba 2014).

This paper primarily makes use of the rational expectations hypothesis along with the sticky information framework for the modelling of our experiment. Let the time at which the expectations are formulated be t, and the expectations at time t denoted as π_t^e. Let I_{t-1} is the given the set of information available at the end of period t - 1, then the existence of rational expectations implies the following assumptions:

$$E(\pi_t | I_{t-1}) = \pi_t^e \tag{1}$$

$$\pi_t - \pi_t^e = \pi_t - E(\pi_t | I_{t-1}) = \varepsilon_t \tag{2}$$

where ε_t is a random variable with $E(\varepsilon_t) = 0$. The first assumption states that the expected inflation depends on the relevant information that is available up to the end of $t-1$. The second assumption recognizes the existence of error term in the REH model. However, the estimation error $\pi_t - E(\pi_t | I_{t-1})$ cannot contain a systematic component as it is supposed to produce unbiased estimate of the future values of inflation expectations. In our experimental set up, we test systemic heterogeneity essentially based on economic literacy.

However, in the presence of information friction, the agents are not supposed to act rationally, and the expectations are supposed to be biased. It suggests that due to lack of updating information, the forecasts are inefficient and biased. In such a scenario, the expectation of inflation becomes

$$\pi_t^e = E(\pi_t) + \varepsilon_t \tag{3}$$

The treatment in our experiment deals with the problem of information updating and expecting the subjects to act rationally. Eventually, we assume that the expected inflation approaches actual inflation in the rational expectations estimator in equation (1), and the error term in the equation (3) disappears.

2. Literature Review

The literature in the field of information friction and inflation expectations grows further in different directions in lines to the theoretical underpinnings. A stream of literature argues that the friction may arise from education and financial literacy. Burke and Manz (2014) suggest that a significant portion of demographic heterogeneity in inflation expectations observed in survey data may be driven by heterogeneity in economic literacy. One among the recent studies argue that the very less frequent updating of information by general public leading to less accurate forecasts compared to the professional forecasters and policy makers(Cornand and Hubert 2022). Studies have found lower education is associated with higher rates of expected inflation (Bruine de Bruin *et al.* 2010; Bryan and Venkatu 2001). Literature also indicates that rational inattention and cognitive limitations play a major role in information friction; see, (Cavallo, Cruces, and Perez-Truglia 2017).

The population's financial literacy level and the degree of interaction with financial instruments also contribute to information friction, especially in a developing country like India. Factors such as availability and use of information, cognitive skills, and the influence of past experiences in the formation of inflation expectations are studied in the literature. Bruine de Bruin *et al.* (2010) study the formation of expectations in the light of demographic variables and financial literacy to determine which contributes to the heterogeneity of survey expectations in the US. Similar to many other studies, individuals who are female, poor, single, less educated, and those with less financial literacy reported higher expectations.

Furthermore, the literate subjects could focus on the overall inflation, while the less literate ones focused more on inflation experiences or price memory of market purchases. Armantier *et al.* (2016) find that individuals with higher financial literacy and numeracy skills tend to have more accurate inflation expectations. Madeira and Zafar (2015) and Malmendier and Nagel (2016) affirms that the past experiences with inflation rates of individuals can significantly impact their expectations about future inflation.

Other factors that have been identified contributing to heterogeneity in inflation expectations; such as the accuracy of individuals' forecasts (Xu *et al.* 2016), and the influence of public information and media coverage on expectations (Madeira and Zafar 2015). A seminal paper by Carroll (2003) postulated the role of news information

in the formation of inflation expectations. He put forward an epidemiological model of expectation formation, according to which consumers update their expectations from the media.

Another stream of literature discussed the ability to process the available information. Coibion *et al.* (2020) explored how individual expectations are formed and highlighted the importance of economic agents' capacity or limitations in processing information about inflation. Cognitive abilities are essential in forming subjective economic expectations and choices (Falk *et al.* 2018). It is understood that it helps economic agents gather information regarding the economy and allocate the available resources according to the needs and utilities within individual budget constraints.

A study using exclusive data from Finland's male population is taken up by D'Acunto *et al.* (2019) to assess the relationship between intelligence quotient (IQ) and expectation formation. The panel data, which surveys the same individual every 6 months, focuses on the assumptions of learning and updating the information for the same. The results suggest that the men with higher IQ report lower forecast errors and vice versa. Furthermore, the Higher IQ respondents overreact to the macro news but update their forecast towards a lesser forecast error. The effect of macro shocks on the lower IQ men does not go with this rule. Also, they deduce that inflation is the changes in the prices of specific goods rather than general prices in the economy.

It is also argued that more literate subjects choose more relevant information and use it more effectively (Burke and Manz 2014). Cavallo *et al.* (2017) conducted experiments and discovered that respondents assign less significance to historical inflation when anticipating future inflation, in a low-inflation country like the US. Moreover, they seem to assign a higher weight to less accurate sources of information, such as their memories of the price changes of the supermarket products they purchased. At the same time, respondents assign a comparatively higher weight to the historical inflation in a high-inflation economy such as Argentina. Furthermore, the 'cost of inflation' plays an important role in deciding the horizon of updating information in the process of inflation anticipation. The study also identifies rational inattention as an important source of information friction.

Carroll (2003), using the survey data, found a percentage of the US population (λ) who acquires the news from professional forecast/ newspaper articles can 'rationally' anticipate inflation for the next period. In fact, he shows that higher dissemination of news narrows the gap between the mean forecast from the Michigan Survey and that of professional forecasters. Pfajfar and Santoro (2013) test Carroll's theory of epidemiology by using the direct measure of the flow of news on prices that consumers have heard and find that most consumers who update their expectations do not revise them towards the mean of professional forecasters survey. Furthermore, they reveal that 75% of the population revise their expectations, contrary to Carroll's 25%. Lein and Maag (2011) also reveal that the λ is not fixed, and the share of the population who updates the expectations is not a constant fraction. Also, it is not the same people who are updating the expectations.

Following Pfajfar and Santoro (2010), Das *et al.* (2018) conduct an experimental study on expectation formation in a New Keynesian macroeconomic framework, finding heterogeneity in expectation formation and model switching behavior. The subjects of the experiment were students of economics at Jadevpur University, India. The authors conclude that the expectation formation process is adaptive and heterogeneous. They also find high heterogeneity in expectation formation and model switching nature by the subjects. Saakshi and Sahu (2019) used a panel data and identified the heterogeneity in household inflation expectations in India are due to the city level information friction developed from differences in economic activities.

To sum up, according to the literature, the formation of inflation expectations exhibits heterogeneity, mainly from information asymmetry or friction. Various methods, such as the sticky price and rational inattention models, are employed to model information friction. In addition, demographic variables such as education, access to information, information processing abilities, and the cost of updating expectations also significantly impact the heterogeneity of expectations.

Based on the theoretical underpinnings and literature survey, this study undertakes an experimental study to find the interaction between information friction and economic literacy. This paper adds to the literature of experimental studies for identifying the formation of inflation expectations in the presence of information friction.

3. Data and Methodology

This study is aimed to shed light into the process of the formation of inflation expectations and how it varies with subjects' understanding of economic concepts. Following Burke and Manz (2014), an experimental survey approach in this regard will allow us not only observe the forecasting process, but also the revision of forecasts based on the information treatment. It is different from the regular survey method as it has narrow possibility to address the information friction and heterogeneity. Adding to it, surveys cannot readily gain insight into how individuals select and process information when forming inflation expectations. Given these considerations, our

experiment serves as a valuable addition to the existing research based on survey data about inflation expectations.

The data is from the original survey conducted by the author between 5th July 2020 to 17th August 2020 among young, educated respondents across India with a special focus on financial literacy. It used a purposeful sampling method and employed the survey via social media platforms such as WhatsApp, Facebook, Telegram and direct emails to ids collected from sources as a data collection method.

3.1. Survey Design

The survey was conducted online, and the respondents were asked to complete a Google Form. The questionnaire used for the study is in Appendix 5A. The survey contained a brief introduction about the aim of the survey and the confidentiality of their responses. The survey was strictly voluntary. They were also asked to refrain from taking help from any sources to keep the survey's integrity.

Stage 1: *eliciting initial expectations*

After beginning the survey, participants were immediately prompted to provide their inflation expectations for two-time horizons: 3 months ahead, corresponding to September 2020, and 12 months ahead, corresponding to June 2021. The options for their responses were presented as brackets ranging from 0% to 16%, with each bracket representing a 1% range. For example, a "4%-5%" response would indicate an expectation of inflation within the range of 4% to 5%.

Further, they were then directed to fill out demographic details, including gender, age, employment, annual income of the family, educational qualification, marital status, state of residence, category of place of residence, religion, and caste.

A separate section of questions was assigned to record their knowledge of economics at their educational level. Specific questions related to the know-how of inflation and the targeting policy of the central bank are also asked. To tinker more with their inflation knowledge, we asked specific open short-answer questions to recall any past inflation rate with a date they remembered. We also give them the option to reveal the media/ source they refer to while forming inflation expectations in general.

Stage 2: *information treatment*

After this, they were provided with a set of information regarding inflation. Specifically, we defined inflation and displayed graphs to inform them about historical data related to inflation, inflation target, food inflation, and professional forecasters' expectations. These graphs were explained in words to make it easier for respondents from both economic and non-economic backgrounds.

Stage 3: *eliciting informed expectations*

Finally, they were asked to reveal their expectations again with the same set of questions as in Stage 1.

We hypothesize that the information provided to the respondents to be useful so that the individuals revise their expectations closer to the actual inflation corresponding to the horizons or the RBI inflation target. We also expect that the information is more useful for those who do not have a background in economics and those who do not know about the RBI inflation-targeting policy.

3.2. Descriptive Statistics

A total of 256 people participated in the survey. 76.95% of them were male, 67.19% were unmarried, and 71.88% of them had educational qualifications as post-graduation and above. Respondents with a background in economics (RBE) and those with knowledge about targeting (RKT) are 71.4% and 53.5% of the total respondents, respectively (Figure 1 and 2). RKT denotes those who have true knowledge of targeting wherein it takes the value 1 (Yes) if they quoted the number between 2% and 6%, and 0 otherwise. Similarly, RBE takes a value 1, if the respondent has a background in economics, and 0 otherwise. 23.83% of the respondents claimed to 'know exactly' about inflation (Figure 3).

Figure 1. Participants with background in economics

Background in Economics (%)

28.52%

71.48%

No Yes
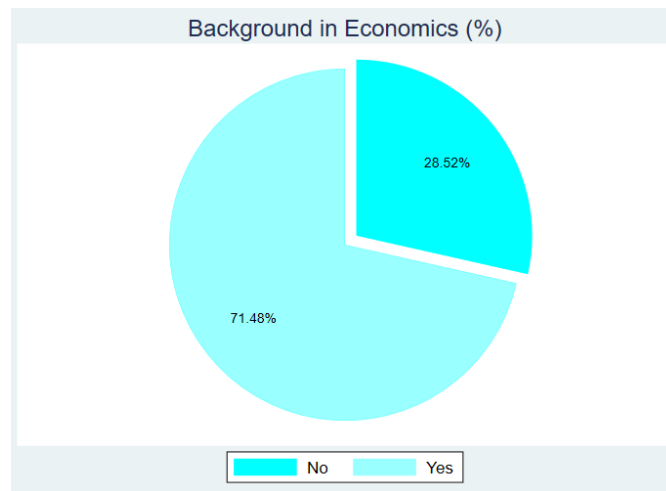
Figure 2. Participants with true targeting knowledge

Knowledge of Targeting (%)

46.48%

53.52%

No Yes
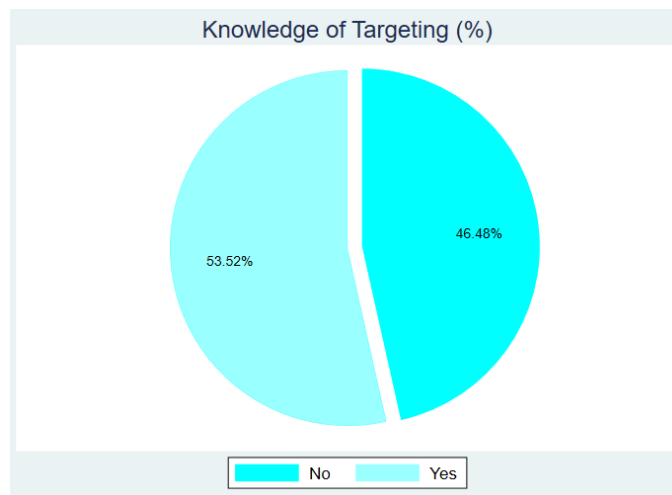
Figure 3. Participants' knowledge about inflation in Likert scale

227
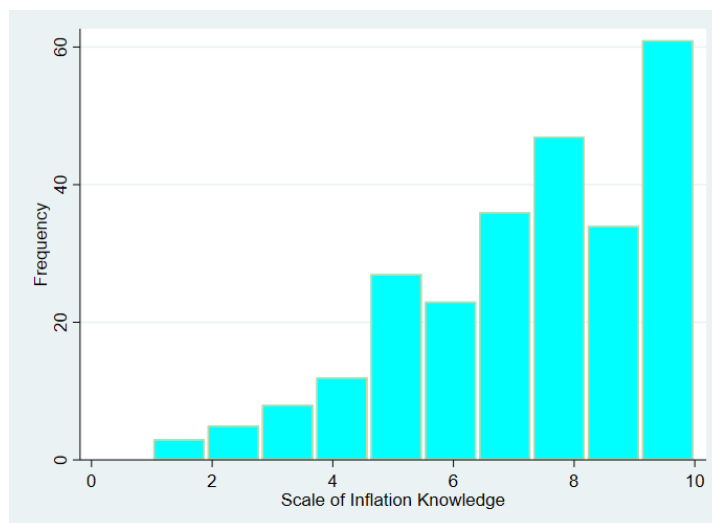
Figure 4. Information sources of respondents
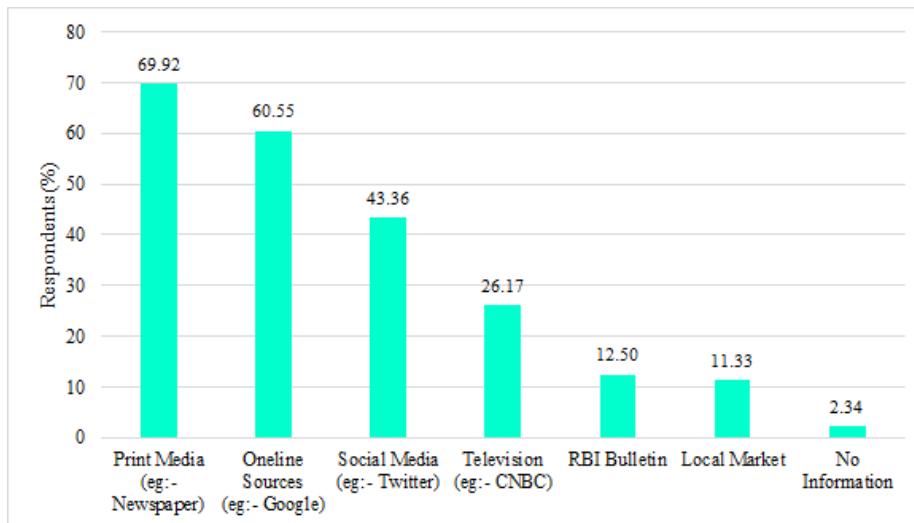
Source: Author's calculation from the experimental survey

The frequency of people referred to various sources for information on inflation is displayed in Figure 4. The respondents were free to select multiple sources. The most referred is the print sources including newspapers and magazines, followed by online search engines and social media. The least referred ones are the RBI bulletin and the local market price information.

As can be observed from Table 1, average expectations were below the realized inflation for both horizons – 3 months and 12 months. After the information treatment, respondents revised their expectations upwards. Furthermore, the standard deviation declined following the treatment, perhaps due to the information pass-through.

Table 1. Descriptive Statistics

Variable	Mean	Median	SD
Inflation Expectations 3 months ahead – Pre-treatment	5.08	4.5	3.28
Inflation Expectations 3 months ahead – Post-treatment	5.24	5.5	2.97
Inflation Expectations 12 months ahead – Pre-treatment	5.42	4.5	3.64
Inflation Expectations 12 months ahead – Post-treatment	5.79	5.5	3.23

Source: Author's calculation from the experimental survey

3.3. Empirical Methodology

The primary analysis involves assessing how the expectations of individuals about the future are influenced by the information provided to them. As inflation targeting focuses on long-term expectations, we only consider the 12 months ahead expectations in the analysis.

As the expectation data is not normally distributed, we take up the Wilcoxon signed-rank test to compare the medians pre and post information treatments. A one-sample test is used to determine whether a sample median significantly differs from a known or hypothesized population median, which in our case will be the corresponding realized inflation rate. Two sample test is similar to the one-sample test, rather determines whether there is a significant difference between the medians of two independent groups.

Further, an OLS regression is run to examine whether economic literacy is significant in expectation formation. The model can be depicted as:

$$\pi_{t,t+12}^e = \beta_0 + \beta_1 X_1 \tag{4}$$

Where in $\pi_{t,t+4}^e$ is the expectations about *t*+12 (12 months ahead) forecasted at time *t*. A significant β_1 would suggest that the expectations are affected by the background in economics. This regression is estimated with both the expectations before and after the information treatment. The OLS regression in this analysis is not intended to express causal relationship rather association of the variables. This model also evades adding other determinants of inflation expectations into consideration for two reasons. Primarily the regression doesn't address the question of determinants of inflation expectations. Secondly, the survey data doesn't allow us to consider

other macroeconomic variables in to the regression for it is an experimental study. However, the treatment process has included macroeconomic variables and thus can be considered that the information provided takes care of such concerns.

4. Results

This section discusses the results. Initially, we checked whether the respondents revised their expectations following the information treatment. The CPI inflation rate during the survey (July 2020) was 6.67%. The actual inflation rate corresponding to (12 months ahead) June 2021 was 5.59%. We use the one-sample test for the hypothesis (H_0: Median Expectation = Inflation).

Table 2. Inflation Expectations Pre and Post-treatment

Treatment	Inflation expectation	Actual inflation	z	p
Pre	4.5	5.59	-2.26	0.02
Post	5.5	5.59	-0.42	0.67

Source: Author's calculation from the experimental survey

Table 2 suggests that the 12 months ahead forecast post-treatment is closer to the actual inflation while the pre-treatment is not, indicating effectiveness of information treatment. Furthermore, it is noted that the expectation increased by 1% owing to the treatment, which is a step closer to the realized inflation leading to a lesser forecast error.

4.1. Background in Economics and Formation of Expectations

We found that, primarily, the treatment is effective for the overall population of the survey with significant revision in the expectations. In this section we particularly look in to whether the expectations of the RBE and non-RBE are aligning towards the actual inflation post-treatment? The results for tests of equality based on the hypothesis (H_0: Median Expectation = Target) are tabulated in Table 3.

The expectations of Non-RBE have increased from 3.5% to 5.5% due to the treatment. While the median RBE expectations are left without change even with the treatment. On this note we can assume that the RBE didn't find the information provided useful, as their expectations are already aligned with the actual inflation. Hence, they didn't meet the expectations at all.

Table 3. Test for equality based on economic literacy

Economic Literacy	Treatment	Inflation expectation	z	p
Non-RBE	Pre	3.5	-3.21	0.00
RBE	Pre	5.5	-0.46	0.64
Non-RBE	Post	5.5	-1.26	0.21
RBE	Post	5.5	0.35	0.72

Source: Author's calculation from the experimental survey

Table 4. Influence of economic literacy on expectations

Economic Literacy	Pre - treatment	Post - treatment
Non-RBE	-	-
RBE	1.35**	0.73
	(0.52)	(0.46)
Constant	4.45***	5.27***
	(0.45)	(0.40)
N	256	256
R²	0.03	0.01

Note: *, ** and *** represent significance at 10%, 5% and 1%, respectively.
Robust standard errors are in the parenthesis.
Source: Author's calculation from the experimental survey

Further, to check the effect of treatment, we run an OLS regression. Table 4 presents the results suggest that the average expectations of RBE are higher than the non-RBE. It also reiterates that the background in economics did not have an effect in the forecast post-treatment, indicating that once the information is passed, background in economics was not a significant factor in explaining expectations formation.

4.2. Knowledge of Targeting and the Formation of Expectations

In this section, we analyze whether the median expectations of the RKT and non-RKT are aligning towards the prescribed upper bound of inflation target (6%) post-treatment. This analysis will inform us how true knowledge regarding inflation targeting plays a role in formulating expectations. In doing so, we take up the compare the medians of expectations categorised by the RKT and non-RKT. Results of the hypothesis tests (H_0: Median Expectation = Target) are tabulated below.

Table 5. Test for equality based on knowledge of targeting

Targeting Knowledge	Treatment	Inflation expectation	z	p
Non-RKT	Pre	4.5	-1.85	0.06
RKT	Pre	5.5	-2.76	0.00
Non-RKT	Post	5.5	-0.81	0.42
RKT	Post	5.5	-1.50	0.13

Table 5 suggests that the expectations before treatment was significantly different from the RBI inflation target regardless of the categorization based on targeting knowledge. However, the median expectations post targeting aligned towards the target and thus not significantly different from the target. It is also noted that the non-RKT revised their expectations owing to the treatment while the RKT did not.

Conclusions

This study used an experimental survey method to address the question of information friction in the formation of inflation expectations. In doing so, we tested the effectiveness of information treatment on updating inflation expectations of respondents with a background in economics study and those who have knowledge about central bank inflation targeting. Our results found that the treatment is significantly effective as the respondents updated their expectations based on the information provided, leading to a lesser forecast error.

Specifically, we found that the information treatment is effective for those who didn't have a background in economics as they revised it to align with the actual inflation. However, after the information is provided the background in economics is insignificant in the formation of inflation expectations. The treatment is also found effective in aligning the expectations towards the inflation target regardless of the targeting knowledge. This result also implies that the information treatment is helpful even for those who have comparatively better knowledge about targeting. Similar results are found in (Burke and Manz 2014) wherein, an improved economic literacy was associated with improved forecasting scores. However, they also found that the more literate subjects could make the most out of the information provided. In our case, the more literate subjects did not have much room for improvement of forecast and thus the results cannot be counted contradictory. Bruine de Bruin *et al.* (2010) also reports the financial literacy variable associated with better inflation forecasts, which corroborates our findings.

Results of the study shed light on the importance of addressing the information friction that adds to the heterogeneity in expectations formation. Better financial education and effective central bank communication can help decrease forecast errors. Based on our findings, the most preferred source of information on inflation is print media, followed by online search engines and social media. In the wake of the rise of influential social media platforms, central banks can opt for mechanisms that reach the public easily and effectively so that economic agents can easily update information regarding inflation and thus reduce information friction.

This study is conducted based on a survey that was fielded online in the presence of the COVID-19 outbreak. In effect, the survey caters to an internet community, those who can read and write the English, and those with an internet connection. However, it perfectly caters our objective of studying learned individuals' expectations. Further research can be carried out using a field survey to overcome these limitations. The prospective study may also employ more sophisticated difference indifference methodology to better the results.

Note: Questionnaire of the survey will be provided up on reasonable request.

Declaration of Competing Interest

The author declares that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Payment for Non-Standard Forms of Labor and their Impact on the Economy and Social Status of Employees

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Abstract: *Today in the context of the formation of a new historical phase of social development of civilization - post-industrial society - there is a de-standardization of employment, i.e. the spread of flexible and variable forms of employment, which are called non-standard. It is the modification of traditional and the emergence of completely new forms of employment that actively influence the main parameters of the labor market (demand, supply, labor price, etc.). Therefore, today, personnel leasing, outsourcing, outstaffing, remote employment, non-standard working hours, etc. can be considered fundamental innovations in the field of employment. The following methods were used during the study: analysis, synthesis, induction, deduction, dialectical approach, analytical thinking, abstraction, and generalization. The purpose of the study is to define the essence of precarious forms of labor, their impact on the economy and social protection of the employee, advantages, and disadvantages. Also, to investigate problematic theoretical and practical issues related to the right to remuneration in Ukraine in the context of precarious employment, in particular, to summarize the main directions of reforming legal regulation in this area.*

Introduction

Rapid changes in social and labor relations and human resources management caused by globalization and social transformations, changes in the conditions and rules of doing business among business entities, as well as

changes and manifestations of existing problems of legal regulation of labor are the reasons for the emergence of non-standard forms of organization and types of employment among employees of business entities, self-employed persons and the population of Ukraine in general.

Supporting decent work for all requires a deep understanding of non-standard, or, as they are also called, atypical forms of employment and their possible positive and negative consequences. The purpose of functioning social and labor relations in Ukraine based on social partnership and social responsibility is to ensure the protection of employees, sustainability of the business environment, successful entrepreneurship, and development of the labor market (Yaroshenko *et al.* 2023a). Thus, the problem of studying the issue of non-standard forms of employment in Ukraine arises.

The concept of flexible forms of employment is relatively new in the practice of different countries of the world and is necessary to optimize the number of working hours, the start and end of the working day, and the creation of flexible jobs, *i.e.* in a broad sense, it includes non-standard forms of employment. Full-time employment is considered to be standard or typical, meaning that an employee is employed according to the working hours stipulated by law, collective bargaining agreement, or labor contract (Yurovska *et al.* 2023). This is full-time hired labor based on an indefinite employment contract. If at least one of these conditions is changed, it is appropriate to speak of precarious employment.

The right to remuneration by international and national standards enshrined in legal acts is an integral part of the right to work, which is realized both under standard employment conditions and, due to the challenges of the times, increasingly under non-standard conditions. At the same time, legislative guarantees and regulation of non-standard forms of employment, including those related to remuneration, are not always timely and effectively adapted to social changes (Yaroshenko *et al.* 2023b). This leads to imperfect legal regulation of relations in the field of remuneration of labor under non-standard forms of employment, and certain aspects need to be improved and reformed.

A study of the theoretical and practical aspects of the right to remuneration in the context of non-standard forms of employment is necessary to bring national legislative provisions in this area in line with the principles of remuneration, international legal guarantees of the right to remuneration, and law enforcement realities. In addition, due to the full-scale armed aggression against Ukraine, the need for effective organization of labor relations under martial law, which under these circumstances are considered non-standard - both in form, content, and purpose, has become particularly relevant.

Many scientific works, including such scholars as N. A. Azmuk (2020), I. Krasko (2020), L. S. Shatalova (2022), O. I. Kiselyova (2021), D. O. Plekhov (2021) J. Osiejewicz (2020) are devoted to this topic. The purpose of the study is to define the essence of non-standard forms of labor, their impact on the economy and social protection of employees, and their advantages and disadvantages. Also, to study the problematic theoretical and practical issues related to the right to remuneration in Ukraine in the context of precarious work, in particular, to summarize the main directions of reforming legal regulation in this area.

1. Materials and Methods

The analysis method is used to examine the history and development of non-standard forms of labor. The synthesis method allows you to combine various sources and ideas to create a comprehensive and well-founded analysis of the research subject. Induction is used to study specific cases of using non-standard forms of work and to derive general patterns based on these examples. The deduction method helps to put forward theoretical assumptions and hypotheses about the impact of non-standard forms of work on the economy and social status of employees and the remuneration of non-standard forms of work. It helps to identify key factors and predict possible consequences of using these forms of work.

The dialectical approach is used to consider the contradictions and interrelationships in the impact of non-standard forms of work on the economy and social status of workers and to explore the negative aspects of these forms of work and their positive impact. Analytical thinking is used to consider the issue of remuneration for non-standard forms of labor. The method of abstraction helps to identify key concepts and factors important for the study of the topic. The generalization method is used to formulate general conclusions about the impact of non-standard forms of work on the economy and social status of employees.

A number of articles related to the research topic were also analysed, such as "Methodological principles of labor market research in the context of the formation of the digital economy" (Azmuk 2020), "Peculiarities of legal regulation of labor in the IT sphere" (Zinovatny and Zinovatny 2022), "Theoretical and legal aspects of the development and implementation of home and remote work in modern realities" (Yakovlev and Vanjurak 2020), "Prerequisites and current trends of state regulation of the development of non-standard forms of employment"

(Krasko, 2020), "Challenges of digital technologies for the sphere of work" (Shatalova 2022), "Nanotechnologies and their impact on the labor market: risks for Ukraine" (Kiselyova 2021), "International legal regulation of remote work as one of the forms of non-standard employment" (Plekhov 2021), "Transformation of motivational attitudes in the field of work under conditions of military conflict" (Tuzhilkina 2022), "The question of the ratio of non-standard and unstable employment" (Svichkaryova 2019), "State management of the sphere of labor remuneration" (Krokhmal and Parkhomenko-Kutsevil 2022), "Organization of payroll accounting at enterprises: problems and ways to solve them" (Gurina and Bestyuk 2021), "Payroll accounting: problems and directions for improving personnel management accounting" (Popova and Kolotylo 2019), "Labour market segmentation, regulation of non-standard employment, and the influence of the EU" (Dingeldey and Gerlitz 2022), "Workers without workplaces and unions without unity: Non-standard forms of employment, platform work and collective bargaining" (Aloisi and Gramano 2019), "Employee sharing: a new type of employment, opportune in a globalized context" (Marica 2020), "Working during non-standard work time undermines intrinsic motivation" (Giurge and Woolley 2022).

2. Research Results

Issues related to the legal regulation of precarious employment are becoming increasingly relevant both in the science of labor law and in the immediate area of law enforcement. This is primarily because mass industrial production, which dominated throughout the twentieth century and was characterized by the use of standard employment, is currently undergoing significant transformations under the pressure of the technologies of the twenty-first century (Yaroshenko *et al.* 2022). This circumstance encourages employers to increasingly resort to forms of labor relations that best meet these technologies and, in some cases, go beyond the generally accepted legal norms that were defined in the last century.

Non-standard employment, as defined by the International Labor Organization (ILO), includes four different types of employment of employees that deviate from standard labor relations. These include temporary employment (casual work and short-term contracts); part-time and on-call work; tripartite employment (work through temporary agencies and other forms of employment mediation or dispatching); and disguised employment or self-employment (where workers are legally classified as self-employed but their work is managed by someone else). Non-standard forms of employment include full-time employment; part-time employment, temporary workers; part-time employment; employment based on civil law contracts; home-based work; on-call work; remote work; temporary employment (staff leasing, staff out staffing, staff outsourcing); informal employment; unregistered employment in the informal sector. The growth in demand for non-standard forms of employment is influenced by the peculiarities of production in the post-industrial era, globalization, the development of the international service sector, the development of IT technologies, etc.

From a theoretical point of view, views on the standard of employment have changed depending on the conditions of the socio-economic development of society. The fast-growing service sector requires different kinds of employees: those who work flexible hours, shorter or longer than the norms stipulated by law; more mobile and, if necessary, easier to dismiss, as they have only a temporary employment contract; those who combine executive and entrepreneurial functions, etc. The demand for labor from small businesses, whose role in the modern economy is constantly growing, is similar (Arrighetti *et al.* 2022).

The quantitative and qualitative growth of atypical forms of labor occurred in Western Europe and the United States in the 70s of the last century, but the recognition of the right to exist of non-standard labor relations occurred only in the late 1990s and early 2000s in the regulations of the International Labor Organization (for example, Convention No. 181 on Private Employment Agencies). In 2008, the European Union (EU) Directive on Work in Temporary Employment Agencies No. 2008/104/EC was adopted (Azmuk 2020).

According to ILO research, about half of all workers in the world are employed outside of standard labor relations with employers. Only 25% are employed on permanent contracts, 35% are self-employed, 13% work on temporary contracts or fixed-term contracts, and 12.3% are employed in the informal sector (Britchenko and Saienko 2017). At the same time, according to the latest ILO report, there is a significant shortage of decent work in non-standard forms of employment. There is an increase in the use of non-standard forms of employment, including temporary work, part-time work, temporary borrowed labor, subcontracting, dependent forms of self-employment, and hidden labor relations.

Of course, non-standard working conditions can provide workers with access to the labor market, but along with some flexibility in the relationship between employees and employers, many forms of employment also deprive workers of certain job security. The growth of precarious work confirms both the interest of employers and

the sufficient productivity of such workers for each particular business entity: in the face of unemployment, there may be no better alternatives.

The experience of the United States is interesting in this regard. In the United States, non-standard forms of employment are widespread, which are called non-traditional forms with non-standard employment and working conditions. According to American employers, they help to reduce labor costs, efficiently use working time, and avoid problems with labor unions. At the same time, social insecurity in these forms of employment is already a problem for employees. At the same time, temporary employment is the most appropriate option for performing a specific amount of work and is carried out under an employment contract. Part-time employment in the United States is employment with a reduced weekly workload (less than 35 hours). Highly skilled professionals and employees of free professions prefer to work under individual agreements. There is a category of "on-call" workers, *i.e.* those who are hired when production needs arise, for example, during periods of peak demand for certain works or services (Giurge and Woolley 2022).

The practice of hiring workers through private employment agencies that provide companies with workers of the required professions and qualifications on lease allows them to save on their training (staff leasing). Some Americans work several jobs, *i.e.*, are part-time workers. Flexible forms of employment are practiced for more than 30% of employees, which are often sought after by employees themselves, especially women and students, as well as those seeking to combine work with life plans and responsibilities (work-life balance). The spread of flexible employment and flexible working hours is a sign of the significant flexibility of the American labor market, which allows companies to compete successfully in the global market (Zinovatny and Zinovatny 2022).

In the United States, the discussion of precarious work raises several important research questions. The main issue concerns the quality of non-standard forms and how they relate to standard forms of employment for an individual worker. Such an assessment involves determining the consequences of non-compliance in terms of the nature and extent of the costs and benefits that arise. Employees also benefit from the advantages of non-standard employment contracts, including greater autonomy, increased earning potential, flexibility, and greater control over work-life balance, allowing employees to combine work and family responsibilities. Organizations benefit from the fact that standardized arrangements go beyond the usual provisions and protections of a governance standard, thereby providing cost savings and the ability to quickly adapt to changing conditions.

From this perspective, precarious work is seen as unstable and potentially low-quality employment. These concerns become more important when viewed in the context of the growing number of people moving into precarious work as part of the process of transforming full-time employment into precarious work, as organizations increasingly use outsourcing and temporary agency work. Critics see these trends as part of a broader new approach to labor management that increases productivity by increasing the cost of labor and the risks of using such labor (Lab 2020).

In the EU, two new forms of employment are emerging in connection with new labor relations that differ from traditional forms: employee sharing and job sharing. Recently, such non-standard types of employment as temporary management, casual work, mobile work using IT technologies, voucher work, portfolio work, simultaneous remote employment, and joint work have been developing. In EU countries, the regulation of non-standard forms of employment is legally justified (Yakovlev and Vanjurak 2020).

In today's globalized world, diversification of employment relations is becoming an important competitive advantage. It largely determines the ability of the labor market to successfully adapt to rapid changes in the economic, social, and institutional environment. However, diversification of employment relations is negatively related to the rigidity of labor legislation.

Given the spread of non-standard forms of employment and the growing number of their types, it has become natural to regulate such labor relations to effectively define the rights and obligations of employees and employers, including the establishment of mechanisms to ensure compliance with the guarantees of the right to remuneration. One of the main international documents establishing the peculiarities of home-based work is the Home-based Work Convention, No. 177 (1996a), adopted by the International Labor Organization on 20.06.1996 (ILO Convention No. 177).

A notable provision of this act is the definition of "home-based work". According to Article 1 of the ILO Convention No. 177, home-based work consists of the performance of work by a person: at his place of residence or in other premises of his choice, but not at the employer's premises; for remuneration; to produce goods or services, according to the employer's instructions, regardless of who provides the equipment, materials or other resources used, unless the person has the degree of autonomy and economic independence necessary to be considered an independent worker by the national law.

It should be noted that the concept of "home-based" under this provision includes both home-based and remote work, for which Ukrainian law still provides for certain differences. In the context of remuneration of employees of this non-standard form of employment, the provision of paragraph "d" of part 1 of Article 4 of ILO Convention No. 177 is important, according to which equality of treatment in respect of remuneration of homeworkers and other employees in the enterprise performing similar work should be encouraged. Given that the article itself does not specifically state to which form of employment this "comparison" applies, the context suggests that it is more likely to apply to persons working under standard employment conditions.

At the same time, the provision also considers the peculiarities of home-based work, its needs, and conditions applicable to the same or similar type of work. This provision can be interpreted as emphasizing the need for equal treatment of employees of different forms of employment, but only if the specifics and, to a certain extent, the efficiency of their work make it possible to objectively evaluate it equally in monetary terms (Krasko 2020).

Along with the ILO Convention No. 177, the ILO also adopted Recommendation concerning Home-Based Work No. 184 of 20.06.1996 (1996b) (Recommendation No. 184), which sets out certain proposals for the regulation of home-based work. Section VI of Recommendation No. 184 is fully devoted to the issue of remuneration for home-based workers. Among the interesting provisions, in particular, is the recommendation to establish a minimum wage for home-based work by national legislation and practice.

At first glance, it seems that the separation of the minimum wage for standardized employees and homeworkers violates the principle of equality, which was also emphasized in ILO Convention No. 177. However, a detailed analysis of this recommendation makes it clear that in addition to determining the minimum rate for a particular piecework job (which should also be equal to that received by a standard form employee at the employer's enterprise or, in its absence, at another enterprise in the same industry or the same area), it is also recommended to provide certain compensation to homeworkers (Möhring 2021).

By paragraph 16 of Recommendation No. 184, such compensation should be provided to homeworkers for the costs associated with performing work outside the employer's premises, including energy, water, communications, maintenance of machinery and equipment; and time spent and maintenance of machinery and equipment necessary for the work.

Thus, ILO Convention No. 177 and Recommendation No. 184 paid special attention to home-based workers, and the provisions of these acts emphasize the inadmissibility of discrimination against such workers compared to those who perform work on a standard employment basis unless there are objective factors for this (Shatalova 2022).

Another significant step towards the regulation of non-standard employment relations was the adoption of the European Framework Agreement on Teleworking on July 16, 2022 (the Framework Agreement) at the European Union level. The Framework Agreement, unlike the aforementioned ILO Convention No. 177 and Recommendation No. 184, uses the concept of "telework", which, according to Article 2 of the Framework Agreement, is "a form of work organization and/or work performance using information technology, in the context of an employment contract/relationship, whereby work that can also be performed at the employer's premises is performed outside these premises regularly».

In the context of the study of non-standard forms of employment and the identification of those that are not covered by labor legislation, it should be noted that "telework" refers only to work under an employment contract or the existence of an employment relationship. The said act, as well as Recommendation No. 184, establishes the need for the employer to compensate the employee for the costs associated with the performance of work, in particular, communication costs, in Article 7.

The Framework Agreement does not contain any provisions on remuneration directly, but Article 4, which deals with employment conditions, stipulates that so-called teleworkers have the same rights as those working at the employer's premises. Additionally, it is noted that it is possible to conclude special collective and/or individualized agreements between teleworkers and employers, taking into account the peculiarities of this form of employment.

In general, as in the case of standard employment, aspects not regulated by law and requiring individualization in the case of home-based work (within the meaning of ILO acts) and telework (within the meaning of EU acts) are agreed upon in a collective agreement, *i.e.* at the local level.

To summarize, it is worth noting that the principles and international legal guarantees of the right to work, including remuneration, apply to labor relations in non-standard forms of employment. There is a rather small number of international acts that would contain norms on non-standard forms of employment, in particular, despite their diversity, these acts relate to the work performed outside the employer's premises (home and

telework). Nevertheless, this situation is quite understandable, as detailed regulation of labor relations takes place at the national, regional, sectoral, and local levels, both within the company and between the employer and a particular employee (Kiselyova 2021).

For a long period, the regulation of non-standard forms of employment was not in the field of view of both international organizations and Ukrainian legislators. Despite some proposals for changes in the regulation of labor relations, the adoption of regulations in this area was not timely.

However, a significant challenge for society in general and the national legislator, in particular, was the need to regulate labor relations in the context of quarantine and the introduction of so-called restrictive anti-epidemic measures to prevent the spread of the acute respiratory disease COVID-19, both in almost all countries of the world and Ukraine in particular.

For example, according to a 2021 study by the European Agency for Safety and Health at Work on the regulation of telework in post-COVID Europe, out of the 27 EU member states analyzed, 20 had a legislative definition of telework and specific legal regulation at the national level. In the post-COVID period, 5 countries adopted new regulations on telework, and 12 countries had drafts of such regulations under consideration at the time of the study. At the same time, only 3 countries (Denmark, Finland, and Sweden) had no specific regulation of telework before the pandemic, nor any innovations with or after the pandemic. As a result of the spread of the disease in 2020-2021 and the repeated quarantine throughout Ukraine and certain administrative-territorial units, it was expected that relevant regulations would be adopted to regulate the specifics of labor relations in the new realities (Plekhov 2021).

The first attempt at regulation was the adoption of the Law of Ukraine No. 540-IX "On Amendments to Certain Legislative Acts of Ukraine Aimed at Providing Additional Social and Economic Guarantees in Connection with the Spread of Coronavirus Disease (COVID-19)" dated 30.03.2020 (Law of Ukraine No. 540-IX), which, among other things, amended the Labor Code of Ukraine (Labor Code) (1971).

Until 02.04.2020, Article 60 of the Labor Code of Ukraine provided for the possibility of dividing the working day into parts in the presence of special conditions and nature of work, which almost corresponded to the concept of flexible working hours introduced with the entry into force of the above-mentioned Law of Ukraine No. 540-IX.

However, with the amendments, Article 60 of the Labor Code of Ukraine was transformed into a rather specific regulatory mechanism for several non-standard forms of employment: flexible working hours, remote work, and home-based work. The legislator's logic was obviously to secure the ability of employees to work outside the employer's premises, given the quarantine, and with certain time deviations from the standard working day, probably also to enable employees to adapt to performing work mostly from home.

In the context of exercising the right to remuneration in the context of these non-standard forms of employment, Article 60(9) of the Labor Code of Ukraine (as amended on April 2, 2020) provides that the application of the labor law shall be applied to all forms of employment. 2020) stipulates that the application of flexible working hours does not entail changes in labor standardization, and remuneration and does not affect the scope of labor rights of employees; paragraphs 12, and 13 of Article 60 of the Labor Code of Ukraine stipulate that the performance of remote (home) work does not entail any restrictions on the scope of labor rights of employees; unless the employee and the employer have agreed otherwise in writing, remote (home) work provides for remuneration in full and within the terms specified in the applicable employment agreement (Tuzhilkina 2022).

The above amendments have raised many problematic issues, especially about the right to remuneration, which, on the one hand, is guaranteed to be free of any restrictions, and, on the other hand, provides for the possibility for the parties to an employment agreement to "agree otherwise," meaning that the employer and employee may agree to not pay any remuneration at all.

Attention is also drawn to the confusion with the understanding of remote work as a temporary (forced) form of work mode, in particular during the quarantine period, and remote work as a special form of work organization carried out permanently based on a remote work agreement.

It is worth noting that the provisions of the Labor Code of Ukraine (as amended on April 2, 2020) do indeed provide for the possibility of concluding an employment agreement for remote (home) work, which by all indications generally corresponds to the regulation of labor relations of these non-standard forms of employment. At the same time, the possibility of establishing a condition for remote (home) work or flexible working hours during the threat of an epidemic, pandemic, and/or military, man-made, natural, or other threat (Article 60(2) of the Labor Code of Ukraine) also falls under non-standard employment, since such legal relations are non-standard in form, content, purpose, result, etc. Therefore, both remote work during the quarantine period and a special form of work organization are considered to be the same form of employment.

In the context of the labor rights of employees in general and the right to remuneration in particular, it is important to note that by Article 60(11) of the Labor Code of Ukraine (as amended on April 2, 2020), employees working on the terms of remote (home) employment are not subject to the internal labor regulations.

At the same time, according to the conclusion of the Supreme Court set out in its decision of 09.06.2021 in case No. 420/2174/19 and based on the analysis of the differences between civil law and labor relations, a characteristic feature of labor relations, among others, is subordination to the internal labor regulations, as well as the employer's obligation to provide a workplace. In particular, clause 47 of the said resolution states that "a contractor working under a civil law contract, unlike an employee performing work under an employment contract, is not subject to the rules of internal labor regulations, he organizes his work and performs it at his own risk".

Analyzing these features and taking into account the fact that the conclusion was made by the Supreme Court in 2021, *i.e.* after the adoption of several amendments to the Labor Code of Ukraine in terms of regulating certain non-standard forms of employment, we can see the lack of adaptation of law enforcement practice to the so-called new realities of labor relations (even though their spread occurred much earlier than their legislative consolidation) (Svichkaryova 2019).

More detailed regulation of certain non-standard forms of employment in Ukrainian legislation was reflected in the amendments introduced by the Law of Ukraine No. 1213-IX "On Amendments to Certain Legislative Acts of Ukraine on Improving the Legal Regulation of Remote, Home-Based Work and Work with Flexible Working Hours" dated 04.02.2021.

The said regulatory legal act supplemented the Labor Code of Ukraine with provisions on flexible working hours (Article 29 of the Labor Code of Ukraine), home-based work (Article 601 of the Labor Code of Ukraine), and remote work (Article 602 of the Labor Code of Ukraine), which effectively distinguished between three separate types of non-standard forms of employment, which had previously been regulated within the same article.

It is noteworthy that national legislation distinguishes between home-based and remote work, unlike the analyzed European acts, which define both types as home-based work (ILO Convention No. 177, Recommendation No. 184) or telework (Framework Agreement). The difference between the two under Ukrainian law is that in the case of home-based work, it is performed by an employee at the place of residence or in another specifically defined area that cannot be changed without the consent of the employer, while in the case of remote employment, it is performed at any place of the employee's choice; in both cases, outside the employer's work or production premises. There is also a difference in legal regulation (Krokhmal and Parkhomenko-Kutsevil 2022).

An important aspect in the context of remuneration for home and remote work is the legally provided possibility for an employee to receive compensation for expenses related to the performance of labor functions outside the employer's premises (Matvieieva *et al.* 2022). In this aspect, national legislation complies with similar provisions of ILO Convention No. 177. Thus, by Article 601(6) of the Labor Code of Ukraine, as a general rule, in the case of home-based work, it is the employer who must provide the employee with everything necessary to perform the work, but if the parties agree otherwise, the employee is entitled to compensation by the provisions of Article 125 of this Code - either according to the rules established in a centralized manner or by agreement between the parties.

The labor law provisions do not disclose the concept of tools or at least an indicative list of things necessary for the performance of work, which are referred to in the context of the said compensation. Analyzing the tools and means of labor for performing home-based work (within the meaning of ILO Convention No. 177), one may refer to one's tools and mechanisms as computers, printers, modems, and office furniture, which are the property of the employee with whom the home-based work agreement is concluded.

Under Article 602(7) of the Labor Code of Ukraine, remote employment also provides compensation to employees for the use of equipment, software and hardware, information security, and other means owned or leased by them. The above list of expenses is not exhaustive, as other expenses related to remote work may also be reimbursed. All of these conditions, including the procedure, terms of payment, and their amount, are generally established by agreement of the parties in a remote work employment agreement.

At the same time, the provision on this condition of the employment agreement is not mandatory, since the provisions of Article 602(8) of the Labor Code of Ukraine impose an obligation on the employer to provide the remote worker with the means to perform work and to pay the expenses related to this, if the employer and the employee have not provided for provisions in the remote work agreement that would regulate their relations in this aspect (Gurina and Bestyuk 2021).

Particular attention should be paid to Article 601(6) of the Labor Code of Ukraine, which stipulates that the performance of home-based work does not entail changes in labor standards, or remuneration and does not affect the scope of labor rights of employees. A similar provision is contained in part 11 of Article 60 of the Labor

Code of Ukraine regarding flexible working hours. However, Article 602 of the Labor Code of Ukraine does not contain a similar provision regarding the regulation of remote work, although the previous version of Article 60 of the Labor Code of Ukraine stated that any restrictions on the scope of employees' labor rights in case of remote (home) work are inadmissible.

For a long time, the Verkhovna Rada of Ukraine has been considering the Draft Law on Amendments to Certain Legislative Acts of Ukraine on the Regulation of Certain Non-standard Forms of Employment, registered under No. 5161 (Draft Law No. 5161), which has been prepared for the second reading since September 21, 2021.

Draft Law No. 5161 proposes to supplement the Labor Code of Ukraine with Article 211, which would regulate relations arising from the conclusion of an employment contract with non-fixed working hours. In terms of content, such a non-standard form of employment would correspond to the so-called "on-call" work, *i.e.*, based on the provisions of Draft Law No. 5161, work without a predetermined time of performance, "the employee's obligation to perform which arises only if the owner or his authorized body provides the work stipulated by this employment contract without guaranteeing that such work will be provided permanently".

From the above definition, it can be concluded that such relations are rather of a civil law nature since the employee is engaged to perform specific individual tasks, *i.e.*, there is a focus on the result rather than the process of work. This position is essentially confirmed by the theses of the Explanatory Note to the Draft Law No. 5161, according to which such an instrument is introduced "as an alternative to civil law contracts".

About the regulation of remuneration for non-fixed working hours, it is proposed to pay wages either for the actual time worked or for the actual work performed. It should be noted that remuneration for the result in the form of a specific task or unit of production once again confirms the civil law nature of the proposed innovations.

Along with Draft Law No. 5161, an alternative Draft Law on Amendments to Certain Legislative Acts of Ukraine on Regulation of Certain Non-standard Forms of Employment No. 5161-1 (Draft Law No. 5161-1) was also registered. Although Draft Law No. 5161-1 was withdrawn from consideration on 21.09.2021, it contains important clarifications regarding remuneration for work performed under an employment contract with non-fixed working hours.

The main difference between Draft Law No. 5161-1 and Draft Law No. 5161-1 on remuneration was the possibility to provide in an employment contract with non-fixed working hours "payment of wages for the actual time worked, for a specific task performed, for a unit of manufactured products, under the piecework system of remuneration". This list is not exhaustive, and it is noted that the parties may agree on other terms of remuneration (Popova and Kolotylo 2019).

In this context, attention should be drawn to the narrow approach taken by the drafters of the draft law to understand the concept of remuneration, which includes only wages, without covering warranty or compensation payments. A similar approach was used in the original Draft Law No. 5161.

Interestingly, it was the alternative Draft Law No. 5161-1 that was the subject of an analysis by the International Labor Organization of its provisions to bring them closer to international and European labor standards. In particular, among the aspects that need to be improved, the ILO noted the need to "provide for the employer's obligation to pay compensation to the employee in case the employer cancels the work assignment previously agreed with the employee after the expiration of the cancellation period established by the employment contract".

On the one hand, in this situation, the question remains as to whether such cancellation occurred due to circumstances beyond the employer's control. On the other hand, it is the employer who is responsible for providing the employee with work and ensuring the necessary conditions for its performance. Unlike some types of civil law relations, labor relations do not provide for the role of the employer as an intermediary between, for example, the customer of the work, who may cancel the work assignment for personal reasons, and the employee.

In this context, it can be concluded that the ILO's proposal is quite reasonable, and the risk of work being canceled after the agreed period should be borne by the employer. The above is also based on the "breadth" of the concept of remuneration, the right to which is to be ensured even in circumstances where the employee is deprived of the opportunity to work and, accordingly, receive remuneration for his/her labor through the fault of the owner or his/her authorized body. Thus, a similar conclusion was made when analyzing the payment for forced absenteeism.

The wording of Article 211 of the Labor Code of Ukraine recommended by the ILO regarding the need for the employer and employee to agree on the number of guaranteed paid hours and the amount of remuneration for work performed in addition to these guaranteed hours is also important. This remark is because the

predominant unpredictability of work under such a non-standard form of employment "does not mean that the employment agreement of this type "does not establish a specific time for work".

Thus, when legislatively regulating work under an employment contract, even with a non-fixed or, as recommended by the ILO, "variable" schedule, attention should be paid to the observance of minimum guarantees of transparency and predictability of working conditions, including remuneration for work and work over the established limits, and in certain cases when tasks are canceled through no fault of the employee or are not performed at all (Kiselyova 2021).

To summarize, it is worth noting that in the context of the realization of the right to remuneration in the context of the analyzed non-standard forms of employment, there is a clear tendency to apply the principle of unity and differentiation. In this case, the scope of labor rights of employees should be equal to the scope of rights granted to employees of the standard form of employment (unity component). At the same time, taking into account the specifics of home-based, remote work, or flexible working hours, special guarantees for employees and corresponding obligations for employers are provided (component of differentiation).

It should be noted that flexible forms of employment are underutilized in Ukraine. This is primarily due to the sectoral structure of the country's economy, which is dominated by heavy industry with 24-hour working hours. However, with a gradual change in the sectoral structure and an increase in the share of the service sector, the introduction of flexible forms of employment will expand this base.

The potential for increased economic efficiency associated with IT technologies is a powerful incentive for the use of remote work in the field of scientific and technical activities. Studying and publishing the results of the activities of enterprises using this new style of work will play an important role in creating conditions for a smooth transition to remote work. There is an urgent need to adopt the Telework Law and amend the Labor Code to accommodate remote work.

Entrepreneurs who offer flexible forms of employment have a greater competitive advantage in the labor market among potential employees, including highly skilled ones. Despite the high effectiveness of this non-financial incentive, flexible working is not for everyone. Working on a flexible schedule requires a high level of self-organization, responsibility, internal discipline, competence and professionalism, and mastery of time management techniques to set priorities correctly and complete all tasks and types of work in a timely and high-quality manner.

It is unacceptable to apply such a regime to enterprises with an excessively rigid organizational and management structure, as well as in the absence of performance evaluation criteria or key performance indicators. To improve the efficiency of business activities, it is necessary to improve the structure of the use of working time, rationalize work and rest regimes, and develop labor efficiency management programs. Improving the efficiency of working time use and reducing the labor intensity of economic results of business activities is impossible without active cooperation between management (owners) and the workforce, an effective labor motivation system, proper occupational health, and safety, labor discipline, a healthy social and psychological climate, a system of corporate ethics and social responsibility of the parties (Krasko 2020).

Further social innovations in the employment sector are expected in the future: public-private partnerships in job creation; innovative forms of working time flexibility combined with social technologies for monitoring, recording, and controlling working conditions and safety; the spread of outsourcing, outstaffing, and staff leasing; and the modernization of social dialogue. Expanding the areas and improving the tools of active employment policy: comprehensive vocational guidance programs; innovative technologies for youth transit to the labor market; promoting social and professional rehabilitation of the unemployed; programs for active involvement of the economically inactive population; voucher technologies in vocational training; stimulating professional and territorial mobility; modernizing the creation of innovative jobs, such as telecommunications based on online communications, home-based work, and collaboration.

A model program for their development can be offered to Ukrainian business entities that are willing and have reasons and prerequisites for using, at least partially, non-standard forms of employment. The directions of forming a policy to improve the quality of non-standard jobs at the state level should include eliminating gaps in the regulatory and legal sphere to ensure equal rights and opportunities for workers regardless of the form of labor organization and employment and working hours; ensuring control over the conditions and methods of using hired labor, compliance with the principles of social responsibility by the parties to social and labor relations; improving the mechanism of social dialogue; providing the social protection system with greater flexibility.

At the local level, the main direction of regulation of precarious employment should be collective bargaining and contractual regulation of social and labor relations and coordination of interests of their subjects in the system of social partnership. In the current conditions of development of the innovative economic model in

Ukraine, it is impossible to provide all economically active citizens with "standard" jobs, but there is every opportunity to ensure decent working conditions that promote productive employment, provide stable income, safety, and comfort in the workplace, and social security of the employee.

3. Discussions

Flexible forms of employment are among the active measures to manage the labor potential of Ukraine. The essence of these flexible forms is to provide an employee with a choice between free and working time, both in terms of the amount of time and the mode of its use. Such forms of flexible employment play a significant role in solving unemployment problems by using the same number of jobs for more workers. The state's investment activities make it possible to create new jobs in the legal sector of the economy, but the Ukrainian private sector exists and operates in a context of strict financial and tax policies and a highly bureaucratic organization. Informal employment provides an opportunity to avoid financial control by the state. In addition, informal employment creates additional jobs that cannot be created legally due to the lack of capital and high level of financial payments. The informal sector, being an independent segment of the labor market, creates jobs, *i.e.*, affects the employment status of the population, thereby reducing tension in the labor market; expands the market for goods and services; and creates a basis for the development of small businesses. The development of non-standard employment in the IT sector largely depends on the development of entrepreneurship and self-employment (Marica 2020).

The criteria for assessing the effectiveness of regulating new forms of employment are: ensuring employment guarantees, ensuring the rights of employees and employers, a decent level of remuneration, interaction of labor relations based on social partnership, and social stability in society. The effectiveness of regulation of temporary work and precarious employment in Ukraine, as the most complex and controversial phenomena in the modern labor sphere, will determine the welfare of employees, the degree of flexibility, and the civilization of labor relations. A program for the development of non-standard forms of employment at the enterprise level will allow for the rational use of labor potential and the attraction of talented professionals, which will help to increase the efficiency of innovation activities (Arlinghaus *et al.* 2019).

Researchers from the University of Melbourne are assessing the real impact of "non-standard" forms of employment on workers amid growing concerns about casual and contract employment. Casual, temporary, and subcontracted employment is generally associated with a lack of work, unpredictable hours, and limited opportunities for advancement, but the research team also found that it can be an important entry point into the labor market and, for some, a better fit with personal preferences.

The widespread use of IT technologies and the Internet outside the company's office makes it possible to create a "flexible work schedule" and more optimized use of working time. An employer that allows employees to work from home can actively influence the structure of its production costs.

The use of non-standard forms of labor has several advantages and disadvantages for both employees and employers. The main problems for employees are the lack of a stable job, the constant threat of unemployment or underemployment; deterioration of basic employment conditions, remuneration, and labor protection; loss of collective labor rights, such as the right to join a trade union and collective bargaining; loss of guarantees in the field of pensions and other social benefits, guarantees and compensations; loss of the right to receive insurance compensation for risks in the system of compulsory state social insurance; loss of connection with and It is quite difficult to maintain a balance under such conditions (Reljic *et al.* 2023).

Non-standard employment poses risks to workers, firms, labor markets, and society, as non-standard employment, especially when it is not voluntary, can increase worker insecurity. While certain risks may be present in standard employment, they are less prevalent than in various forms of precarious work.

The advantages include the ability to combine work with other activities (studying, childcare, etc.); the ability to earn additional income; and the ability to independently regulate working hours; remote employment sometimes becomes almost the only opportunity for people with disabilities to find work; quick response to changes in the labor market; reduction of unemployment; attraction of qualified specialists; the ability to create new jobs and retain existing ones in crisis conditions; optimization of costs for education and training (Aloisi and Gramano 2019).

The intensification of the process of spreading the use of non-standard forms of employment, and in particular, fixed-term employment contracts, tripartite labor relations in the case of out staffing and leasing of personnel, civil law contracts, in practice, usually occurs on the initiative of employers, as it allows them to reduce financial costs: for the organization and maintenance of the workplace, wages and social benefits; avoid the need to respect the labor rights of employees and the costs associated with the dismissal of an employee at the

initiative of the authorities. The main risks of using non-traditional forms of employment for an employer are reduced staff loyalty, deterioration of corporate culture, and complications in managing and controlling labor processes (Dingeldey and Gerlitz 2022).

Conflicts between employers and employees that arose at the beginning of labor relations lead to the fact that the benefits of non-standard forms of employment for employers turn into a deterioration in the situation of employees. Currently, this problem is one of the priorities of trade unions in the coming years. They take a position against the spread of non-standard forms of employment, and in particular, borrowed employment. In Ukraine, for the first time, trade unions have developed a draft law "On the Prohibition of the Use of Borrowed Labor in Ukraine", which was introduced as a legislative initiative by Ukrainian MPs. However, it is virtually impossible to stop, let alone prohibit, the spread of non-standard forms of employment that have taken over the global labor market. Instead, effective mechanisms for regulating precarious work should be developed to minimize social risks and increase the efficiency of hired labor.

The formation and development of qualitatively new social and labor relations under the influence of the spread of non-standard forms of employment and in the context of the formation of a new economy is possible through the preservation and development of human potential since a person is currently the leading factor in economic activity; creation of a comprehensive system of economic and legal mechanisms to promote effective employment; introduction of strict legislative norms that would guarantee the protection of social and labor rights of workers by international labor standards.

Conclusions

The concept of flexible forms of employment, which is a relatively new practice in different countries of the world, is necessary to optimize working hours, start and end of the working day, and create flexible workplaces. In a broader context, this concept includes non-standard forms of employment. Full-time employment is considered standard or typical when an employee works by the working hours established by law, collective bargaining agreement, or employment contract. This means full-time paid work based on an indefinite employment contract. If at least one of these conditions changes, then we can talk about non-standard employment.

The use of non-standard forms of labor has advantages and disadvantages for employees and employers. For employees, it can lead to job instability, loss of social rights and guarantees, and reduced motivation. For employers, it can reduce costs and increase productivity. Non-standard employment can also pose risks for employees, but it can be useful in various situations, such as combining work with other activities and reducing unemployment.

For a long time, non-standard forms of employment have not been actively regulated either by international organizations or by Ukrainian legislation. Despite some proposals for changes in the regulation of labor relations, the adoption of regulations in this area has been delayed for a long time. However, the introduction of quarantine and restrictive anti-epidemic measures in connection with the COVID-19 pandemic has posed significant challenges to society and the legislator. In these circumstances, there is an urgent need to regulate labor relations, including non-standard forms of employment, to ensure the rights and interests of employees.

Therefore, when legislatively regulating work under an employment contract, even if the work schedule is irregular or variable, it is important to ensure minimum guarantees of transparency and predictability of working conditions, including payment for actual work performed and work over the established norms. In the context of remuneration in non-standard forms of employment, it is important to adhere to the principle of unity and differentiation, ensuring equal rights and guarantees for employees, but taking into account the specifics of their work.

Formation of qualitatively new social and labor relations in the context of non-standard forms of employment and the new economy is possible through several measures: preservation and development of human potential, creation of a system of economic and legal mechanisms for effective employment, protection of workers' rights, establishment of a mechanism for interaction between labor participants, use of contractual relations between business and employees, development of social responsibility, increasing the role of social partnership and industrial democracy, as well as taking into account the complexity of work, responsibility, and accountability. It is necessary to develop an information base for objective assessment and analysis of social and labor relations.

Credit Authorship Contribution Statement

Oleg M. Yaroshenko: Writing - Original Draft, Conceptualization.

Olena Ye. Lutsenko: Writing - Original Draft, Methodology.
Nataliia O. Melnychuk: Writing - Review and Editing, Data Curation.
Ivan P. Zhygalkin: Writing - Original Draft, Software.
Oleksandr Ye. Demenko: Writing - Review and Editing, Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Environmental Concerns, Sustainable Consumption, and COVID-19 Fear in Online Consumers: A Research Exploration

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Abstract: *As a conceptual paper, this study examines the nuanced relationships between consumers' environmental orientations (egoistic, altruistic, and biospheric) and their sustainable consumption patterns, particularly emphasizing the prevailing influence of COVID-19 fear. Utilizing a targeted survey approach, responses from online Taiwanese and Thai consumers are gathered and analyzed through a Structural Equation Model, incorporating diverse analytical avenues such as path, mediation, moderation, and multi-group analyses. The study aims to describe prosocial consumers by their distinct environmental concerns and subsequent sustainable consumption behaviors. Furthermore, the study sheds light on how the COVID-19 pandemic has modulated the dynamic between environmental considerations and tangible sustainable consumption actions. In a post-pandemic setting, the study contributes to academic discourse by highlighting the confluence of environmental consciousness and sustainable consumption. It also provides pragmatic implications for businesses, directing them towards eco-centric product offerings and cultivating a deeper ecological awareness among consumers, fostering sustainable purchase intention and behaviors.*

Introduction

This study investigates consumers' post-lockdown sustainable consumption behavior in the context of the COVID-19 pandemic. The pandemic has prompted significant changes in consumers' lifestyles, purchasing patterns, and work arrangements (Lingqvist *et al.* 2021; Fablus *et al.* 2020; Chenarides *et al.* 2021; Vyas and Butakhieo 2020; Rovetta 2021; Hakim, Zanetta, and da Cunha 2021). Adopting a social marketing perspective, implementing social distancing measures has influenced consumers' behavior by triggering psychological responses driven by the perceived threat and risk associated with the infectious disease (Chae 2021; Hakim, Zanetta, and da Cunha 2021). For example, consumers have shown an increased inclination toward online

grocery shopping (Chenarides *et al.* 2021), remote work arrangements (Vyas and Butakhieo 2020), and communication through social network platforms like WhatsApp and LINE (Chenarides *et al.* 2021).

Environmental Implications of COVID-19

COVID-19 has yielded both positive and negative environmental implications, as observed in previous studies (Rume and Islam 2020; Muhammad, Long, and Salman 2020; Lim *et al.* 2021; Wetchayont 2021). The positive effects encompass reductions in fossil fuel consumption, resource utilization, waste management, transportation, industrial activity, and demand for tourist destinations (Rume and Islam 2020). Conversely, the negative consequences involve challenges related to medical waste disposal, such as unplanned disposal of personal protective equipment (PPE), increased municipal waste generation, and a decline in recycling efforts (Rume and Islam 2020). Notably, during the COVID-19 lockdowns, there has been a discernible reduction in air pollution levels in Seoul, South Korea (Lim *et al.* 2021) and Bangkok, Thailand (Wetchayont 2021).

Research Gap and Objective

Previous research investigating the influence of environmental concerns on consumer behavior has highlighted various research contexts. These include the personal aspect, encompassing environmental knowledge and concern (Joireman and Durante 2016; Caniëls *et al.* 2021). The external aspect examines product packaging and corporate environmental responsibility (Joireman and Durante 2016; Caniëls *et al.* 2021). The human resource management practice/policy also explores environmental management and green technology (Schultz, 2001; Stern and Dietz 1994).

Within the realm of environmental concerns, researchers have examined the relationship between three dimensions: environmental egoistic, altruistic, and biospheric concerns and consumers' engagement in sustainable consumption. Sustainable consumption involves cognitive, affective, and conative attributes that enable consumers to avoid acquiring unnecessary products, guided by the Theory of Mind (Hilgard 1980, Quoquab and Mohammad 2020). Furthermore, sustainable consumption encompasses considerations for the well-being of future generations and takes into account the environmental, social, and economic consequences associated with the acquisition, use, and disposal of goods (Quoquab and Mohammad 2020; Hilgard 1980; Hwang and Yeo 2022; Kaur and Luchs 2022).

Two illustrative examples highlight the impact of consumers' environmental concerns on sustainable consumption (Hwang and Yeo 2022). In their study, Hwang and Yeo (2022) investigate the relationship between consumers' perceived value (functional, emotional, social, and altruistic) and sustainable consumption behaviors in South Korea. They focus on sustainable consumption behavior, particularly eco-label and recycled product purchases. The study's findings reveal that emotional value significantly influences the purchase of eco-labeled products, while both emotional and altruistic values play a role in influencing the purchase of recycled products.

Another study conducted by Kaur and Luchs (2022) measures sustainable consumption through two dimensions: (1) socially conscious consumption and (2) frugal consumption. Pepper, Jackson, and Uzzell (2009) developed the measurement scale for these dimensions. The research results indicate that egoistic, altruistic, and biospheric values influence socially conscious purchase behavior. In the context of frugal consumption in India, only altruistic values significantly influence purchase behavior.

This study aims to address two specific research gaps identified in the existing literature. The first research gap pertains to the absence of a direct examination of the relationship between an individual's egoistic, altruistic, and biospheric environmental concerns and their engagement in sustainable consumption behaviors, which can be measured through cognitive, affective, and conative aspects of sustainable consumption. While previous studies have explored the connection between egoistic, altruistic, and biospheric environmental concerns and sustainable consumption intentions, one study by Ayar and Gürbüz (2021) stands out as it considers consumers' sustainable consumption intentions concerning attitude, subjective norms, perceived behavior control, and altruistic value.

Furthermore, previous studies have not sufficiently identified which individuals are more likely to engage in prosocial consumption based on their environmental concerns. To bridge this gap, the present study adopts a comprehensive approach by examining consumers' environmental concerns, categorized into egoistic, altruistic, and biospheric concerns, and their influence on cognitive, affective, and conative dimensions of sustainable consumption.

The second research gap lies in the sampling methodology employed in previous studies, which often focused on collecting data from a single location, such as Turkey (Ayar and Gürbüz 2021), India (Kaur and Luchs 2022), South Korea (Hwang and Yeo 2022), Malaysia (Quoquab and Mohammad 2020), or Poland (Caniëls *et al.*

2021). To address this gap, the current study will include research samples from two distinct locations, specifically Taiwanese and Thai consumers, to assess their environmental concerns and sustainable consumption practices. This study aims to provide a more comprehensive understanding of the relationship between environmental concerns and sustainable consumption across different cultural and geographical contexts based on the Theory of Reasoned Goal Pursuit (TRGP) (Ajzen and Kruglanski 2019).

Research Question

This study investigates the correlation between environmental concerns and sustainable consumption among Taiwanese and Thai consumers, aiming to address existing literature gaps, especially post-COVID-19 lockdowns.

The research questions guiding the investigation are outlined below:

(1) To what extent do consumers' environmental concerns influence their engagement in sustainable consumption practices?

(2) Do sustainable consumption's cognitive and affective aspects mediate the relationship between egoistic, altruistic, and biospheric environmental concerns and conative sustainable consumption behaviors?

(3) Does the fear of COVID-19 moderate the association between environmental concerns and sustainable consumption behaviors?

(4) Are there discernible differences between Taiwanese and Thai consumers concerning their environmental concerns and the extent of their sustainable consumption practices?

Terminology

Environmental Concerns

The terminology, environmental concerns, adopts the definition from Wesley Schultz's description (2001). Schultz (2001) demonstrates that, according to the value-basis theory, consumer egoistic, altruistic, and biospheric toward environmental concerns result from more general underlying values, and different value orientations result in varied viewpoints. Therefore, Schultz (2001) defines environmental concerns as consisting of three dimensions: (1) egoistic (concern for the self concerning the environment), (2) altruistic (concern for other people concerning the environment), and (3) biospheric (concern for the biosphere). This study will adopt these variables of environmental concerns as independent variables.

Sustainable Consumption

The definition of sustainable consumption is based on work by Quoquab and Mohammad (2020). According to the Theory of Mind, consumers' sustainable consumption has been subdivided into (1) cognitive, (2) affective, and (3) conative sustainable consumption (Quoquab and Mohammad 2020, Hilgard 1980). The Theory of Mind explains how consumers comprehend behavior by examining their thoughts and wants (Quoquab and Mohammad 2020). Cognition is the mental state in which consumers gain knowledge and awareness of an object. Affective is the emotional state in which people develop feelings for or against an object. Conation refers to consumers' intentions and the probability of engaging in specific behaviors. Because the design of the research framework is based on the Theory of Reasoned Goal Pursuit (Ajzen and Kruglanski 2019), this study will utilize cognitive and affective sustainable consumption as mediating variables while conative sustainable consumption serves as the dependent variable.

Fear of COVID-19

The study will adopt the fear of COVID-19 scale from Ahorsu *et al.* (2022) and Lin *et al.* (2021) as a moderating variable. COVID-19 is hypothesized to be a factor in fear, stress, anxiety, and mood disorders to have physiological and psychological effects on consumers (Fawzy El-Bardan and Lathabhavan 2021).

1. Literature Review

1.1. Conceptual Framework and Propositions

According to these four research questions above, the theoretical framework has been designed and developed based on the theory of Reasoned Goal Pursuit (TRGP) (Ajzen and Kruglanski 2019), as shown in Figure 1. The egoistic, altruistic, and biospheric environmental concerns are independent variables. The conative sustainable consumption is the dependent variable. Furthermore, affective and cognitive sustainable consumption are mediating variables. On the other hand, the fear of COVID-19 and locations are moderating variables.

Figure 1. The Research Framework Design
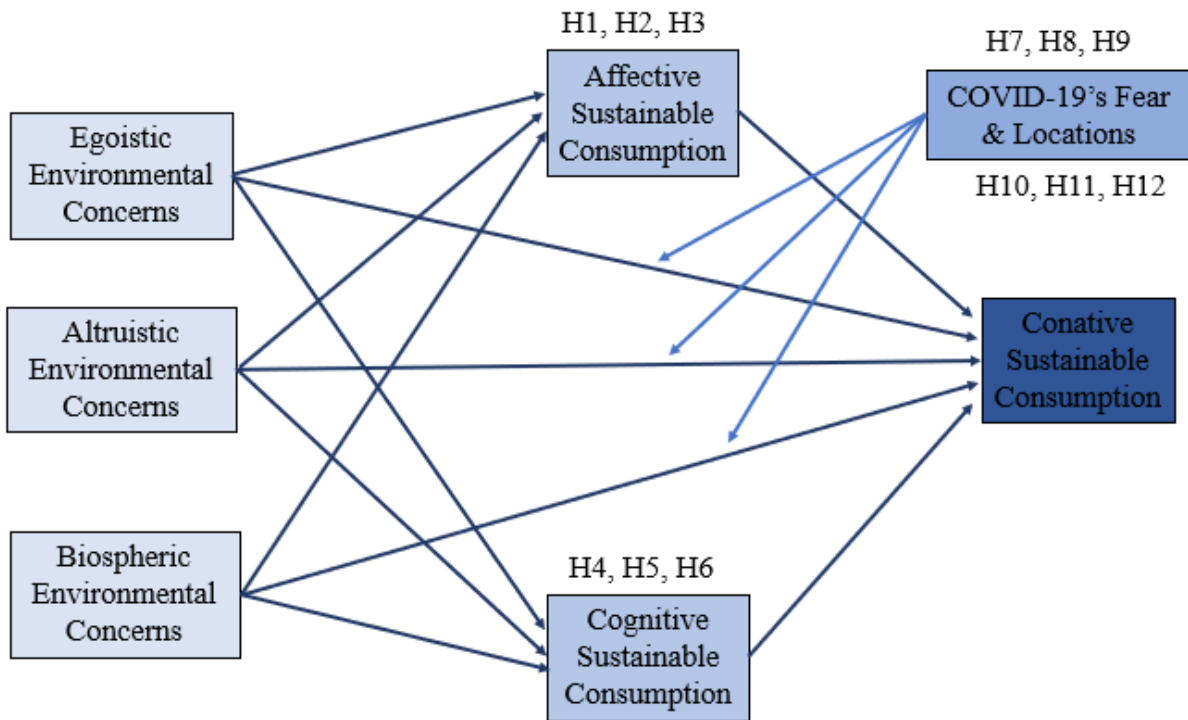
1.2. Theoretical Framework: Theory of Reasoned Goal Pursuit

The theory of reasoned goal pursuit (TRGP) significantly explains and predicts consumers' social behavior and interventions to modify undesirable or desirable intentions and behaviors (Ajzen and Kruglanski 2019). The TRGP has integrated these two theoretical perspectives: the theory of planned behavior (TPB) and goal systems theory (GST) (Ajzen and Kruglanski 2019). TPB is a commonly utilized behavior-centered theory for predicting and modifying human behavior (Ajzen 2012, 1991). According to the TPB, attitude, subjective norm, and perceived behavioral control lead to intention for each behavior option. On the other hand, GST is goal-focused (Kruglanski *et al.* 2002). The goal indicates that active procurement and approval goals are an action to influence motivation.

The following describes the TGRP variable's interactive relationship (Ajzen and Kruglanski 2019):

(1) The intention is the immediate cause of the behavior. Furthermore, actual behavioral control moderates the relationship between intention and behavior.

(2) It can be used to evaluate actual behavioral control only when perceived behavioral control accurately reflects actual behavioral control.

(3) The intention is determined by attitude toward the behavior, subjective norms, and perceived behavioral control.

(4) Behavioral belief determines attitude; normative belief determines subjective norm; control belief determines perceived behavioral control.

(5) Motivation has been affected by attitudes and subjective norms to engage in the intention, which turns into a behavior.

(6) Perceived behavioral control moderates the relationship between motivation and intention.

(7) Active procurement and approval goals directly influence attitudes and subjective norms.

(8) The influence of subjective norms on the motivation to engage in a behavior is moderated by the active procurement and approval goals.

For example, Hamilton *et al.* (2022) applied the TRGP model to explore the correlates of physical activity among Australian undergraduate students during the COVID-19-induced lockdown. Their results reaffirmed the efficacy of TRGP constructs, pinpointing beliefs, goals, and cognitive-affective strategies as significant predictors of physical activity. Emphasizing the salience of discerning behavioral influences during unprecedented scenarios like the COVID-19 lockdown, their research posited the TRGP as a potent framework for sculpting interventions fostering physical activity.

Similarly, Concari *et al.* (2023) investigated a consumer's willingness to participate in recycling schemes, employing the TRGP framework. Their findings accentuated the pivotal role of attitudes, subjective norms, and perceived behavioral control, with active goals as mediators. A key takeaway was the imperative of meticulous active goal analysis, complemented by acknowledging the intrinsic limitations of questionnaires.

Therefore, this study develops the theoretical framework regarding TRGP, as shown in Figure 1. The study hypothesizes that consumers with active environmental protective procurement and approval goals have environmental protection-related procurement and approval objectives. Furthermore, the impact of environmental concerns on both aims has altered their attitudes and subjective norms. In other words, egoistic, altruistic, and biospheric concerns about the environment are examined in the study to realize how they influence consumers' conative sustainable consumption in terms of their affective and cognitive sustainable consumption.

1.3 Environmental Concerns and Sustainable Consumption

Environmental concerns indicate that consumers are more aware of and concerned about the environmental impact of their consumption decisions: consumption intention, green purchase intention, or pro-environmental behavior. For example, the study by Hwang and Yeo (2022) utilizes the actual behavior of sustainable consumption, as measured by purchasing eco-label and recycled products. Their findings suggest that emotional and altruistic values influence (1) the purchase of eco-labeled products and (2) the purchase of recycled products. Specifically, environmental awareness affects environmental concerns, which turn into sustainable consumption (Zameer and Yasmeen 2022). Also, Kaur and Luchs's (2022) study indicates that egoistic, altruistic, and biospheric values influence socially conscious purchase behavior. Only altruistic values influence frugal purchase behavior.

Furthermore, environmental concerns, including environmental awareness and knowledge, assume egoistic environmental concerns, reflecting an individual's self-value (Miftari *et al.* 2022; Zameer and Yasmeen 2022; Caniëls *et al.* 2021). Specifically, because of environmental concerns, consumer attitudes toward organic foods significantly impact consumption intention (Miftari *et al.* 2022). However, egoistic, altruistic, and biospheric values influence socially conscious purchase behavior in the study of Kaur and Luchs (2022). Moreover, altruistic environmental concerns affect sustainable consumption behavior (Hwang and Yeo 2022). Biospheric environmental concerns predict consumers' sustainable patterns (Caniëls *et al.* 2021). Numerous pieces of literature conclude that consumers' value of environmental concerns affects their sustainable consumption, including intention or behavior. Furthermore, consumption means (1) what consumers purchase and how much consumers pay (Kaur and Luchs 2022)

On the other hand, from the view of the prosocial consumer, prosocial consumers regard consumer behavior as conflicting. Purchasing goods or services for one's benefit is considered consumer self-interest (Small and Cryder 2016; White, Habib, and Dahl 2020). Global warming, climate change, and environmental protection have changed consumer behavior (Widayat *et al.* 2022), including consumers' pro-environmental behavior, such as avoiding plastic bags (Widayat *et al.* 2022). Therefore, green or sustainable marketing makes consumers prosocial (Small and Cryder 2016; White, Habib, and Dahl 2020; Widayat *et al.* 2022; Wong and Tzeng 2019).

To identify who will be prosocial consumers, this study utilizes the definitions of environmental concerns by Schultz (2001) and sustainable consumption by Quoquab and Mohammad (2020). Therefore, the independent variables are (1) egoistic, (2) altruistic, and (3) biospheric environmental concerns. The independent variable is conative sustainable consumption. The cognitive and affective sustainable consumption are mediating variables.

These hypotheses are summarized below,

H1: Affective sustainable consumption mediates the relationship between egoistic environmental concerns and conative sustainable consumption.

H2: Affective sustainable consumption mediates the relationship between altruistic environmental concerns and conative sustainable consumption.

H3: Affective sustainable consumption mediates the relationship between biospheric environmental concerns and conative sustainable consumption.

H4: Cognitive sustainable consumption mediates the relationship between egoistic environmental concerns and conative sustainable consumption.

H5: Cognitive sustainable consumption mediates the relationship between altruistic environmental concerns and conative sustainable consumption.

H6: Cognitive sustainable consumption mediates the relationship between biospheric environmental concerns and conative sustainable consumption.

1.4 COVID-19's Fear, Environmental Concerns, and Sustainable Consumption

From the insight of social marketing, since 2020, the COVID-19 pandemic has been changing consumers' behavior, such as purchasing, working, and learning (Chae 2021; Vyas and Butakhieo 2020; Sun *et al.* 2021; Hakim, Zanetta, and da Cunha 2021) and environmental effects (Lim *et al.* 2021; Muhammad, Long, and Salman 2020; Khan *et al.* 2020; Wetchayont 2021). For example, the study of Hakim, Zanetta, and da Cunha (2021) indicates that the desire to visit a restaurant during the COVID-19 pandemic is predicted by consumers' faith in restaurants and brands, reasonable prices, disease denial, and health surveillance trust in Brazil.

On the other hand, the COVID-19 pandemic is a significant factor in modifying consumer behavior, reflecting environmental concerns and sustainable consumption (Severo, De Guimaraes, and Dellarmelin 2021; Dangelico, Schiaroli, and Fraccascia 2022; Leal Filho *et al.* 2022). The COVID-19 pandemic impacted sustainable consumption the most, followed by environmental concerns and social responsibility (Severo, De Guimaraes, and Dellarmelin 2021). For example, in the study by Jian *et al.* (2020), COVID-19 has raised consumers' environmental concerns and trust in green hotel brands, boosting their willingness to spend more.

Consumers have increased their purchase frequency and willingness to pay for sustainable products, show growing attention to environmental concerns, and behave more sustainably. Consumers have increased their purchase frequency and willingness to pay for sustainable products, show growing attention to environmental issues, and act more sustainably (Dangelico, Schiaroli, and Fraccascia 2022). Specifically, the COVID-19 pandemic positively influences sustainable consumption (Severo, De Guimaraes, and Dellarmelin 2021).

The degree to which individuals were prepared to acquire green and sustainably produced goods during the second wave of the COVID-19 pandemic (Leal Filho *et al.* 2022). Leal Filho *et al.* (2022) and Dangelico, Schiaroli, and Fraccascia (2022) find that the COVID-19 pandemic presented a chance to encourage sustainable consumption. Positive and statistically significant impacts are exhibited by ecological awareness, habit, and occasional pro-environmental behavior (Leal Filho *et al.* 2022). The occasional pro-environmental behavior indicator has the most significant positive impact on the likelihood of highly sustainable consumption behavior (Leal Filho *et al.* 2022).

Specifically, consumers' sustainable consumption of consciousness and ecological and social factors were affected by the COVID-19 experience (Huttel and Balderjahn 2021). When sustainability-conscious consumers' ecological, social, and voluntary simplicity consciousness decreases, it significantly affects their willingness to spend sustainably and their purchasing choices (Huttel and Balderjahn 2021). The main reason is that the COVID-19 pandemic raised consumers' perceptions of the threat, resulting in a decline in sustainable items compared with nonsustainable products (Chae 2021).

Therefore, this study adopts the fear of COVID-19 as a moderating variable. The hypotheses are the following.

H7: The fear of COVID-19 moderates the relationship between egoistic environmental concerns and conative sustainable consumption.

H8: The fear of COVID-19 moderates the relationship between altruistic environmental concerns and conative sustainable consumption.

H9: The fear of COVID-19 moderates the relationship between biospheric environmental concerns and conative sustainable consumption.

On the other hand, this study will collect research samples from Taiwan and Thailand. Because of that, two groups of participants compare different paths between environmental concerns and sustainable consumption. These hypotheses are below,

H10: Taiwanese consumers' egoistic environmental concerns and conative sustainable consumerism differ from Thai consumers.

H11: Taiwanese consumers' altruistic environmental concerns and conative sustainable consumerism differ from Thai consumers.

H12: Taiwanese consumers' biospheric environmental concerns and conative sustainable consumerism differ from Thai consumers.

2. Methodology

2.1 Sampling

This study will target a research sample who experienced delivery services in Taipei, Taiwan, and Bangkok, Thailand. There are two reasons. First, these consumers must place their orders via retail websites, online platforms, or mobile applications to utilize delivery services. These consumers are, therefore, Internet or WIFI users. Second, during the COVID-19 pandemic, consumers avoid places of commerce such as restaurants, supermarkets, and shopping malls. Specifically, during the COVID-19 lockdown, consumers only have two choices: pick up or use delivery services.

In other words, the research samples will be collected from the population of Internet or WIFI users, namely, online consumers. Furthermore, they must adopt a delivery service for online purchases. Consequently, the questionnaire will be distributed online using the sample database of professional market research firms in both locations.

2.2 Instrument

The instrument will initially be developed in English and refer to the constructs of (1) egotistic, altruistic, and biospheric environmental concerns from Wesley Schultz (2001), (2) cognitive, affective, and conative sustainable consumer from Quoquab and Mohammad (2020), and (3) fear of COVID-19 from Ahorsu *et al.* (2022) and Lin *et al.* (2021).

In the second step, experienced instructors in Taiwan and Thailand will translate the English questionnaire into Mandarin and Thai. Mandarin and Thai are both widely spoken in each respective country. Respondents will complete the questionnaire within 10 to 15 minutes.

In order to collect validity and reliability of data, the introduction will contain one statement to assess respondents' understanding of delivery services: "The delivery service is the act of ordering specific products through home delivery, such as takeaway, grocery, beverage, errands to run, fresh meals, fast-moving consumer goods (FMCG), etc." The respondents will be required to indicate whether they understood the delivery service. Responses of "yes" and "no" were provided for the following question: "Do you understand the meaning of delivering services?" Respondents who answered "no" will be excluded from the study.

The instrument will be designed in three sections. The first section regards consumers' delivery services usage behavior. Four questions, as shown in Table 1 in the appendix, measure the frequency of consumers using delivery services last week. The number of behavioral measurements divided into (1) less than 2 times; (2) 3 to 4 times; (3) 5 to 6 times; (4) 7 to 8 times; (5) 9 to 10 times; (6) 11 to 12 times; (7) More than 13 times.

The second section contained 36 items, as shown in Appendix, Table 1. (1) environmental concerns are comprised of egoistic concern (four items), altruistic concern (four items), and biospheric concern (four items); (2) sustainable consumption consists of cognitive (six items), affective (six items), and conative sustainable consumption (six items). The fear of COVID-19 consists of six items. The respondents were required to provide their responses on a seven-point Likert scale, with one indicating "strongly disagree" and seven indicating "total agreement."

In the third section, respondents were required to provide information about their gender, age, education level, marital status, monthly income, and living location (city).

2.3 Data Analysis Process

This study will utilize Structural Equation Modeling (SEM) to examine the measurement model and estimate the structural coefficients via SmartPLS software. Chin (1998) illustrates how SEM can be used (1) to examine the correlation between multiple predictors and criterion variables statistically, (2) to construct unobservable latent variables, (3) to analyze measurement errors for observed variables, and (4) to statistically examine the correlation between previous substantive and empirical data measurement assumptions.

The SEM procedure of this study will consist of five steps (Baron and Kenny 1986; Chin, 1998; J. F. Hair *et al.* 2019; Joseph F. Hair *et al.* 2019; MacKinnon *et al.* 2004; McDonald and Ho, 2002; Sarstedt *et al.* 2017). First, the study will use the CFA to examine the validity and reliability of the measurement model. Second, the study will employ a path analysis to examine hypotheses through the structural model. Third, from hypotheses one to six, the study will use bootstrapping to analyze the mediation effect of consumers' cognitive and affective sustainable consumption. Fourth, the bootstrapping approach will examine whether fear of COVID-19 moderates the relationship between consumers' cognitive, affective, and conative environmental concerns and their cognitive, affective, and conative sustainable consumption from Hypotheses seven to nine. Fifth, the study will

adopt bootstrapping multi-group analysis (MGA) to analyze the difference between Taiwanese and Thai groups from hypotheses 10 to 12.

Conclusion

This study has two main objectives: (1) to examine how consumers' egoistic, altruistic, and biospheric environmental concerns influence their cognitive, affective, and conative sustainable consumption and (2) to focus on consumers who experienced the COVID-19 lockdowns and utilized delivery services in Taipei, Taiwan, and Bangkok, Thailand. The study is motivated by two primary considerations: (1) examining if sustainable consumption patterns differ among consumers from various locations post-COVID-19 pandemic and (2) assessing whether COVID-19 fear moderates the relationship between environmental concerns and sustainable consumption in Taiwan and Thailand.

Therefore, by analyzing the relationship between these environmental concerns and sustainable consumption, the study aims to identify and understand prosocial consumers. The anticipated results of this research are expected to make the following contributions:

(1) From an academic perspective, the study will provide valuable insights into the direct influence of consumers' environmental concerns on their sustainable consumption behaviors, specifically after the experience of COVID-19 lockdowns. The study will contribute to a clearer understanding of the factors driving sustainable consumption in the context of significant disruptions such as a pandemic.

(2) From a business standpoint, the study is expected to identify effective strategies for offering green products to consumers and promoting environmental concerns, which can, in turn, impact consumers' attitudes and behaviors related to sustainable consumption, including their purchase intentions and actual consumption patterns. This valuable information will aid businesses in developing targeted marketing and communication strategies to foster more sustainable consumer behaviors and preferences.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Credit Authorship Contribution Statement

Wong Ming Wong: Dr. Wong, as the first and corresponding author, spearheaded the study's conceptualization, methodology, and investigation. He led the formal analysis and oversaw the project's administration while securing funding. Furthermore, he was instrumental in crafting the manuscript, overseeing its review, editing, and final visualization.

MingJing Qu: Holding the second author position, Dr Qu was instrumental in refining the study's conceptual framework and enhancing the manuscript through meticulous proofreading and insightful feedback.

Chanidapha Nunualvuttiwong: As the third author, Ms. Nunualvuttiwong holds a significant role in the research project team. She translated the questionnaire between English and Thai. Furthermore, her strategic approach was vital in professionally distributing the questionnaire to the targeted research sample.

Kobkullaya Ngamcharoenmongkhon: Collaborating as a linguistic specialist, Dr Ngamcharoenmongkhon facilitated the translation of research materials and actively distributed the questionnaire to the designated sample.

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Table 1. Constructs and scale items of the instrument

Construct		Scale Item
Delivery Services Usage Behavior	1	I have used the foods delivery service in the past week is
	2	I have used the beverages delivery service in the past week is
	3	I have used the groceries delivery service in the past week is
	4	I have used the online shopping purchase delivery service in the past week is
Egotistic Environmental Concern	1	I am concerned that environmental issues will seriously impact me personally.
	2	I am concerned that environmental issues will seriously impact my lifestyle.
	3	I am concerned that environmental issues will seriously impact my health.
	4	I fear environmental concerns will seriously impact my future.
Altruistic Environmental Concern	1	I am concerned that environmental problems will seriously impact the people of our country.
	2	I am concerned that environmental issues will seriously impact everyone.
	3	I am concerned that environmental issues will seriously impact children.
	4	I am concerned that environmental issues will seriously impact our children.
Biospheric Environmental Concern	1	I am concerned that environmental issues will seriously impact plants.
	2	I am concerned that environmental issues will seriously impact marine life.
	3	I am concerned that environmental issues will seriously impact birds.
	4	I am concerned that environmental issues will seriously impact animals.
Cognitive Sustainable Consumption	1	I think wasting food and other consumables is unethical.
	2	I realized that overconsumption leads to a shortage of natural resources.
	3	I think it is essential to use eco-friendly products.
	4	Individuals should be concerned about the environment where the next generation lives.
	5	I think it is our responsibility to care for the natural environment.
	6	I know that natural resources are dwindling at an alarming rate.
Affective Sustainable Consumption	1	I felt good when I could control the need to buy non-essential goods.
	2	I would not say I like to waste food.
	3	I prefer to buy organic food because they are environmentally friendly.
	4	I am more motivated to spend more money on eco-friendly products.
	5	I prefer to use paper-material bags because they are biodegradable.
	6	I will only buy what I need.
Conative Sustainable Consumption	1	I intend to reduce the waste of resources (for example, when I am not in the room, I turn off the lights and fans).
	2	I will continue to buy eco-friendly products, even if they are slightly more expensive.
	3	I will avoid consumption behaviors that may cause environmental pollution.
	4	I will continue buying biodegradable packaging (*e.g.*, paper bags instead of plastic bags).
	5	I will maintain on not wasting my food as much as possible.
	6	In the future, I will continue to contribute to the environment in all aspects.
Fear of COVID-19	1	Now I am most afraid of getting COVID-19.
	2	When I think about the coronavirus, I feel overwhelmed.
	3	I am worried about losing my life due to COVID-19.
	4	I get worried when I see news about the coronavirus on social media.
	5	I will lose sleep because I am worried about the new crown virus.
	6	When I think about it, my heart beats faster if I'm infected with COVID-19.

Exploring the Influence Dynamism of Economic Factors on Fluctuation of Exchange Rate - An Empirical Investigation for India Using ARDL Model

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Abstract: *The Indian Foreign Exchange Market has experienced significant changes over the past decade, due to high degree of instability of the Indian Rupee leading to its devaluation against major global currencies. Exchange rate is considered as one of crucial indicators to determine the economic growth. Volatility of exchange rate of each day is influenced by various factors such as demand and supply, Gross Domestic Product, Interest rate, employment rate, public debt, balance of payments, inflation etc. Though there are multiple causes to determine the movement of exchange rate, but still the accurate level of causation is unpredictable. Keeping this in mind, this paper tries to attempt the relationship that exists between the exchange rate and select macroeconomic factors. To analyse the extent of influence of the selected variables on the exchange rate, the research paper uses 10 years of data spanning from Jan 2013 to Nov 2022. Further, the study uses monthly data of above-mentioned variables to bring out the analysis to meet the objectives. Descriptive statistics is used to find the characteristics of the data, correlation analysis and Ordinary Least Square method is used to find the relationship and impact level select macroeconomic factors on exchange rate. Autoregressive Distributed Lag (ARDL) model is used to find if any short run and long run association exists between the variables and the exchange rate.*

Introduction

Exchange rate is defined as the value of one currency expressed in terms of another currency, and it is an influential factor in a nation's economy (Madura, 2006). The significance of the exchange rate lies in its role as both a macroeconomic policy variable and a variable for business operations. The exchange rate is determined by factors such as interest rates, inflation, GDP, current account deficits, exports, and imports, and is considered

a barometer of a nation's money supply. When the rupee weakens against the dollar, it indicates that the Indian currency has lost value compared to the US dollar. This can occur either because there is an abundance of rupees in the market or a shortage of dollars. The value of the rupee is dependent on the availability of US dollars in the Indian market. India gains funds from three sources: exports, foreign investments, and NRI remittances. If there are fewer dollars available, the dollar becomes more valuable, and the rupee loses value. India primarily imports crude oil, and the countries it imports from only accept US dollars or other major currencies, making it necessary for India to maintain a sufficient supply of these currencies.

The foreign exchange market, also referred to as the forex or FX market, is where currency trading takes place through the exchange of various currency rates. This market is dominated by central banks, commercial banks, investment banks, hedge funds, money managers, and individual retail traders. The market's performance is also influenced by various economic, political, and social factors. In India, the rupee has experienced both stability and volatility throughout its history. During the post-independence period, the Indian government maintained a fixed exchange rate regime with the rupee linked to the US dollar, but as the economy liberalized in the 1990s, the government gradually relaxed currency rate regulations. The Reserve Bank of India now manages the exchange rate using a basket of currencies, and the rupee has experienced significant volatility over the years, including a recent episode of depreciation in 2022. Indian Rupee broke through the 83 per Dollar mark in October 2022, reaching an all-time low of 83.002. These fluctuations in the exchange rate have necessitated research on the impact of various factors. It will help investors forecast and take necessary preventive steps towards these fluctuations.

Graph 1. Fluctuation in Indian Currency
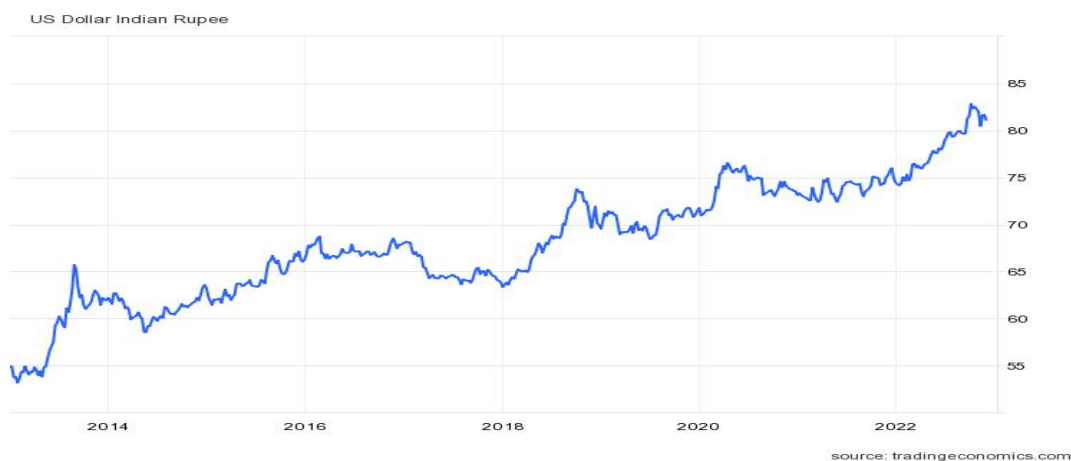
The graph shows the movement of Dollar- rupee exchange rate for a period of 10 years starting from 2013. As can be seen from the graph, the exchange rate is highly volatile. The rupee was as low as 52 in 2013 as compared to Rs 83 against dollar in 2022.

Significance of the Study

Exchange rate changes are significantly influenced by economic variables, including GDP (Gross Domestic Product), interest rates, and CPI (Consumer Price Index). GDP is a measure of a nation's overall economic health, and a strong GDP is frequently correlated with a more robust domestic currency. Higher interest rates may entice foreign investors looking for greater returns, boosting the native currency's demand and hence supporting its exchange rate. Lower interest rates, on the other hand, may deter foreign investment and cause currency depreciation. Conversely, the CPI measures inflation levels, and higher inflation can weaken a currency's purchasing power and cause devaluation. These economic factors interact intricately, which highlights their relevance in determining exchange rates and makes them essential indicators for firms, investors, and regulators through this present study.

Problem Statement

The foreign currency market in India has undergone significant changes in recent years, primarily due to the high volatility of the Indian rupee, causing it to lose value compared to major currencies in the global market. Exchange rates play a crucial role in international trade and are not only important in determining the type of

hedging to reduce exchange rate risks but also in predicting exchange rates. Accurately predicting exchange rates is crucial for businesses, as changes in foreign currency rates can greatly affect import and export profits and losses. The volatility of the exchange rate is unpredictable till now. Hence, the present study helps to find how the selected economic factors affect movement of exchange rate during the selected period.

Supporting Theory

The objective of econometrics is the application of testing the theories. In this line, this research mainly supports two theories namely, Monetary Model and Uncovered Interest Parity. Hence, the study has tested the following theories. The monetary model theory developed by Cassel (1918) argues that exchange rate volatility is primarily driven by changes in monetary policy and differences in inflation rates between two countries. When a country raises interest rates or tightens monetary policy, the demand for its currency increases, leading to an appreciation of its exchange rate. On the other hand, the uncovered interest parity theory developed by Keynes (1923) suggests that exchange rate movement are driven by differences in interest rates between two countries. If the interest in one country is higher than in another, its currency is expected to appreciate, making it less volatile.

1. Literature Review

In addition to the above supporting theories, the study also provided insight into the existing studies on the same which are done by many economists over the years. Here, a few important literatures are mentioned below.

1.1 Volatility of Exchange Rate

The value of a currency is influenced by multiple factors, some of which have a greater impact than others. These factors may vary over time and between countries. A study conducted by Consensus Economics on 90 currencies relative to the USD between 2010 and 2011 found that five key factors shape exchange rates: relative economic growth, inflation differential, trade or current account balance, equity flows, and short and long-term interest rates (Karl, 2004). Fluctuations in exchange rates can have a negative impact on international trade by creating uncertainty and increasing risks associated with changes in currency value (Sauer 2001). Research on the factors that influence exchange rates in developing countries has mostly focused on Latin America and has emphasized the role of trade in exchange rate movements (Diaz-Alejandro 1982; Edwards 1989).

(Çelĭk, 2022) It has been established that the short-term foreign debt and the exchange rate have a passing relationship. It was discovered that rising foreign debt will negatively impact exchange rates. Also Found an inverse relationship between Net capital and exchange rate (Hasan and Islam 2022). The findings indicate that the most significant macroeconomic variables influencing exchange rates are the current account balance, GDP growth rate, interest rate and foreign direct investment (Malekhosseini *et al.* 2019). The findings demonstrated that the real exchange rate misalignment from its equilibrium level has significantly responded to the type of exchange rate regime adopted by the countries, with the floating exchange rate regime increasing the real exchange rate misalignment wherever it is used in the selected developing countries. (Charles *et al.* 2022) Results showed that in Tanzania, there is a strong positive correlation between economic fundamentals and currency rate volatility (Rafiq *et al.* 2023). The study revealed that the rate of inflation, exports, and imports all remained substantial and played a considerable role in affecting currency rates in Pakistan. Exports and the inflation rate have a positive correlation with the exchange rate, whereas imports and the FOREX reserve have a negative correlation.

1.2 Establishing the Connection between Various Factors and Exchange Rate

1.2.1. Inflation

Inflation has a significant impact on a currency's value. Obstfeld and Rogoff noted in their book that changes in inflation and exchange rates are interrelated and can affect each other (Obstfield and Rogoff 1996). They suggested that central banks using inflation targeting could help stabilize exchange rates. If a country has a lower rate of inflation compared to others, it will likely see an increase in exports, and vice versa. Taylor suggested that policies like inflation targeting could play a critical role in reducing the volatility of exchange rates and stabilizing the economy (Taylor 1993). Engel and West also found a positive correlation between inflation and exchange rates, but noted that other factors like interest rates, trade balances, and political events can also influence this relationship.

1.2.2 Gross Domestic Products

The relationship between exchange rates and Gross Domestic Product (GDP) has been extensively studied in economics. Various studies have attempted to understand the interplay between these two important macroeconomic variables. Azid *et al.* (2005) studied the impact of economic growth on exchange rates and found a positive relationship between the two variables. McPherson and Rakovski (2000) analyzed the connection between exchange rates and GDP in Kenya, using time series data from 1970 to 1996. They examined both the direct and indirect relationships between real and nominal exchange rates and GDP growth and found no significant direct correlation. Madura (2006) investigated the relationship between exchange rates and market interaction and concluded that the exchange rate is dependent on market interaction and that GDP can negatively affect the exchange rate in a fixed exchange rate system. These studies demonstrate the complexity of the relationship between exchange rates and GDP, and that no single, clear-cut relationship exists. Further research is necessary to fully understand this dynamic relationship.

1.2.3 Interest Rates

The connection between interest rates and currency exchange rates is the subject of ongoing investigation among economists. Macdonald and Nagayasu (2000) used quarterly data from 14 industrialized countries between 1976 and 1997 to examine this relationship and find a long-term correlation. Edison and Paula (1991), on the other hand, used quarterly data and concluded that interest rates have no long-term effect on exchange rates, challenging earlier research that emphasized macroeconomic factors in determining exchange rates.

Apart from this, there are other studies that examine the varying views on how currency exchange rates are impacted by interest rate, producer price index, external debt, and GDP. Chen (2006) conducted research on six developing countries and analyzed the correlation between interest rates and exchange rates using a Markov regime switching method, with a focus on exchange rate volatility. The results indicated that an increase in nominal interest rates leads to a higher chance of a regime change, resulting in a more unstable exchange rate. On the other hand, Kraay (1999) conducted a study on a large dataset during speculative attacks and found no clear link between interest rates and exchange rates. The exchange rate of the Romanian leu was analyzed based on various economic factors such as GDP, inflation rate, money supply, interest rate, and balance of payments from 2000 to 2010, revealing an inverse relationship between the EUR/RON exchange rate, GDP, and money supply, but no correlation with balance of payments.

Macdonald and Nagayasu (2000) found a long-lasting relationship between interest rates and exchange rates in their analysis of data from fourteen industrialized countries from 1976 to 1997. Ramasamy and Abar (2015) utilized bootstrapping to investigate the impact of macroeconomic factors on the exchange rate and found that all factors, except employment and budget deficit, influenced the exchange rate. Edison and Pauls (1993) analyzed quarterly data and found no long-term impact of interest rates on exchange rates. McPherson *et al.* (2000) also found no relationship between the exchange rate and GDP or interest rates. Despite a substantial amount of research on the impact of exchange rates on microeconomic factors, there is a scarcity of studies on the effect of various economic variables on exchange rates, particularly in developing countries. This research will be beneficial for investors to comprehend the factors that influence the foreign exchange market and make informed decisions.

This study addresses the research gap by addressing the following questions:
- Is there a correlation between the chosen economic variables and the fluctuation of the foreign exchange rate?
- To what extent do the selected macroeconomic variables impact the fluctuation of the foreign exchange rate?

3. Research Objectives

1. To investigate the influence of various factors on the fluctuations in the foreign exchange rate.
2. To examine the correlation between the chosen economic variables and the foreign exchange rate.
3. To determine the effect of different economic variables on the fluctuation of the foreign exchange rate.

Graph 1. Research Framework
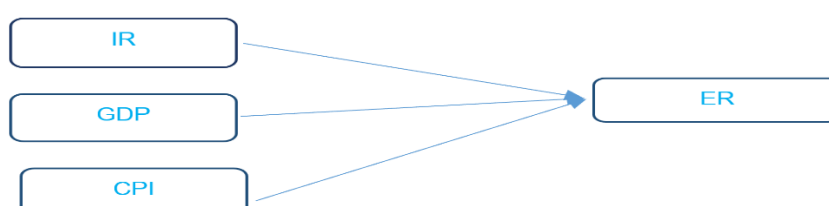
3.1 Hypothesis

H1- There is a significant relationship between GDP and Exchange Rate

H2- There is a significant relationship between Interest Rate and Exchange Rate

H3- There is a significant relationship between Consumer Price Index and Exchange Rate

3.2 Data and Model Specification

3.2.1. Data and Description of the Variables

The study is descriptive and analytical in nature and uses annual time series data on Exchange rate which is an endogenous variable. To see the influence of various variables on the exchange rate, the study has considered selecting macroeconomic variable as exogenous variables. All exogenous factors are chosen after a rigorous evaluation of current studies, as well as the cause for the link. The selected macroeconomic variables used in the study are Consumer Price Index (CPI) which is the proxy of inflation, Gross Domestic Product (GDP) and Interest Rate (IR). The study uses monthly observations for the above-mentioned variables spanning from Jan 2013 to Nov 2022 over a period of 10 years. Bloomberg terminal was used to gather all the variable data.

3.2.2. Econometric Model and Methodology

The Augmented Dickey Fuller Test was used to assess the stationarity of all variables. Furthermore, descriptive statistics is used to characterize the features of each variable. The study used correlation analysis to determine the link between the variables. Additionally, the fundamental econometric model is developed in accordance with the study's objectives, which are listed below.

$$\text{Exchange Rate} = \alpha + \beta_1 (GDP)_t + \beta_2 (IR) + \beta_3 (CPI)_t + \mu_t \tag{1}$$

The study used the robust Autoregressive Distributed Lag (ARDL) model developed by Pesaran and Shin (1999) and improved by Pesaan, Shin, and Smith (2001) to investigate the long run and short run influence of the variables. This model offers a number of benefits over other cointegration models, including the Engle and Granger cointegration test and the Johansen cointegration test. This model can also be used if the variables are integrated in a different level order, such as I(0) or I(1). The model is significantly more efficient in small and limited data, like in this research.

According to the procedure, the study employed ARDL bound F test to check the presence of long run relationship among the variables. Hypothesis is framed and presented below

H_0– There is no presence of long run relationship

H1 – There is a presence of long run relationship

The decision of accept or reject depends on the F statistics value. If the F statistics isgreater than the lower 1(0) and upper bound 1(1), then there is a presence of long run relationship among variables and vice versa. The study used conditional ARDL to determine the long run coefficients of each variable after calculating co-integration with the help of the Bound F test. It demonstrates how far each regressor influences the exchange rate of India. To estimate this, the study constructed the Unrestricted Error.

Correction Model (UECM) of ARDL approach and written as

$$\text{Exchange Rate}_t = \beta + \sum \delta_1 GDP_{t-i} + \sum \delta_2 IR_{t-l} + \sum \delta_3 CPI_{t-i} + \varepsilon_t \tag{2}$$

where, t = time series notation, β_0 = Intercept, δ = Beta Coefficient, ε_t = Residual or error term

Once the existence of long run equilibrium among the variables is being proved, the next process is to estimate the short run dynamic coefficients with the help of the error correction model associated with long run estimates obtained from ARDL-UECM approach. The ECM explains how long time it will take to get adjusted or speed of adjustments of dependent variable towards the long run equilibrium. The following equation is constructed for error correction mechanism of ARDL Approach.

$$\text{Exchange Rate}_t = \beta_0 + \sum \delta_1 GDP_{t-i} + \sum \delta_2 IR_{t-l} + \sum \delta_3 CPI_{t-i} + \Phi ECM_{t-1} + \varepsilon_t \tag{3}$$

where, ECM indicates error correction term, Φ is the speed of adjustment parameter to long run equlibrium and δ_1, δ_2 and δ_3 are short run coefficients. Furthermore, for long-run equilibrium stability, the sign of ECT must be negative but significant.

As previously noted, the study applied residual diagnostics for ARDL model also to assess the presence of autocorrelation and heteroscedasticity. In addition to this, study employed the Cumulative Sum of Squares of Recursive Residuals (CUSUMSQ) graph (Brown, Durbin and Evans, 1975) to test the stability of the long run relationship associated with short run.

3.3 Empirical Research and Findings

3.3.1. Checking Unit Root Hypothesis

Testing of unit root problem with data on respective variables is always crucial prior applying any econometric model. Hence, using of non-stationary time series data leads to the spurious results (Gujarati and Porter 2009). As per the time series assumptions, the absence of unit root which means presence of mean and variance constant over a period of time in a time series to make the series stationary (Hendry 1995). For checking the unit root test of each variable, the study used Augmented Dickey-Fuller (ADF) test proposed by Dickey and Fuller (1979). The following hypothesis is formulated to check the presence of unit root test of each variable.

3.3.2. Unit Root Test

H0: Unit root problem in time series data (*i.e.*, δ = 0)
H1: No unit root problem in time series data (*i.e.*, δ < 0)

Table 1. Summary of Unit Root Test

Variables	At Level(With Trend and Intercept)		First Level of Difference (With Trend and Intercept)		Inference
	T- Statistics	Probability	T- Statistics	Probability	
Consumer Price Index	-0.617148	0.8615	-7.063227	0.0000*	Stationary
Exchange Rate	-1.829410	0.3648	-10.94582	0.0000*	Stationary
GDP	-2.179490	0.2149	-13.00490	0.0000*	Stationary
Interest Rate	-1.199247	0.6732	-6.591982	0.0000*	Stationary

* Indicates significance at 1 per cent level.

The table demonstrates the Augmented Dicker fuller test to study the stationary properties of time series. The results show that all the variables used in the test are stationary at the first level of difference *i.e.* the order of integration is I(1).

Table 2. Summary of Descriptive Statistics

Variables	CPI	GDP	ER	IR
Mean	4.9178	5.8462	4.2165	1.8567
Median	4.9163	5.8593	4.2119	1.8718
Maximum	5.1744	6.0690	4.4160	2.3272
Minimum	4.650	5.4612	3.9751	1.4469
Std. Deviation	0.1360	0.1496	0.0913	0.2673
Skewness	0.0546	-0.3293	-0.2438	-0.2515
Kurtosis	2.1326	1.9072	2.8456	1.9151
Jarque-Bera	3.7893	8.0726	1.2970	7.0900
Probability	0.1503	0.0176	0.5228	0.0288

Table 2 presents the descriptive statistics for the variables. GDP has the highest mean value (M= 5.846214, SD= 0.149603) followed by CPI (M= 4.917853, SD= 0.136093) followed by ER which has the lowest Standard Deviation value (M= 4.216528, SD= 0.091392).

Table 3. Correlation Analysis

Variables	ER	GDP	IR	CPI
ER	1			
GDP	0.8119**	1		
IR	-0.8106**	-0.8259**	1	
CPI	0.9453**	0.8871**	-0.8951**	1
Note: **Correlation is significant at 5% level				

IR has the lowest mean value (M= 1.856750, SD= 0.267385). Rows 3 and 4 indicates the minimum and maximum values which shows that CPI has a minimum of 4.650144 and maximum of 5.174453, GDP has a minimum of 5.461201 and maximum of 6.069097, ER (Min= 3.975186 Max= 4.416066) and lastly IR has a minimum of 1.446919 and maximum of 2.327278. CPI has a longer tale towards the right side which is seen by the positive value of skewness 0.0546 while GDP (-0.3293), ER(-0.2438) and IR(-0.2515) have longer tail towards right. All the variables are lighter tailed which could be seen by the value of kurtosis which is less than 3.

Correlation analysis is being used to find the relationship between Exchange Rate and other variables. From the above table we can see that ER has a positive and strong relationship with CPI (r= 0.945319, p<0.05) followed by GDP (r= 0.811904. p<0.05). This shows that an increase in CPI and GDP does have a significant and positive impact on ER. The correlation value of IR (r= -0.810658, p<0.05) shows that it has a negative and significant relationship with ER.

Table 4. Ordinary Least Square Method

Endogenous Variable	Exogenous Variable	Coefficient	T-Stat	P value	F- Stat	R²	DW
ER	Constant	15.1916	3.3850**	0.0010	353.2458 (0.000)	0.9021	0.4334
	GDP	-0.0122	-1.5845	0.1158			
	IR	0.5876	2.4551**	0.0156			
	CPI	0.3861	14.589**	0.0000			

Note: **indicates significant at 5% level

Ordinary Least Square method has been used in Table 4 to check the influence of exchange rate on GDP, IR and CPI. This could be shown by the coefficient of determination *i.e.* R square which is 0.902106. It shows that 90.2 per cent fluctuation in the exchange rate is due to variations in GDP, IR and CPI. The beta coefficient (B) describes whether the exogenous variable has a positive or negative influence on the endogenous variable.

IR and CPI have a positive and significant impact on the exchange rate since the p value is less than 0.05. It means that 1% change in IR and CPI will have 0.5876 and 0.3861 percent change on Exchange Rate. GDP has a negative impact. The F statistic (F=353.2458, p<0.05) depicts that GDP, IR and CPI have a jointly significant impact on the exchange rate. According to Durbin Watson test, R^2 is more than DW test. Thus the model avoids spurious results in estimating regression model.

Further, the study investigated the cointegration of ER, GDP, IR and CPI with the help of F Bound test. Table 5 shows the summary of F-Bound Test. The following hypothesis is formulated to check the presence of cointegration among the variables.

H0- There is no co integration among ER, GDP, IR and CPI
H1- There is cointegration among ER, GDP, IR and CPI

Table 5. F-Bound Test

Level of Significance	Critical Values		
	Lower Bound I(0)	Upper Bound 1 (1)	F-Calculated
1 %	3.65	4.66	4. 7290*
5%	2.79	3.67	
10%	2.37	3.20	

* denotes computed F statistics more than the critical value at one percent significance level.

Here, the F-statistics (*i.e.* 4.7290) is greater than the lower and upper bound test. Hence, it is inferred that there is long run association among the ER, GDP, IR and CPI at 1,5 and 10 percent significant level. It indicates ER, GDP, IR and CPI are moving together for a longer period of time. In addition, the study also analyzed the impact of GDP, IR and CPI on exchange rates in the long run as well short run which is presented in Table 6 and 7.

The volatility of exchange rate has positive and significantly influenced by its own lagged values of one month *(β=0.786, p<0.01)*, CPI *(β=0.073, p<0.01)* and IR *(β=0.3662, p<0.01)* at one percent significant level. Changes in these factors do significantly causing the movement of exchange rate in the long run. On the other hand, two months lag of interest rate *(β=-1.4379, p<0.01)* has negatively impacted on the movement of exchange rate in the long run. Hence, the result is aligned with the study of Khan's (2010). The degree of determination (R^2) represents that 0.96 percent which indicates variation in the exchange rate is explained by changes in the CPI, IR and lags of ER.

Table 6. ARDL Long Run Coefficient

Dependent Variable- ER				
Regressor	Coefficient	Standard Error	t-statistic	Probability
Constant	6.508505	3.1363	2.0751	0.0403**
ER(-1)	0.786408	0.0546	14.399	0.0000*
CPI	0.073289	0.0266	2.7486	0.0070*
IR	0.366246	0.3885	0.9425	0.3480*
IR(-1)	1.065598	0.5563	1.9151	0.0581
IR(-2)	-1.437998	0.4200	-3.423*	0.0009*
GDP	-0.005147	0.0045	-1.1353	0.2587
R- squared	0.966003	F-statistic	520.9292	
Adjusted R-squared	0.964149	Prob(F-statistic)	0.0000	
Durbin-Watson stat	1.8697			

* denotes 1% significance level ** denotes 5% significance level

Table 7. Error Correction Model

Variables	Coefficients	Std. Error	t-statistic	Probability	Results
D(IR)	0.3662	0.3756	0.9748	0.3318	Insignificant
DIR(-1)	1.4379	0.3757	3.8265	0.0021*	Significant
Coint Eq(-1)	-0.2135	0.0431	-4.9502	0.0000*	Significant
Serial Correlation LM Test	-0.2135 (0.5615)	R-Square	0.230564		
Heteroscedascity Test	1.747678(0.0968)	Adjusted R-Square	0.217065		
		Durbin- Watson Stat	1.869770		
F- statistic	4.729	Prob(F-statistic)	0.0000		

* denotes 1% significance level

The estimated results of error correction mechanism presented in Table 7. It is observed that the beta coefficient shows that exchange rate is positive and significantly *(β=1.4379, p<0.01)* influenced by one month lag of interest rate at one percent level but however the exchange rate does not have significantly influenced by current interest rate in the short run. On the other side, the CPI and GDP do not have impact on volatility of the exchange rate in the short run.

The coefficient of error correct term has negative and significant at one percent level. It indicates the short run deviation is gets corrected or adjusted by 0.21 percent towards the long run equilibrium for every month. The explanatory power of the model represented by R^2 indicates 0.23 percent variation in the exchange rate is explained by the selected explanatory variables in this model. Moreover, the probability of F statistics shows jointly significant at one percent level and this model eliminated spurious results through DW test (R^2<DW). Also, there is no heteroscedastic and no autocorrelation in the error term since the p value is greater than five percent.

3.3.3 Stability Test

Graph 2. CUSUM of Squares
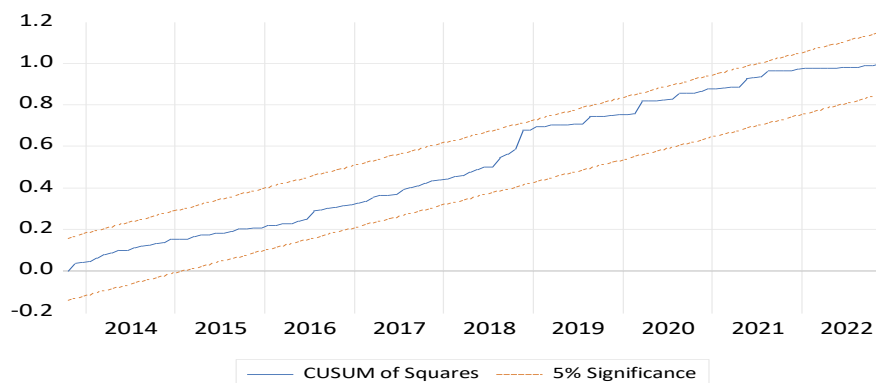
The plot CUSUMSQ shows the blue line lies between the two dotted red lines, that is all the estimated coefficient in the given regression output indicates stable. Since, stability test stay within the critical bound test at five percent significant level indicates long run and short run dynamic coefficients are stable in the ARDL-ECM model. Hence, the model is stable, and it could be used for policy marking decisions.

3.4. Implications

CPI and IR have a long-term relationship with Exchange Rate. A long-term relationship between the Consumer Price Index (CPI), interest rates, and the exchange rate can signify the overall health and stability of a country's economy. If a country has a consistently low and stable CPI, it may indicate that inflation is under control, and that the economy is growing at a sustainable pace. This can lead to a stronger currency, as investors and traders are more likely to want to buy and hold the currency due to the potential for higher returns on investments in that country. Similarly, if a country has consistently high and stable interest rates, it may indicate that the economy is strong and that there are good investment opportunities in that country. This can also lead to a stronger currency, as investors and traders are more likely to want to buy and hold the currency due to the potential for higher returns on investments.

On the other hand, if a country has a consistently high and unstable CPI or a consistently low and unstable interest rate, it may indicate that the economy is not performing well, and that there is a higher risk of inflation or economic downturns. This can lead to a weaker currency, as investors and traders are less likely to want to buy and hold the currency due to the potential for lower returns on investments. When both factors, CPI and Interest rate, are stable and consistent over time, it can also indicate that the central bank of that country is capable of keeping the inflation rate stable and economy growing at a sustainable pace.

Conclusion

The study's primary objective is to analyse the impact of CPI, GDP and IR on Exchange Rate in the long as well as short run. The stationarity test shows that all the variables were stationary at the first level of difference. CPI and GDP have a strong and positive relationship with CPI while Interest Rate has an inverse relationship. Cointegration among the CPI, GDP, IR and ER has been identified with the help of Bound F test. Further, the study empirically proved that one-month lag of ER, CPI and IR has positively impacted whereas two-month lag of IR negatively influenced the exchange rate in the long run. However, it is observed that the interest rate does significantly influence the movement of the exchange rate in short as well as long run.

Limitations and Scope

The current study focuses on the examination of the economic factors affecting exchange rate; however, its scope is limited by data availability. To address this limitation, future studies can consider incorporating other variables such as political, social, and environmental factors, which can provide a more comprehensive understanding of the impact of economic factors on exchange rates. Additionally, the current study is limited to a 10-year period, which may not be sufficient to fully capture the long-term relationship between economic factors and exchange rate. To address this, future research can consider extending the data period for analysis to get a more accurate picture of these relationships. Furthermore, the study is restricted to the Indian market and does not consider the global perspective. To address this limitation, future studies can expand the data sources used in the analysis to include a wider range of countries and regions, thereby increasing the robustness and reliability of the results.

Credit Authorship Contribution Statement

Sathish Pachiyappan: He has identified the research problem of the study, formulated the research framework and objectives of the study accordingly. Also, contributed for analyzing the econometric model using E-Views.
Ananya Jain: She has contributed to writing of abstract, introduction and literature review of the study.
John Paul Raj: He has contributed to writing of the implications, limitations, future scope of the study followed by conclusion.
Saravanan Vellaiyan: He has written the mathematical equation for each econometric model which has mentioned in the report. Also, contributed for writing the theoretical support for this research work.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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The Impact of Corruption on the Economic Security of the State

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Abstract: *The level of national economic security is influenced by many factors. But over the past year and a half, Ukraine has faced new challenges and threats of an unprecedented blow to its economic security from the armed aggression of the Russian Federation. In addition to the above-mentioned threats to Ukraine's economic security, "old" internal problems, one of which is corruption, have had a significant negative impact. Summarizing domestic and foreign scientific theories and empirical studies, the article analyzes the main elements of corruption's impact on economic security and identifies the direct and indirect impact of corruption on economic growth. It is argued that corruption has increased the challenges to the country's economic security due to: a decrease in total investment and a slowdown in economic growth, a reduction in spending on education and health care, a deterioration of infrastructure and taxation, and a decrease in foreign direct investment. The author concludes that it is necessary to systematically develop and implement measures to prevent and combat economic corruption. At the same time, achieving economic security should be an attribute and integral part of the national anti-corruption policy.*

Keywords: corruption; economic security; budget; economic growth; anti-corruption policy.

JEL Classification: D73; F52.

Introduction

The current scale of global corruption is staggering. The World Bank Institute's estimate of more than $1 trillion is only a rough idea of how much bribery takes place around the world. The World Economic Forum estimates that corruption costs more than $2.6 trillion a year, or about 5 percent of global gross domestic product. At the same time, according to conservative estimates, since national security motives are a reliable bulwark for concealing corrupt activities, corruption in the defense sector costs the world $20 billion a year (Transparency International Ukraine 2021). Globally, corruption is considered a major problem for countries and their development, although it has always been inherent in almost all societies. The presence of corruption in state institutions, regardless of the status and level of development of a country, undermines the legitimacy of the government, threatens the

fundamental values and sovereignty of society, and causes distrust in other countries, and cooperation in such a situation is impossible.

In particular, as stated in the United Nations Convention against Corruption (United Nations Office on Drugs and Crime 2004), it is in developing countries that the consequences of corruption are most devastating, as it harms the most vulnerable, limits significant financial resources for development, undermines the ability of governments to provide basic services, increases inequality and injustice, and jeopardizes foreign aid and investment. Corruption is a key driver of economic inefficiency and a major obstacle to poverty reduction and development. From the first years of Ukraine's independence to the present day, domestic and foreign experts and scholars have consistently noted the significant negative impact of corruption on the Ukrainian state. They have consistently emphasized corruption in public procurement, the energy sector, and the management of land and other natural resources. Corruption in the judiciary and law enforcement is particularly dangerous.

Transparency International's research shows that in 2022, Ukraine ranked 116th out of 180 countries in the Corruption Perceptions Index (CPI), receiving 33 points out of 100 (Transparency International Ukraine 2022). Compared to 2021, the CPI increased by 1 point, regaining its 2020 value. Such a stagnation in the Corruption Perceptions Index can only indicate a period of stagnation in the process of overcoming this negative phenomenon.

Unfortunately, according to the results of the study, our country is still at the bottom of the graph, belonging to countries with a rather high level of corruption. In general, over the past 11 years, corruption in Ukraine has partially decreased, as the Corruption Perceptions Index increased by 7 points in 2022 compared to 2012, from 26 to 33 points. However, this increase is rather insignificant: an average of 0.7 points per year. There have also been two drops in the Corruption Perceptions Index: in 2013, 2019, and 2021.

Today, corruption has become so widespread that both Ukrainian citizens and the international community see it as a major threat to independence and national security. The report of the U.S. Helsinki Commission (Council for Security and Cooperation in Europe) states that "corruption prevents Ukraine from becoming a fully-fledged, prosperous democracy and hinders its ability to fight Russian aggression" (Voice of America 2017). Citizens' trust in state institutions has been undermined, as it is well known that officials at all levels are unable to protect the national interests, rights, and freedoms of citizens, as they are focused on personal enrichment.

Nevertheless, several studies conducted abroad on the economic consequences of corruption show that these consequences are significant and not only limit the growth of countries but also increase it. In particular, in the 1960s, world-renowned economists N. Leff and S. Huntington noted that corruption can be considered a useful substitute for the rule of law where the rule of law is underdeveloped. As a result, "the benefits of corrupt activity, that is, the value created by the additional productive transactions it enables, may outweigh the costs." This is most likely to happen when legal business opportunities are severely limited.

It is worth noting that corruption has significant economic consequences, both hindering and promoting growth. The relative magnitude of these two effects depends on the country's enforcement of property protection laws. When such protection is weak, corruption at the state level can significantly contribute to the expansion of economic activity. In this regard, the task was set to deepen scientific research in the field of assessing the direction and intensity of the impact of corruption on economic growth and economic security of the country. The purpose of this paper is to study the mechanisms of corruption's impact on various aspects of the country's economic development and to determine the impact on key elements of economic security.

1. Materials

The study is based on the general philosophical and general scientific level of theoretical and empirical knowledge. To achieve this goal and solve the tasks set, the article uses a set of general methods and special methods that meet the objectives, namely: theoretical - generalization; abstraction - the study of the essence and concept of corruption and its impact on economic security, induction, deduction; comparison and systematization - to determine the diversity of corruption phenomena and their impact on the economic development of Ukraine; observation, analysis, synthesis, cause, and effect - to determine the social aspects of corruption development in Ukraine.

To assess the impact of corruption on Ukraine's economic security, the author uses analysis, synthesis, transition from the abstract to the concrete, deduction, and modeling. Using generalization, analysis, grouping, modeling, synthesis, and comparison, it is proved that corruption is a threat to the country's economic security. Modeling, analysis, induction, grouping, comparison, and observation are used to develop solutions to existing problems in the industry. The impact of corruption on national economic security is shown by the methods of analysis, synthesis, generalization, and cause-and-effect relationship.

The spread of corruption in Ukraine and its destructive impact on the country's economic security have long been the focus of attention of domestic scholars. In particular, it is possible to note the fundamental research of O. Busol (2015), V.M. Geets (2017), M. Skrypnychenko *et al.* (2018), N. Yurkiv (2018), L. Parfentii (2022). The works of O.I. Baranovsky (2006), V. Trepak (2020), V. Mazyarchuk, and I. Fedko (2016) reflect on the development of financial systems affected by corruption. At the same time, there is a lack of domestic research on the multidimensional impact of corruption on national economic security, as well as limited empirical studies on quantifying the impact of corruption on the Ukrainian economy.

In foreign studies, the problem of assessing the impact of corruption on economic growth and components of economic security is considered more broadly, taking into account various aspects of economic and financial activity. Convincing empirical evidence of the economic and social cost of corruption is provided by R. Lemarchan (2019), R. Hanlon (2022), Y. Margalit (2019), and many others. Therefore, it is necessary to deepen the generalization of theoretical and empirical studies on the impact of corruption on the economic development of countries, which will help to identify danger points among the key elements of economic security.

2. Results and Discussion

The creation of civil society is becoming a reality as part of the transition to a market economy and overcoming the most serious threats to the economic stability of the nation, the main one being corruption. Corruption is a negative socio-economic phenomenon that discredits Ukraine in the international arena, hinders investment in all sectors of the national economy, including the financial sector, creates unfavorable conditions for doing business, etc Corruption is a certain negative phenomenon that affects the social, moral, psychological, and economic spheres of society. The spread of corruption in Ukraine and globally makes it a serious threat.

Corruption is an illegal activity in politics and public administration that involves the use of public officials and the powerful opportunities provided to them for personal gain. There are three main approaches to characterizing corruption from a methodological point of view. The first approach assumes that corruption is a deviation from legal requirements, official morality, and basic moral standards. This method allows for explaining corruption from both a broad and a specific point of view. Generally speaking, officials are considered corrupt when they directly use the power that comes with their positions to further their interests. In the strict sense, corruption is defined as the adoption of illegal decisions by the authorities that allow another party to gain some benefit and officials to receive illegal remuneration.

According to the second strategy, corruption is seen as a social phenomenon that determines the effectiveness of existing national socio-economic institutions and legal systems. This approach views corruption as a "source of friction" that society as a whole, as well as its governing institutions, must overcome to achieve its goals. This behavior is a reflection of the corruption of the social system as a whole. According to the third point of view, corruption is a broad set of strategies used to influence the behavior of specific social groups to gain advantages for organizing and doing business at the proper level and quality of national service (Samiylenko *et al.* 2021).

The level of corruption in Ukraine continues to be high, comparable to the level of economic security of the country. As a result, according to the Economic Security Strategy of Ukraine until 2025 (President of Ukraine 2021), the state of Ukraine's economic security from 2010-2019 was assessed as unsatisfactory, with a decline in almost all indicators to a threatening level in 2012 and 2014-2015. The average level of economic security for the current period is 40%, which means a zone of unsatisfactory condition, according to calculations made by the Ministry of Economy of Ukraine by the Methodology for Calculating the Level of Economic Security of Ukraine, approved by the Order of the Ministry of Economic Development and Trade of Ukraine of October 29, 2013, No. 1277. In 2019, the level of economic security in Ukraine was 43%, and in the first half of 2020 - 41% (Voice of America 2017).

As stated in the Economic Security Strategy of Ukraine until 2025 (President of Ukraine 2021), corruption is one of the main threats to investment and innovation security. The high degree of shadow economy and the phenomenon of legalization of illegal income are two major problems in the area of financial security (money laundering). Since the shadow economy fosters corruption, and the extent of corruption is the basis for the functioning of the shadow economy, it is well known that these two phenomena are closely intertwined and dependent on each other. In addition, corruption is a major source of proceeds of crime and a key factor in many money laundering schemes.

Corruption not only threatens the country's development, social stability and security, and economic well-being but also leads to the destruction of its democratic system and social values. Corruption seriously affects the efficiency and fairness of the distribution and redistribution of public resources, leading to national economic

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inequality. It also affects business activity, as in the context of corruption, business entities simply cannot avoid corrupt relations in the course of their business activities, which ultimately leads to a slowdown in the country's economic development.

According to some studies, corruption, in addition to its general degree, can have various individual characteristics. One of these characteristics is the unpredictability of the service market, including corruption: the unpredictability of corruption in individual organizations, the level of useless behavior of a corrupt official, etc. Thus, the analysis of the relationship between corruption and FDI shows that the perception of the level of corruption and bribery in a country plays a very important role: "Uncertainty about corruption kills the will to invest" (Hanlon 2022). Measures to minimize corruption can theoretically lead to a reduction in the shadow economy in a country, as corruption is directly correlated with the presence and size of the shadow economy. First of all, this can significantly affect the size and effectiveness of social programs that depend on tax revenues, which in turn can affect the overall efficiency of the economy.

Collateral damage from the erosion of the state's reputation, an increase in crime in general, the promotion of corruption in law enforcement agencies, and a decrease in national security due to corruption in the military all contribute to this issue. However, quantifying the relationship between corruption and such socio-political phenomena requires not only the development of special methodologies but also the collection of a large amount of local data (Vysotska and Vysotskii 2017).

We believe that corruption is directly related to the shadow economy. The shadow economy is an economic activity in which entities avoid official accounting and taxation. The shadow economy is divided into three types, as described below, depending on the type of activity and source of income:

1) informal economy - legalized (permitted) economic activity, whose entities avoid official accounting and stimulate their activities due to the situational needs of individuals. This is the largest segment of the shadow economy, represented by various types of small-scale production of goods and services (*e.g.*, music or photography services at weddings, escorting passengers or cargo, tutoring, repairs by agreement with customers, and construction work) by individuals. Selling household goods on the spontaneous market). The modern type of activity adds activities that are determined by the latest advances in information technology, are not yet covered by the current legislation, and are difficult to tax due to their virtual nature (for example, the so-called home office, *i.e.*, you can earn money on your computer without leaving your home);

2) hidden economy - legal economic activity, usually dominated by entrepreneurs who carry out various organizational and financial manipulations to obtain additional profit (*e.g.*, artificial division), which the state establishes for small businesses, using barter transactions to make a profit, making informal payments to employees to "warm up" the staff (the so-called envelope). This economy is also known as the "shadow" economy, because in it, expenses are still legal, but income is illegal;

3) the criminal economy is known as financial fraud, theft, smuggling, bribery, drug trafficking, pimping, and extortion. Illegal (criminal) activities in the form of human trafficking, etc. (Pygolenko 2009).

The main reasons for the shadow economy are:

▪ imperfect legislation, mainly tax legislation. In particular, excessive tax pressure (excessive tax rates and/or excessive taxation), confusing (non-transparent) mechanisms of tax administration (calculation), unfair tax benefits for entrepreneurs closely connected to the state, etc;

▪ the corruption of the national administrative system, which consists of the commercialization of officials' duties, is a purely human flaw (greed, legal ignorance, etc.) (Vysotska *et al.* 2019).

Combining crime with the legal economy through access to political power and the possibility of "laundering" dirty money. Corruption is committed for illicit enrichment. Funds obtained through corruption are legalized in various ways. The State Financial Supervision Service of Ukraine (SFSU) controls financial transactions to prevent possible laundering of dirty money. Typical methods of laundering the proceeds of corruption include the following:

▪ involvement of persons who have no family ties to corrupt officials;

▪ receipt of cash "bribes" with further transfer of funds in non-cash form;

▪ bringing the proceeds of corruption to Ukraine and further legalization;

▪ receiving inheritance (multiple) from persons who are not related to the corrupt official;

▪ acquisition of corporate rights (Geets 2017).

The impact of corruption on economic growth has been the subject of many studies over the past few decades. Domestic scholar V. Trepak (2020) notes that the results of his research indicate that corruption contributes to the emergence and development of negative phenomena and processes in the economic sphere, in particular, the distortion of the mechanism of market competition, the emergence of monopolistic tendencies in

the economy, and the identification of inefficient allocation of state budget funds. This leads to an unfair distribution of income, enriches corrupt actors at the expense of other members of society, contributes to the growth of prices for goods and services due to the so-called "administrative costs" of corruption, and determines the existence and development of organized crime and the shadow economy.

According to V. Mazyarchuk and I. Fedko (2016), corruption reduces overall investment and thus economic growth. The decline in investment is associated with uncertainty caused by inflated production costs and corruption. Slower growth is a direct consequence of lower investment inflows. In addition, spending on education and health care has also declined due to the ease of budgetary maneuvers in these areas. As officials can easily generate revenue from public investment projects, the country's infrastructure and public investment projects are deteriorating, and tax revenues are declining due to corruption in the tax and customs authorities. These factors contribute to an increase in the share of public investment. As a result, the quality of state functions is declining, and foreign direct investment is decreasing, as corruption has the same effect as taxation, causing insufficient budget revenues.

I. Burakovsky (2018), Head of the Institute for Economic Research and Policy Consulting (IERPC), noted that corruption leads to the loss of state sovereignty. According to the researchers, there is a so-called "corruption space" in Ukraine, in which certain funds circulate (their volume is the size of the space). Narrowing corruption opportunities means "withdrawing" (in a positive sense) money from various corruption mechanisms. Since the extent of corruption in the Ukrainian economy is currently unknown, it is difficult to assess which parts of the overall corruption situation have changed. The only economic sectors that IERPC assessed were those where it was possible to conduct an economic assessment between 2014 and 2018. These sectors were those that historically caused the nation to suffer significant losses from corruption. Therefore, they compared the effect (reduced space for corruption) to GDP and determined that these effects amounted to $6 billion, or 6% of GDP per year over the same period to get a sense of the scale of the change.

Most scholars have found, based on numerous theoretical and empirical studies, that corruption has the most detrimental effect on the economy. According to domestic and foreign research and analysis of the impact of corruption on economic security and financial elements, the following points can be made.

The economy is a dynamic mechanism that changes its state for some time under the influence of various reasons (Fig. 1). Therefore, to achieve qualitative transformations, it is necessary to minimize the impact of negative factors, primarily corruption, on the country's economic health. Economic growth is a steady increase in economic productivity over a long period or simply an increase in the economic power of a country through an increase in GDP. In other words, a growing economy produces more goods and provides more services. This process is accompanied by an increase in the competitive advantages of the national economy on the world stage.

Figure 1. Elements of economic development under the influence of corruption
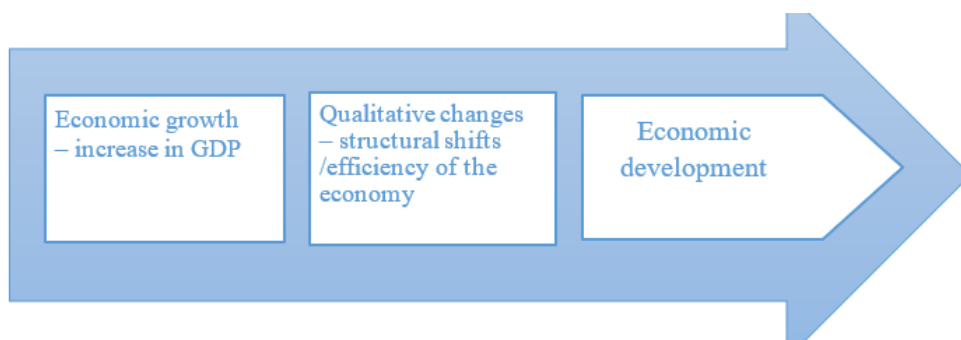
Source: developed by the authors

Development is a multifaceted process that includes changes in social and governmental institutions, as well as accelerating economic growth, reducing inequality, and eradicating poverty. Thus, not only economic growth but also social, cultural, and institutional changes lead to an improvement in the quality of life of the population. That is why it is so important to minimize the impact of corruption on the development process (Vysotska *et al.* 2019). Based on a generalization of foreign theoretical and empirical studies, we can identify the key dependence of economic growth on national corruption indicators (Table 1). They can be used to model the impact of corruption on future economic growth.

Table 1. Variables for assessing the impact of corruption on economic growth

Variable	Anticipated impact	The content of the indicator	Empirical studies	Source
Dependent variables				
Dependent variable with lag		Real GDP per capita	Natural logarithm of GDP per capita ($)	
Corruption	-	Corruption perceptions index.	L. Pelegrini, R. Gerlach, T. Eidt; M. Ugur, N. Dasgupta, B. Venard; S. Saha, R. Gunder; B. Tarek, Z. Ahmed.	Transparency International (TI)
	+		P. Meon, C. Secat; P. Egger, G. Winner; T. Eidt, J. Dutta; J. Heckelman, B. Powell.	
Democracy Index	+	Democracy freedom index	A. Schumpeter, G. Kotera *et al.* ; G. Heckelman, B. Powell; S. Saha, R. Gunder	Freedom House music
Index of economic freedom	+	Average value of the index of economic freedom	G. Heckelman, B. Powell. E. Peev, D. Muller	The economic freedom of the world (EFW)
Independent variables				
Capital investments	+	Investment/GDP ratio	I. Ekanayaki, D. Chatrna	Work Bank
Population growth rate	−	Percentage of annual population growth	R. Barro, C. Sala-i-Martin; J. Sachs	Work Bank
Trade openness		Percentage of imports and exports to GDP	R. Wakzyarg, K. Welch; F. Wang, K. Liu; B. Okuyan *et al.*	Work Bank
Education level		Percentage of pupils enrolled in primary school (%)	S. Berkheim; A. Boughanmi.	Work Bank
Government expenditure		Percentage of public expenditure from GDP	D. Landau; M. Marlowe, S. Folster, M. Henrickson.	Work Bank

Source: generalized by the author

When studying corruption, it is first of all necessary to identify those aspects of the phenomenon that pose a real threat to the country's economic security. These threats include an increase in the size of the shadow economy; the combination of crime with the legal economy through the acquisition of political power and the possibility of "laundering" dirty "money"; violation of competition in the market; delay in the emergence of effective private owners and the efficient use of budget funds. Low price growth due to the inclusion of corrupt officials' "services" in the price, a decline in trust in the state and its ability to regulate economic processes increased social inequality, and income gaps between different segments of the population (Hoinaru *et al.* 2020).

One of the distinguishing factors of the successful development of European countries compared to Ukraine is a significantly lower level of corruption. In Ukraine, the gross domestic product (GDP) per capita in current prices for 1990-2020 increased from 1,816.0 to 3,726.9 dollars. USA, *i.e.* 2.1 times. During the same period, for example, in Poland, this indicator increased from 1,740.0 to 15,656.2 dollars. USA, *i.e.* almost 9 times. According to the calculations of the International Monetary Fund, if the level of corruption in Ukraine were reduced to the average level among European countries, then real GDP growth would not be 3%, but 5%. In addition, it would change the growth potential (Akimova *et al.* 2020).

Corruption indirectly affects the national monetary system and the stability of the national currency. The sources of shadow revenues are bribes and unofficial payments outside the sphere of influence of the official authorities, as the National Bank of Ukraine and the government are unable to manage large amounts of money in the shadow. If its volume grows to a critical level, this flow of money can panic any part of the domestic market. The optimal level of inflation should increase along with corruption, as the size of the shadow economy is a more effective tool for increasing government revenues than changes in the tax system by expanding the money supply. Inflation reduces public sector wages and thereby increases the demand for additional revenues, *i.e.* the causal relationship in this case can be as follows (Margalit 2019).

Local experience shows that corruption hurts a country's ability to innovate. First, it includes restrictions and additional requirements for business operations that are not permitted by law, granting specific business entities undue advantages, and entering into agreements that business entities are forced to enter into against them. As a result, certain businesses, especially those from countries with low levels of corruption, lack the experience necessary to engage in corrupt practices. As a result, they lose market share or prefer to operate in countries with low levels of corruption (Nagorna 2019).

Secondly, the lack of transparency in business practices leads to a loss of interest from investors, which is a factor in the economy lagging behind corrupt regions in the future with higher standards of business transparency. The driving force behind economic development is investment activity. Foreign investment brings about the most progressive structural changes in the economy. As of the end of 2019, the volume of foreign direct investment per capita in Ukraine amounted to USD 1,112. The figure was equal to USD 1,112 per capita. In Poland, this figure was equal to USD 6242. In Poland, the figure was $6242, which is 5.6 times higher. A survey of foreign investors, 74% of whom currently have investments in our country, conducted in November 2020, showed that the most significant obstacles to foreign investment in Ukraine are distrust in the judicial system (8.5 points on a 10-point scale) and widespread corruption (8.2 points) (National Agency for the Prevention of Corruption 2023).

Third, it is more difficult to organize new businesses and new projects. Corruption is a serious impediment to innovation, as innovators are more in need of government services such as licenses and import quotas than producers with established business processes. The high demand and inelasticity of such public services make them prime targets for corruption. Fourth, innovators do not have extensive corruption or lobbying ties and are therefore particularly vulnerable to bribery and expropriation. Innovators can't operate regularly in a corrupt atmosphere, as they have less access to credit financing and often face greater challenges in corrupt practices.

Corruption has a double negative impact on the budget. First, the budget receives less tax revenue due to the existence of the shadow economy, and second, budget funds are used inefficiently, as they are mainly financed by corrupt public expenditures. A one-point drop in the Corruption Perceptions Index reduces national income by 1.71-2.51% of GDP. Each unit increase in corruption reduces spending on education and health care by 0.34-0.45% of GDP (Skrypnychenko *et al.* 2018). Prices are higher because the price includes the cost of the "services" of corrupt officials. Corruption increases the price of goods. Producers are forced to pay bribes, and the resulting costs are included in prices, thereby passing the costs on to consumers. Corruption not only increases the cost of goods but also increases the cost of investments and investment projects. It has been established that corruption increases the cost of an investment project by 10-20% (Yurkiv 2018).

Every year, the state budget of Ukraine loses UAH 455 billion due to corruption schemes, including UAH 120 billion through "envelopes" and conversion centers, UAH 100 billion through "gray imports", UAH 100 billion through schemes in public procurement, UAH 70 billion through offshore schemes, UAH 30 billion through "twists", UAH 20 billion through schemes involving individual entrepreneurs, and UAH 15 billion through counterfeiting. Losses of budget funds lead to underfunding of the expenditure side of the state budget, which has an unsatisfactory impact on the social sphere and the country's defense capability. The lack of budget funds leads to higher inflation, which increases macroeconomic instability (National Agency for the Prevention of Corruption 2023).

Non-transparent public procurement tenders have led to the fact that public orders, and thus budget funds, are awarded not to those who are competitive, but to those who have been able to gain advantages illegally. This leads to a decrease in market efficiency and discrediting the ideas of market competition. It should be noted that Ukraine has introduced the ProZorro electronic public procurement system, which has replaced paper public tenders (Uddin and Rahman 2023).

Inefficient use of budget funds. Corruption hurts both state budget revenues and expenditures. As the level of corruption in a country increase, budget revenues decrease. Tax revenues are more vulnerable to corruption than other budget revenues, as a 1% increase in corruption was associated with a 1.5% decrease in

revenues relative to GDP and a 2.7% decrease in tax revenues relative to GDP. As a result of the state's fight against corruption, state budget revenues have increased on average fourfold over the long term (Rodchenko and Govorukha 2020).

The state budget expenditures - social expenditures - also suffer from corruption, as corrupt government expenditures are primarily financed, and social expenditures lose their targeting, *i.e.* they are received by the wealthy. According to IMF calculations, a unit increase in corruption corresponds to a decrease in the ratio of such expenditures by 1.32-2.19% of GDP. Also, a unit increase in corruption reduces the ratio of education and healthcare spending to GDP by 0.34-0.45%.

Price increases due to increased "corruption costs". Businesses pay bribes to avoid paying taxes and government regulation. In Ukraine, 62% of respondents evade taxes, 47% of them pay bribes, and the average amount of bribes is 1.76% of income (National Agency for the Prevention of Corruption 2023).

It increases the income gap between different classes of the population. Corruption contributes to the unfair redistribution of wealth in favor of limited segments of the population. This has led to an increase in inequality among the population. Moreover, a large share of shadow income is received by representatives of the upper classes. The top 20% of wealthy households in Ukraine earn more than 70% of unofficial income. According to others, the simplest true picture of the distribution of total monetary income (including money) among different classes of the population is as follows:

- 40% of the population receives about 10% of total monetary income (about 10% of the country's population);
- 30% of the population receives up to 30% of income (approximately one-third in the shadow);

10% of the population - about 40% of the total income of the country's population (about 75% of them are in the shadow) (Parfentii 2022).

Corruption undermines the foundations of economic competition. The economic model of free competition implies that prices for goods and services are determined solely by market factors, the ratio of supply and demand. Corruption schemes lead to higher prices. Doing business becomes more expensive and loses its competitiveness. There are many examples where prices for the same goods in Ukraine are much higher than in European countries. Overpriced goods limit the purchasing power of Ukrainians, most of whom already have insufficient income. Consequently, limited demand does not stimulate the development of the production of goods and services.

Corruption hinders the mobility of production factors, which is an important component of free competition. We are talking about state-owned factors of production, and their involvement in private business does not always occur without the use of corruption schemes. For a long period, most corrupt practices in Ukraine have been committed in the transfer of state-owned land. Starting in October 2017, corruption in the field of land relations was countered by the introduction of leasing state-owned agricultural land exclusively through electronic land auctions (Drebee and Abdul-Razak 2020).

The business environment considers corruption to be a significant obstacle to doing business. According to the results of a national sociological survey of the population and business representatives for a comprehensive assessment of the corruption situation in Ukraine based on the Methodology of the Standardized Survey on Corruption in Ukraine, approved in 2021 by the NACP, entrepreneurs "consider political corruption at the highest level to be the most serious type of corruption among the three proposed" (political, business and every day), "but assess the situation more positively than the population. In particular, 85.8% of business representatives consider political corruption at the highest level to be a serious problem, while less than half of the respondents consider everyday corruption to be a serious problem."

Overall, on a five-point scale, business representatives consider corruption to be a very serious threat to business activity (average 4.35 points). They consider the most corrupt areas to be permitting and mining (4.54 points). This is followed by customs (4.40 points), privatization of enterprises (4.26 points), forestry (4.25 points), public procurement of works and services for construction, repair and maintenance of state and local roads (4.24 points), public procurement of works and services for implementation of other major infrastructure projects (4.18 points), land relations, land management (4.16 points), judiciary (4.05 points) and others (National Agency for the Prevention of Corruption 2023).

The emergence of political corruption in Ukraine in the late 1990s and early 2000s at the national level among the top leadership of the state, executive and judicial authorities, members of parliament, and leaders of political parties led to the monopolization of the mining and metallurgical, fuel and energy complexes, chemical industry, machine building, shipbuilding, and oil and gas markets. The monopolization of the leading sectors of

the economy has led to the emergence of oligarchy. The monopoly position allows for excessive profits, some of which are used by the oligarchs to commit corrupt acts for further enrichment.

Over the years, the oligarchy has become a stable source of increased corruption in Ukraine among representatives of all branches of government. The signing of the Law of Ukraine No. 1780-IX "On Prevention of Threats to National Security Associated with the Excessive Influence of Persons with Significant Economic and Political Weight in Public Life (Oligarchs)" by President of Ukraine Volodymyr Zelenskyy on November 5, 2021, creates the legal framework for eliminating the preconditions for doing business using oligarchic schemes (Asteriou *et al.* 2021).

It is worth noting that corruption in the public sector has a large negative impact on corporate tax payments. Thus, reducing public sector corruption can have a significant impact on a country's ability to collect taxes. This is especially important for small and medium-sized state-owned enterprises that seek to reduce their tax burden in a corrupt environment. However, large multinational corporations respond to public sector corruption by investing in other countries, revealing the opportunity cost of corruption. As corruption has a similar effect on taxes, foreign direct investment (FDI) flows decrease. Thus, FDI inflows are inversely proportional to levels of corruption (Fig. 2) (Busol 2015).

Figure 2. The impact of corruption on the economy
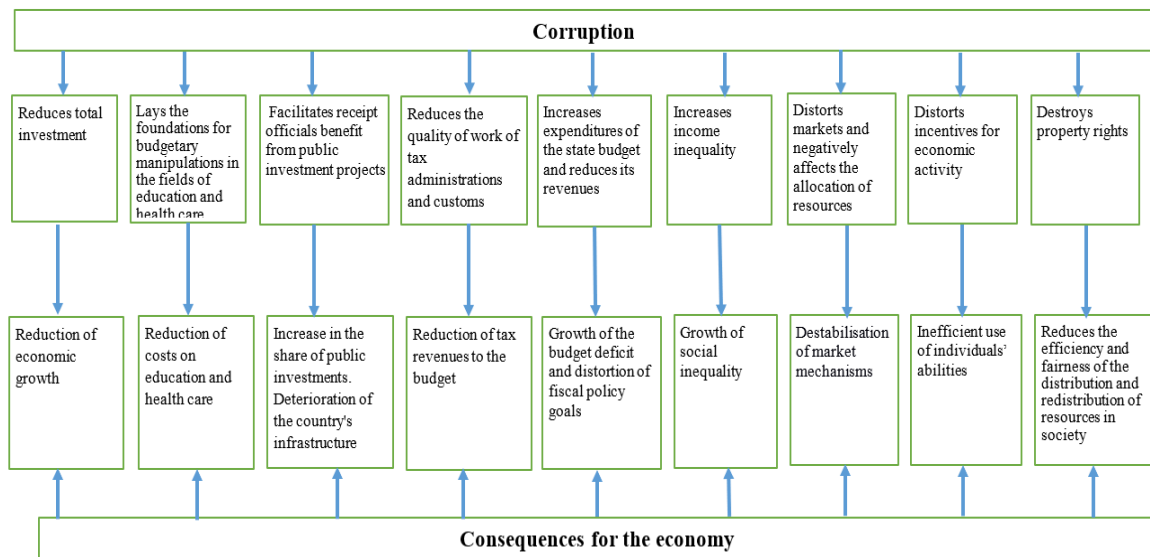
Source: developed by the authors

It is possible to identify a trend that democracies with open economies, free press, strong trade, and a high proportion of women in government have the lowest levels of corruption. On the other hand, less developed countries that rely on fuel and raw material exports, have complex regulatory and legal systems and have economies defined by "inflationary instability" have very high levels of corruption. Thus, the extent to which corruption affects the economy also depends on the country's legal and institutional framework, as well as the quality of its governance and political institutions. The absence of political stability and a good legislative framework can lead to a favorable environment for corruption, which in turn can lead to ongoing crises. This is evidenced by the failure to implement the necessary reforms in every sphere of life, which reduces the quality of life of the population (Samiylenko *et al.* 2021).

In addition, studies show that average income in corrupt countries is one-third lower than in countries with low levels of corruption, literacy rates are about 25 percent higher, and infant mortality rates are three times lower. This data shows that corruption poses a serious threat to the socio-economic situation in a country and systematically affects the level of economic development. A comparison of data across countries shows that corruption is consistently associated with lower GDP per capita growth, economic inequality, and lower human development (WGI 2022).

Thus, corruption hurts long-term economic growth, as it affects investment, taxation, public spending, and human resource development. Direct economic losses from corruption are insufficient budget revenues and inefficient spending of budget funds. The overall decline in economic efficiency under corruption is an indirect

consequence of corruption, including economic losses due to the causes of corruption (*e.g.*, administrative barriers that lead to corruption while reducing economic efficiency). In addition, the economy suffers from losses caused by corruption itself (*e.g.*, a drop in investment returns due to corruption). It is extremely difficult to calculate the negative impact of corruption (Lemarchan 2019).

Let us consider in more detail the experience of countries that have managed to develop effective mechanisms to combat corruption, reduce its scope, and establish control over the activities of officials. As part of this study, we consider it necessary to study the determinants used by them that contribute to preventing and overcoming corruption, as well as to implement them in Ukraine. According to the Transparency International ranking in 2020, the leading countries in preventing and fighting corruption were: New Zealand, Denmark, Finland, Switzerland, Singapore, Sweden, Norway, the Netherlands, Luxembourg, Germany, Canada, the United Kingdom, Japan, France, the United States, and other countries (Sinha *et al.* 2019).

These countries, as well as several others, have achieved effective results in combating and overcoming corruption. Today, these countries are role models that indicate the benchmarks to which we should strive. Each country, on the one hand, has developed its peculiarities of organizing the process of preventing and combating corruption, and on the other hand, there are certainly some common features, such as firmness and determination to carry out anti-corruption activities, involvement of the public in these actions, and moral and ethical rejection of corruption.

In civil society in countries such as Germany and the United Kingdom, there is a prevailing understanding that if a person holds an important public office, he or she must be talented and professional. To formulate the determinants of counteracting and overcoming corruption in Ukraine, a thorough study of the experience of these countries is needed, with a special focus on Singaporean and Polish practices that have proven effective today (Malanski and Póvoa 2021).

For example, Singapore has established and is successfully operating a special independent and autonomous body to combat and overcome corruption - the Corruption Investigation Bureau, whose activities are aimed at verifying the facts of offenses and abuses of officials, studying the functioning of state organizations and structures whose activities are inclined to corruption schemes, and developing recommendations for them. The country focuses on eliminating the preconditions for corruption risks, which is quite effective and successful. Thus, in Singapore, overcoming corruption is a priority state direction, the implementation of which has a positive impact on the country's economic development. The study of Polish experience points to the following four determinants of overcoming corruption: transparency of the public sphere, individual initiative, media activity, and control of the political sphere (Mukhtarov 2022).

In Germany, the police are the leading institution involved in the fight against corruption. Measures aimed at countering corrupt activities are being actively implemented at the local level. The country has also created a register of corrupt companies, which will lead to close supervision and control of the firm's activities by the Main models of anti-corruption activities Singaporean or Asian (Singapore, Japan, South Korea, North Korea) Swedish or Scandinavian (Sweden, Finland, Denmark, the Netherlands) (Alfada 2019).

A vertical strategy aimed at obtaining quick results, the consequence of which is not the complete elimination of corruption, but finding a level of corruption that is acceptable to both the government and society. A horizontal strategy aimed at consistent implementation of anti-corruption activities based on anti-corruption incentives for law enforcement agencies and the inability to participate in the execution of public procurement in the future.

The analysis of the Dutch experience shows that there is cross-cutting transparency and publicity in the actions and work of officials. A system of control over state and public organizations and institutions that may become centers of corruption exists and is functioning effectively. A system of penalties for corruption offenses has also been developed, including deprivation of both pension and social services and welfare (Sharma and Mitra 2019).

The experience of other countries that have high rankings in the Corruption Perceptions Index, including the determinants of anti-corruption policy, is shown in the table below. The analyzed foreign experience in countering, preventing, and combating corruption allows us to identify leading trends, mechanisms, and tools that can be useful for our country. The main ones are as follows:

▪ formation of a conscious civil society about the intolerance of corruption through constant information explanation about the negativity of this phenomenon, implementation of various anti-corruption programs and projects;

▪ intensification of the activities of civil society organizations and expansion of their influence on anti-corruption processes through the actual introduction of their representatives to the supervisory and advisory boards of public administration bodies;

▪ prevalence of preventive and encouraging anti-corruption measures over repressive ones;

▪ expanding the use of e-governance, Internet platforms, and interactive websites to quickly respond to citizens' reports of facts containing corruption components (Bahoo *et al.* 2020).

In our opinion, summarizing the results of a large number of studies, we can say that corruption leads to a decrease in total investment, and thus to a slowdown in economic growth. This reduction in investment is explained by the uncertainty caused by inflated production costs and corruption. The slowdown in growth is a direct result of lower investment inflows.

Increase the share of public investment by making it easier for officials to benefit from public investment projects. Corruption of tax and customs officials leads to lower tax revenues. As a result, the quality of productivity decreases, and the state operates with insufficient budget revenues (Ceschel *et al.* 2022).

Recently, Ukraine established the National Anti-Corruption Bureau, a national law enforcement agency whose main tasks are to prevent, detect, deter, investigate, and solve corruption offenses committed by senior officials, as well as to prevent the commission of new crimes. The establishment and launch of the National Anti-Corruption Service of Ukraine was one of the requirements of the IMF and the European Commission for visa liberalization between Ukraine and the EU (Baranovsky 2006).

In addition to Transparency International Ukraine, the Anti-Corruption Action Center, which also reports and investigates corruption, launched a website, UKR.AV, this year to provide information on fraud in public procurement. The easiest place to spot corruption is in public procurement. The state spends about UAH 300 billion. Every year, public procurement is like an abyss. Over the past two years, we have managed to preserve the state budget and prevent the theft of more than UAH 1 billion. Only contracts that were terminated or forced to reduce prices were considered. Therefore, the conditions for combating corruption in Ukraine are gradually being created (Serednyak 2018).

We believe that due to a long history of "turning a blind eye" to corruption, Ukraine's economic performance is now one of the lowest in the world. Undoubtedly, corruption is a long-standing systemic social phenomenon that requires a lot of effort and time to overcome. To reduce the level of corruption in Ukraine, it would be useful to have an effective and efficient anti-corruption judicial system, actively involving businesses in creating new transparent rules of relations between the government and business. We believe that the fight against corruption requires certain actions by the authorities, namely: developing an effective anti-corruption policy, strengthening responsibility and punishment for corruption, reforming courts and criminal justice agencies, simplifying the business environment, and decriminalizing the economy. Form an effective and transparent administrative, political, and financial system, pay attention to the legality of the use of budget funds, conduct electronic public procurement, and create a system of easy access to information.

Also, extremely important elements of the anti-corruption system in Ukraine should be:

▪ development and adoption of a clear and understandable code of conduct for public officials, which will set out specific principles of their behavior;

▪ creation of a specific list of interests of public officials, according to which they should be held liable for committing such acts;

▪ inclusion in the register of information on property and income of public officials of information on all their interests, including political, scientific, and charitable, which are realized on a paid or free basis;

▪ continuous implementation of preventive measures in the relevant area.

Conclusions and Further Research

Corruption threatens national security and affects many aspects of a country's economic development. It is also important to understand the impact of corruption on key elements of economic security. To accurately measure corruption, most studies use large datasets with many years of measurements. They are usually performed using various econometric techniques. Most large studies show significant economic negative effects of corruption, including reduced economic growth potential. This is because corruption is usually kept secret, making information inaccurate and unreliable.

Corruption hurts long-term economic growth. It reduces tax revenues, reduces investment, reduces public spending, and reduces the rate of economic growth in a country. Corrupt governments also experience a decline in infrastructure, reduced funding for education and healthcare, and increased control over the population that benefits from education and healthcare.

The introduction of a systematic anti-corruption approach and the implementation of anti-corruption measures is long overdue. At the same time, maintaining economic security should be part of any state's anti-corruption policy. That is why it is so important to create a concept of economic security that should comply with the following principles. The main duty of the state is to actively promote the creation and functioning of basic market institutions. This includes ensuring that the legal environment is maintained through adherence to market principles, as well as prohibiting monopolization of the economy. Otherwise, companies will not be able to operate efficiently. In addition, the state should actively support investment lending and uncompromising protection of state property.

The state-monopolized financial banking and procurement systems of Ukraine, such as Naftogaz of Ukraine, Ukrnafta, and Ukrzaliznytsia, should be removed from the corrupt system. This includes the financial system and public procurement; the latter is the process by which large national projects are selected. Eliminating corruption in this way would also eliminate the state's monopoly in many other areas. The deoligarchization of the national economy should be carried out as soon as possible. People in charge of the economy must be incorruptible. In addition, they must be free from illegal lawsuits and obvious mafia influence. They need to resist bribery and maintain the proper functioning of the national economy.

Additional government initiatives are needed to end the economic downturn. States should establish new relationships with the World Bank and the International Monetary Fund to receive tranches of currency. These funds should be used to finance real projects, such as social security and new businesses. Currently, the state invests in unproductive projects, such as the accumulation of speculative capital through luxury goods. By switching these projects to financing, countries can help ensure the financial security of their citizens. Privatized state-owned companies continue to suffer from the same problems as the corporations they replaced. These include outdated technology, inefficiency, and lack of creativity. The creation of new enterprises contributes to the creation of a competitive environment while maintaining the problematic issues.

Ukraine's monetary policy should be changed to make the country's central bank accountable and transparent. This can be achieved by making the information they provide reliable, timely, understandable, and complete. The markets that the bank regulates should be able to use this information to make informed decisions. It is important to continue researching the economic importance of corruption and its impact on national security. This is because many people are not sure how best to approach this topic and need more concrete evidence to support their theories. A key step in this direction is to develop a coherent theory on how to explain corruption as an informal economic institution.

Current research needs to be expanded to prove the link between corruption indicators and economic security. It is also necessary to quantify the impact of the fight against corruption on economic security measures. This work should be done on a larger scale than a single organization. The institutional context of corruption and its impact on the economy as a whole should be taken into account. This will help to create a more reliable basis for future policy decisions on corruption.

Prospects for further research in this area will be the development of specific programs to protect the economy from corruption risks. The scientific novelty of the results obtained is to identify and solve existing problems related to the development of practical recommendations for improving and implementing the mechanism of state anti-corruption policy in ensuring the economic security of Ukraine. The practical significance of the results obtained is to develop recommendations for improving the theoretical and methodological foundations for the development and improvement of the mechanism of national anti-corruption policy to ensure the economic security of Ukraine.

Credit Authorship Contribution Statement

Anatoly Mazaraki: write the contribution of first author choosing the relevant actions, but not limited to Conceptualization, Investigation, Methodology, Project administration, Software, Formal analysis, Writing – original draft, Supervision, Data curation, Validation, Writing – review and editing, Visualization.
Tetiana Melnyk: write the contribution of the second author choosing the relevant actions, but not limited to Conceptualization, Investigation, Methodology, Project administration, Software, Formal analysis, Writing – original draft, Supervision, Data curation, Validation, Writing – review and editing, Visualization.
Lyudmila Serova: write the contribution of the third author choosing the relevant actions, but not limited to Conceptualization, Investigation, Methodology, Project administration, Software, Formal analysis, Writing – original draft, Supervision, Data curation, Validation, Writing – review and editing, Visualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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The Process of Economic Transition from Central Planning to a Market Economy: The Former Soviet Union Countries vs China

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Abstract: *This paper discusses the starting economic, social and political conditions of market-oriented reforms in the former Soviet Union countries and Eastern Europe and compares those to China. In addition, the pace of reforms and their sequencing, as well as their economic and political determinants, are also analyzed. The chapter then proceeds to evaluate the results of reforms in economic and social terms and compares and contrasts the current economic systems in China and in the successor countries of the former USSR. Finally, differences between successor countries of the former USSR in their reform strategies and outcomes are also pointed out, concluding with the forthcoming economic and social challenges in China and successor countries of the former USSR.*

Keywords: economic transition experience; former Soviet Union; Eastern Europe; China.

JEL Classification: P27; P51; P52.

Introduction

This paper discusses the starting economic, social and political conditions of market-oriented reforms in the former Soviet Union countries and Eastern Europe and compares those to China. This is an important novelty, as this distinction is rarely pointed out in the literature and is thus emphasized here. In addition, the pace of reforms and their sequencing, as well as their economic and political determinants, are also analyzed from a contemporary perspective, thus providing an opportunity for more recent re-evaluation of past events. The paper then proceeds to evaluate the results of reforms in economic and social terms and compares and contrasts the current economic systems in China and in the successor countries of the former USSR. Finally, differences between successor countries of the former USSR in their reform strategies and outcomes are also pointed out, concluding with the forthcoming economic and social challenges in China and successor countries of the former USSR.

The Process of Economic Transition from Central Planning to a Market Economy. USSR vs China

The process of transition, or transformation-, from central planning to a market economy in the countries of Central and Eastern Europe and former Soviet Union (CEE/fSU) started in the 1980-90s. However, around that time, the two groups - China and CEE/fSU countries - were at different stages of development: Russia was already semi-developed, with well-developed education and healthcare system, and social security programs. More specifically, Russia started centrally planning after WWI: The initial plan (1918-21) failed, and caused famine, and massive resistance of peasants. Next, the New Economic Plan (NEP) introduced some market principles in agriculture and enterprise management, but Stalin's collectivization undid those positive effect: there were shortages, in some sectors, budget constrains were soft, and subsidies were extended to cover losses. In turn, that led to perverse incentives, and managers were always asking for subsidies. In addition, the collective property rights were bad for investment, and led to thefts and mismanagement. Overall, the system was not sustainable, and had to move to democracy, market-based economy, and macroeconomic equilibrium.

Furthermore, hard budget constraints had to be implemented, and prudent policies to be put in place, such as price liberalization, opening to trade, targeted welfare system, and privatization.

In contrast, China had a different experience before 1980s. China was in decline in the 30s, then Mao's collectivization policies (1958-59) led to another collapse; the cultural revolution 1966-71 was also devastating for the economy. After Mao's death, Deng Xiao Ping initiated a series of reforms in 1978: the household responsibility system, de-collectivization, dissolution of communes, turning land to private hands, and implementing dual pricing – which meant that some of the output was sold at pre-set prices, while the rest was sold on the market. This was very important, as agricultural output constituted more than 50% of the Chinese GDP. So, China had only started to industrialize in 1990, while Russia was already over-industrialized. Another stark contrast to Russia was that China had a labor reserve in rural areas, while this process has already been exhausted in Russia.

In addition, China kept its institutions during the process of transition, which added to the credibility of the economic reforms. On the other hand, there were no large political changes, as the Chinese Communist Party was very much against any major democratic reforms. In some way they were maybe right, as the democratic regime was viewed as weakening of the state. In hindsight, however, Stiglitz's advice to CEE/fSU countries in the 1990s to follow the Chinese gradualism approach was not correct, as China had a shock collectivization and industrialization earlier, which required radical de-collectivization later. As pointed by by Dabrowski (2014), there were 3 major differences in initial conditions: (1) the level of economic development and industrialization at the beginning of the transition; (2) social policy and social services, and (3) the difference in political environment. We will discuss each in turn.

At the start of the transition period 1989-91, most of the CEE/fSU countries had 20-50 times higher GDP per capita (in PPP constant $) than China in 1980, when the transition in China started (Dabrowski 2014, WDI 2023). The CEE/fSU countries were already middle-income countries, while China was lagging behind. Even in 1990, after 10 years of Chinese transition, China is significantly behind even the worst FSU/CEE country, and one-tenth that of Russia (Dabrowski, 2014). In terms of the structure of the industry, the state-owned industry was non-competitive in both China and CEE/fSU, but China was under industrialized, while CEE/fSU countries was already over-industrialized. Another important difference was that the latter were also overmilitarized: China's military spending was a mere 2.7 % of GDP, relative to that in Russia (17.5%), Romania (4.8%), Hungary (3.1%), Poland (1.9%), as quoted in Dabrowski (2014). Of course, that spending was at the expense of consumption and investment goods. The difference becomes even larger when one controls for the size of each country.

That was because in 1980, agriculture (based on manual labor) made the majority of Chinese GDP, while in CEE/fSU countries that was manufacturing, and agriculture was largely mechanized, but not effective, and very energy intensive. This higher energy intensity was just one of the examples of higher distortions present in CEE/fSU countries, as compared to China. Chinese labor productivity was low, but once the food supply for the nation has been secured, there was an army of labor that could be redirected to the urban areas, where the new plants were being built. In contrast, CEE/fSU countries were operating at zero unemployment, and enterprises were overstaffed; CEE/fSU countries were industrialized, but also collective. That made industry unproductive, and often the value of output was less than the value of inputs. It was then not a surprise that output declined in the initial years of transition, as those countries had to downsize, and lay off workers, who remained unemployed ever after. There was also use of old machinery, the plan did not account for replacement parts, for amortization, and that deliveries of spare parts did not arrive on time.

In contrast, China in the 1980s had already dissolved the communes, and Chinese agriculture was already private. This is very important, as private ownership utilizes the profit motive, and productivity improvement considerations, which are central in achieving economic growth. Thus, agricultural output in China increases (while it was collapsing in CEE/fSU), while there was less need for labor/employment, which led to the release of this surplus labor to urban areas. China used the surplus labor from agriculture for manufacturing, together with the high savings that were channeled into capital investment in the manufacturing sector. Such a self-financed model was not available in Europe, where CEE/fSU had to borrow/privatize to obtain modern capital in manufacturing. In addition, in China, it was easy to start a business initiative, mostly through a quasi-market arrangement (town enterprises), where the town set up an enterprise, but then left to the people to manage it in a market environment, based on market principles.

Another major difference between CEE/fSU countries and China was the huge differences in social policy and the provision of public goods. In China only public employees, or 20% of population, were eligible for a pension. This was also the case in CEE/fSU before the Communist regime took over, which forced a move towards a solidarity model, *e.g.*, a universal old-age pension has been in place since the 1950s. Same held for universal health insurance, and universal unemployment insurance, injury-at-work insurance, maternity leave, etc.

In other words, CEE/fSU countries had a social safety net that was very similar to that in Western Europe. However, when the state was doing the saving for the population, private saving rate decreased a lot. In contrast, China had a very high private saving rate, which was then used to finance the investment rate for the industrialization stage. In addition, the burden of social expenditure in China was low, while it was and too high in CEE. In addition, there was no or low social regulation in China. Lastly, health and education services in China were also poor.

On the political front, there were also major differences between CEE/fSU countries and China. In particular, in the last years of communism central governments in CEE/fSU were not able to use coercive force - overall, the command system was collapsing, there was widespread lack of discipline, theft, central plans were becoming quite unrealistic, managers were cooking the books, etc. In contrast, China was able to keep selectively certain parts of the command system (a planning bureau still exists to this day). In addition, the Chine Communist party is still the monopoly party in China, while in CEE/fSU countries the regime collapsed, and brought democracy. Overall, there was much higher demand for democratization, relative to China, where a potential democratic revolution in 1989 was suppressed by force by the Communist party. Those completely different political environments also determined the differences in the transition experiences of China vs CEE/fSU.

In CEE/FSU countries there was still need for unpopular structural reform – they had to cut spending, which was always resisted. There was also over-staffing in public enterprises, where the high wage bill at the expense of modern machines in hospitals and lack of PCs in schools. In addition, there was a demographic crisis, as many left once borders were open, while among those who remained, many were unwilling to have children during times of uncertainty. In addition, there was a huge economic cost of de-collectivization and restitution of land rights to previous private owners. Plot sizes were small to justify tractor purchase, neighbors did not trust one another to enter a new collective and buy jointly a tractor to be used by the whole village. There were no such problems in China.

Next, the CEE/fSU countries had to secure macroeconomic stability – again, it was easy for China, as there was no social contract, and no obligation for solidarity model implementation. On the other hand, building a market economy was not the option under the authoritarian regime; instead, planning offices were using complex math models to avoid the use of prices, or use "shadow" or administrative prices.

In China, the market model was introduced despite the presence of a Communist party, and at the cost of repression. Overall, gradualism worked for China, but was not an option (or was less promising in the "best scenario") for FSE due to government's inability of fine tuning – with the quick change of governments, with policy reversals (*e.g.*, in Bulgaria during the first years), with the lack of basic public goods like electricity (power cuts), bread, and toiletries. Due to the lack of petrol, governments could not provide law and order, there were bandits and racketeers, as well as mafia-like structures in the underworld. In addition, gradualism was the platform of market socialist parties, which were "reformed communists," or the third way – which ended up being a disappointing experience generally, as there was no clear path of reforms. The other, a radical approach ("shock therapy," or "cold turkey") called for comprehensive reform and irreversible move to a market economy. Indeed, 20 years after the transition started, fast reformers did better than gradualists: early reformers recovered the initial output loss earlier, implemented important structural reforms, liberalized prices and achieved macroeconomic equilibrium faster.

The Chinese experience was different, though. China went for very gradual reforms, with experiments at regional level, *e.g.*, the special economic zones that were established in the West regions, which attracted foreign direct investment, at the expense of the rural East which remained underdeveloped. This regional disparity is still present nowadays, while in CEE/fSU countries income distribution is much more equitable, and the prevalence of poverty is lower. In addition, China introduced dual pricing regime, under which enterprises also could send some output on market-based principles. This was until 84, followed by stage II of reforms (84-93), which included decentralization, regional leadership, regional market experiments. One such experiment was the township and village enterprises, where municipalities creating enterprises, but very quickly became quasi-private. Next, during 1993-05, China unified its exchange rate, introduced current account convertibility, liberalized trade, joined WTO, and implemented large-scale privatization of industry and financial sector. By 2005, it was an emerging economy, integrated with the rest of the world. However, it still had some capital controls, and also continues to subsidize the state banks and state enterprises. Furthermore, the relative laxity of fiscal and monetary policy led to the credit and real estate bubble. In addition, there was a public investment boom as a response to the recent financial crisis, which was a government policy to boost aggregate demand. As a result, investment in China reached 50% of GDP, and led to a lot of irrational projects being pursued and resulted in a lot of toxic assets in the financial system. Also, for a long time the world community protested against the intentionally under-

apppreciated Chinese currency renminbi (RMB), which allowed China to accumulate international reserves, which were invested in the US treasuries, and additionally fueled the crisis in the US in 2008.

The weak currency, and the low labor costs are behind the export led strategy followed by China, which is now the biggest world manufacturing exporter, and also due to the current-account surpluses – the biggest world creditor. As of 2010, more than 70% of Chinese GDP is from the private sector, and poverty has been massively reduced since the 1990s. Overall, macro equilibrium is achieved, but social programs are largely missing. In addition, the development of a middle class leads to an increase in labor costs, and the appreciation of the renminbi puts a break on export growth. In urban areas there is lack of space, which leads to spread of diseases (like with COVID-19), and air pollution is a problem due to the dirty production methods used in manufacturing. Lastly, there are problems with human rights (recent unrest in Hong Kong and Taiwan), the demographic crisis due to one child policy (which was recently abolished) – all put a break on extensive growth, growth rates start to decrease, and there are no more labor reserves.

By 2000, the transition was largely completed, with the majority of output (60-80% GDP) being produced in the private sector in most of the countries. [Notable exception are Uzbekistan (45%), Turkmenistan (25%), and Belarus (20 %).] Most of those countries are open for trade and financial flows. Still, some market distortions still persist, and there are governance issues with the rule of law and the quality of the institutions, namely non-banking financial sector, infrastructure, competition policies, enterprise restructuring, and enforcement of property rights. Overall, fast (early) reformers outperform gradualists, and early reformers recovered faster from the initial output drop in the 1990s. Next, sequencing, timing and pacing of reforms were crucial: macro-stability was achieved fast, while liberalization can be gradual. Inflation was put under control, thanks to the prudent fiscal policy has been put in place, and the implementation of hard budget constraints, rapid and *en masse* privatization, deregulations for new firms, restitution of land. Externally, the Balance-of-Payments was put under control, often with the help of the stabilization programs of IMF, structural loans from World Bank, accession to WTO. The EU accession brought economic growth through trade integration. All those were complemented by the global boom until the financial crisis (2008-10), and there has been a delayed recovery afterwards, which showed the need for more integration, improve business climate and governance. At the same time, targeted welfare programs need to be in place to support the socially weak layers of the population. To this day, West Balkans and CIS countries are still problematic, as well as Ukraine and Belarus. Russia has regressed substantially, due to the volatile oil prices, and the inflationary pressures. As a group, the CEE/fSU counties have increase in importance, but their total output still makes less than 10 percent of global GDP, and 3 % is due to Russian oil, followed by Poland with 2.9% (Dabrowski 2014). Only time will tell if this trend will continue in the future.

Conclusions and Further Research

This paper aimed to reignite the discussion on the starting economic, social and political conditions of market-oriented reforms in the former Soviet Union countries and Eastern Europe in comparison to those in China. This is an important contribution, as this distinction in the stage of development is rarely pointed out in the literature, and was thus particularly emphasized here. In addition, the pace of reforms and their sequencing, as well as their economic and political determinants, were also analyzed from a contemporary perspective, giving the readers another opportunity to re-evaluate and reflect on those past events. The paper then proceeded to assess the results of reforms in economic and social terms and compared and contrasted the current economic systems in China and in the successor countries of the former USSR. Finally, differences between successor countries of the former USSR in their reform strategies and outcomes were also pointed out, concluding with the forthcoming economic and social challenges in China and successor countries of the former USSR. Clearly, there is much need for further research work to be done on those issues.

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Credit Authorship Contribution Statement

Aleksandar Vasilev: Conceptualization, Investigation, Methodology, Project administration, Writing – original draft, review and editing.

Declaration of Competing Interest

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G. Boole, Not J. M. Keynes, Is the Founder of the Logical Approach to Probability

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Abstract: *A fundamental and basic error committed by all economists and philosophers doing work on Keynes is their failure to realize that the original, logical theory of probability, with the consequent emphasis placed on relational, propositional logic, imprecise probability and interval valued approaches to decision making, was developed by George Boole and not by J. M. Keynes.*

All one needs to do is read chapters I, II and X to XVII of Keynes's 1921 A Treatise on Probability and compare Keynes's chapters with chapters I, XI, XII and XVI to XXI of Boole's The Laws of Thought. A shorter route to this conclusion is to skip all but chapter I of Boole and compare it with chapter I of Keynes. Why no social scientist, behavioral scientist, economist, or philosopher has been able to do this simple task is a question that needs to be investigated by psychologists and psychiatrists looking for problems related to cognitive dissonance.

A careful reader of chapters I and II of Keynes's A Treatise on Probability will soon realize that Keynes is talking explicitly about Boole's logical, objective, probability relation. This relation has absolutely nothing to do with Plato's theory of forms. How do we come to know this relationship? Boole states that we come to know this relationship through both observation (empirical) and reflection (intuition or perception).

This paper shows that there is a deep Boole-Keynes connection that has been overlooked in the literature on Keynes. Keynes built his logical theory of probability on Boole. One can extend Hishiyama's 1969 conjecture, about Keynes's A Treatise on Probability not having been read by any economist, to also conclude that Boole's The Laws of Thought was not read by any other economist except Keynes.

Introduction

The paper will be organized in the following manner. Section One, the Literature Review, will examine the work of George Boole. Section Two, Method (Part I), will examine the writings of an economist., R. M. O'Donnell (1989, 1990, 2004a, 2004b) who has completely overlooked Boole's (1854) contribution. We will examine O'Donnell's claims about this question of Boole's priority over Keynes concerning the credit for the founding of the logical theory of probability. Section Two, Method (Part II) will examine the writings of a philosopher, D. Rowbottom (2008, 2018) on this same issue. Section Three, Research Results, covers the issue of why Boole's and Keynes's works were not covered by economists and philosophers. Section Four, Discussions, will reiterate Hishiyama's 1969 conclusion, based on his assessment and evaluation of the issue of the relevance of Keynes's new logic of uncertainty (1921, 1973) for his later writings, such as the *General Theory*, that Keynes's *A Treatise on Probability* had never been read. The Conclusion will end the paper.

1. Literature Review: Boole's Laws of Thought

In 1854, Boole demonstrated that there was a dual nature concerning the concept of probability involving both mathematics and logic. Boole was the first to notice that the standard mathematical laws of the calculus of probability (disjunction, conjunction, complementarity) were directly related to the logical operators in his relational, propositional logic- "or" (union of probabilities), "and" (joint probability) and "not" (complementarity). Boole substituted propositions about events or outcomes for the events or outcomes themselves. He carefully discussed the role of premises, conclusions, arguments, true and false propositions, primary and secondary propositions, as well as direct and indirect knowledge. This then led in chapters XVI to XXI to his application of his relational, propositional, formal logic of probability, the specification of probability as being a logical relation connecting premises containing evidence to conclusions using conditional if-then statements and bi-conditional statements, using if -and -only -if. Boole also assigned priority in his study of probability as involving dual mathematical and logical conceptualizations, but with logical considerations coming first and mathematics (quantification by numbers) being relegated to coming second:

"The general doctrine and method of Logic above explained form also the basis of a theory and corresponding method of Probabilities. Accordingly, the development of such a theory and method, upon the above principles, will constitute a distinct object of the present treatise." (Boole 1854, p.8).

Boole's assessment above leads him to the following conclusion:

"The ground of this necessity of a prior method in Logic, as the basis of a theory of Probabilities, may be stated in a few words. Before we can determine the mode in which the expected frequency of occurrence of a particular event is dependent upon the known frequency of occurrence of any other events, we must be acquainted with the mutual dependence of the events themselves.
Speaking technically, we must be able to express the event whose probability is sought, as a function of the events whose probabilities are given. Now this explicit determination belongs in all instances to the department of Logic. Probability, however, in its mathematical acceptance, admits of numerical measurement.
Hence the subject of Probabilities belongs equally to the science of Number and to that of Logic. In recognizing the co-ordinate existence of both these elements, the present treatise differs from all previous ones; and as this difference not only affects the question of the possibility of the solution of problems in a large number of instances, but also introduces new and important elements into the solutions obtained…" (Boole, p.13)

This results in the following conclusion:

"In the first place it is always possible, by the preliminary method of the Calculus of Logic, to express the event whose probability is sought as a logical function of the events whose probabilities are given." (Boole, p.15)

This then leads to Boole's specification of a logical relation of probability involving "…reflection" on the part of the decision maker regarding the nature of the connection of the premises to the conclusion:
"General reasoning would verify this conclusion; but general reasoning would not usually avail to disentangle the complicated web events and circumstances from which the solution above described must be evolved. The attainment of this object constitutes the first step towards the complete solution of the question I proposed. It is to be noted that thus far the process of solution is logical, i. e. conducted by symbols of logical significance, and resulting in an equation interpretable into a proposition. Let this result be termed the final logical equation.
The second step of the process deserves attentive remark. From the final logical equation to which the previous step has conducted us, are deduced, by inspection, a series of algebraic equations implicitly involving the complete solution of the problem proposed. Of the mode in which this transition is effected let it suffice to say, that there exists a definite relation between the laws by which the probabilities of events are expressed as algebraic functions of the probabilities of other events upon which they depend, and the laws by which the logical connexion of the events is itself expressed. This relation, like the other coincidences of formal law which have been referred to, is not founded upon hypothesis, but is made known to us by observation (I.4), and reflection." (Boole, p.16).
We can extend our discussion about Keynes's book never having been read to reach the same conclusion with regards to Boole's *The Laws of Thought*. Boole's 1854 book has never been read by any social scientist, economist or philosopher involved in the study of Keynes's *A Treatise on Probability*. That Keynes was

using Boole's formal, symbolic, mathematical, relational, propositional logic in the *A Treatise on Probability* has still not been recognized by any 20th or 21st century economist or philosopher.

Reading Boole allows a reader to realize that Keynes' s logical, objective, probability relations are identical to Boole's logical, objective, probability relations. There are thus no such things as Platonic logical probability relations in either Boole's The Laws of Thought or Keynes's A Treatise on Probability. The universal misbelief that Keynes was relying on Plato, who is never mentioned or cited by Keynes anywhere in the A Treatise on Probability, was due to the failure of academicians to understand that Keynes's Boolean, relational, propositional logic is a formal, mathematical, symbolic logic that would take a great deal of substantial effort to understand on their part. No economist or philosopher made the required effort.

The Carabelli - Dow (Carabelli, 1988 p. 23; Carabelli, 2003; Dow, 2012, p.2) conclusion claims that Keynes's logic was only a common sense, discourse logic written out in the English language. There exists no such logic anywhere in Keynes 's *A Treatise on Probability*, just as Ramsey's Axiom I (Ramsey 1922, p.3; Ramsey 1928), upon which Ramsey claimed that Keynes's logical approach was based, appears nowhere on any pages in Keynes's A Treatise on Probability.

2. Method (Part I) - on R. O'Donnell 's Erroneous Attribution of Boole's Achievements to Keynes

Consider the following statement made by O'Donnell (1989):

"The main concern of the TP, however, was logic rather than epistemology. Its basic objective was to solve the puzzle of rational but non-conclusive argument - to analyze and justify the innumerable arguments in science, daily life and elsewhere which are believed to be rational in some sense, but which are not deductively conclusive. Keynes's solution was to bring this family of argument under the sway of logic by making the theory of probability synonymous with the theory of logic. Probability then became the general theory of logic, dealing with the logical relationships between virtually any pair of propositions, and containing the traditional deductive logic as a special case. The natural vehicle for this project was a logical conception of probability in which probability was concerned with logical relations between propositions, the typical case being that of an argument in which the premises lend only partial support to the conclusion. Keynes referred to these relations of partial support or entailment between propositions as probability-relations and made the additional claim that such relations expressed the degrees of rational belief that individuals were warranted in placing in the conclusions of such arguments.

Nevertheless, epistemology was indispensable to Keynes's logical project for it was necessary to explain how individuals came to know these probability-relations and degrees of rational belief. But although required to take up an epistemological position, Keynes displayed markedly different attitudes to the two disciplines. While generally confident on matters of logic, he expressed hesitancy in regard to epistemology, viewing it as a 'disordered and undeveloped' area of philosophy (292)." (O'Donnell 1989, 334-335).

There are two errors that need to be corrected here. The first error comes from O'Donnell's acceptance of Ramsey's false definitions, contained in his reviews of Keynes's logical theory of probability in 1922 and 1926, as being applicable" to any two propositions." (Ramsey 1922, 3; Ramsey 1928, 27). This is, of course, Ramsey's non -existent Axiom I, which Ramsey claimed Keynes's logical theory of probability was based on and which he had shown was false. O'Donnell thus accepts an Axiom I that existed only in Ramsey's imagination.

O'Donnell states that Keynes's theory was about "…dealing with the logical relationships between virtually any pair of propositions…" (O'Donnell 1990, 334; see O'Donnell 1989, 23, 34, and 40 for similar errors).

Keynes's theory deals with those sets of propositions which are related/relevant/similar to other sets of propositions only. It is not restricted to pairs of propositions.

The second error made by O'Donnell is O'Donnell's claim that Keynes was "… making the theory of probability synonymous with the theory of logic. "They are not synonymous since logic forms the foundation for Keynes's theory of probability. Logic came first and probability came second for both Boole and Keynes as regards probability.

The rest of O'Donnell's statement about what Keynes accomplished is, in fact, an excellent statement summarizing what George Boole first accomplished in 1854, 67 years before Keynes's book was published. Thus, where ever Keynes's name appears in O'Donnell's discussion, it must be replaced with Boole's name. O'Donnell has never mentioned G. Boole in any of his work that commenced in 1978. Neither has any other of Misak's (2020) so called" Keynes scholars." (See Bateman 1987, 1989, 1990, 1992, 2016, 2021, Blackburn 2021; Carabelli 1988, 2003; Dow 2012; Davis 1994; Gerrard 2023; Good 1962; Hacking 1980; Mellor 1983; Monk 1991; Runde 1994; Russell 1922; Skidelsky 1992; Wheeler 2012; Wilson 1923; Zabell 1991; Zabell 2005).

The question then becomes what was it that Keynes did? What Keynes did was to advance the Boolean research program much further than where it was at the time of Boole's premature death at the age of 49. After Keynes, Hailperin (1965) advanced this research program further in 1986. That is where the current state of Keynes's logical theory currently resides.

2. Method (Part II) - on D. Rowbottom 's Erroneous Attribution of Boole's Achievements to Keynes

Consider Rowbottom's (2008, 2018) assessment of the logical theory of probability in 2008 and 2018 below. First, consider Rowbottom's belief that Keynes was "…the architect of the logical interpretation, used 'logical relations'" (Rowbottom 2018, 419). This is simply erroneous. Boole, not Keynes, was the architect of the logical theory of probability. It was Boole, not Keynes, who developed the concept of logical relations. Keynes simply applied and then further developed Boole's original system.

Second, consider what Rowbottom's severe and serious misinterpretation of what is implied by the use of the Boolean-Keynesian concept of logical relations:

"According to Keynes (1921), probabilities are objective in a Platonic sense, and consist of relations that subsist between propositions {qua abstract entities); …Yet one is supposed to be capable of grasping some of these relations, at least, by intuition alone…So Keynes has the view that 'degrees of rational belief map onto 'objective and logical relations', but this is not an identity claim. On the contrary, there are relations between non-spatiotemporal entities (namely propositions) which are 'out there', and which one is obliged to 'spot', so to speak, if one is to arrive at rational judgement." (Rowbottom 2008, 336-337).

This assessment has nothing to do with any of Keynes's analysis of rational judgment or with Boole's logical relations that connect the premises and conclusions of an argument. Rowbottom's failure, as is the case with all other writers on Keynes's logical theory of probability for over 100 years, to grasp the Boole-Keynes connection, led him to substitute the metaphysical and nebulous 'platonic relations' of Plato, Platonism, and Neo-Platonism among entities for Boole's relational, propositional, formal, symbolic logic, which is what Keynes used throughout the A *Treatise on Probability* (1921, TP). Boole's *The Laws of Thought*, and not Plato, Moore, Locke, Leibnitz, Von Kries, Wittgenstein, Russell, etc., is the major foundation for Keynes's logical theory of probability.

Until this is recognized, there is no chance of any future progress being made in the further development and application of the Boole-Keynes system of decision making under uncertainty for the rest of the 21st century.

3. Research Results

Academicians are unable to make correct assessments of Keynes's work because they (a) have not read Keynes's TP (Hishiyama 1969) and /or (b) they lack any understanding of Keynes's reliance throughout the TP on the original work done by [8] through his relational, propositional logic. I can find no careful and researched discussion of the Boole - Keynes logical connection except for (Hailperin 1965 and Brady 2004a, 2004b, 2022, 2012) in the 20th and 21st centuries.

The main reason for the failure of the economics and philosophy professions to grasp Keynes's TP is the severe error of assuming that Ramsey had proven Keynes's TP to be logically flawed because it was based on an Axiom I that Ramsey supposedly proved to be false. In fact, there is no such axiom anywhere in Keynes's *A Treatise on Probability* or anywhere in any other publication of Keynes. In fact, Ramsey's reviews of Keynes are full of so many errors that they must be viewed as the lack of any substantial knowledge on Ramsey's part. Ramsey, an 18-year-old university student just out of high school, never understood (a) what Boole's relational, propositional logic consisted of or how Keynes was applying it continuously throughout his book, and (b) what the required logical relation, existing between a premise and a conclusion, entailed. Ramsey's work is simply not a scholarly contribution to the literature on Keynes and the logical theory of probability. Ramsey fails to provide even one reason for rejecting Keynes's logical theory of probability in either of his two reviews.

4. Discussions

This state of affairs has been going on now for over 100 years. It is time for this intellectual fiasco to be ended. Keynes did not accept Ramsey's critiques because of the immense number of errors contained in them. For instance, Keynes is 180 degrees in the opposite direction from Ramsey concerning the use of mathematical expectations to base decisions on. Keynes emphasized degrees of rational belief. Ramsey emphasized degrees of belief (actual beliefs). There simply is no agreement possible between the two in the same way that there was no agreement possible between J. Tinbergen and Keynes. Keynes was committed to the use of imprecise probability both in theory and application. Ramsey and Tinbergen are committed to different theories of precise probability (subjective and frequentist, respectively) both in theory and application. Neither Ramsey nor

Tinbergen had the slightest inkling that Keynes's position was one of imprecise probability expressed through the method of interval valued probability that was based on the original work of G. Boole. This same situation exists today as regards C. Misak's "Keynes scholars". None of them has any inkling that Keynes's position follows directly from Boole's original, foundational thought that involves a relational, propositional logic that is then combined with an interval valued approach to probability. Boole provided Keynes with a method of logical analysis and a way of operationally quantifying decision situations of partial information or knowledge and partial ignorance, which was Keynes's definition of uncertainty. Keynes basically based Part II of his TP on chapters XVI-XXI of Boole's *The Laws of Thought*. This Boolean foundation then appears in chapters X to XVII, XX and XXII of Keynes's A *Treatise on Probability*.

Conclusions

Keynes's rational degrees of belief are not mysterious or mystical, Platonic entities, concepts, forms or relations that have to be intuited in order to make a probabilistic analysis or estimate probabilities. They are no different than Boole's logical, probability relations, relations that must exist between related propositions for any conclusion to be derived.

Thus, Keynes's rational degrees of belief follow directly from the application by Keynes of G. Boole's relational, propositional logic, which requires that there be a logical connection between the premises and conclusions provided by a logical relation. Boole's formal, symbolic, mathematical logic is the foundation for Keynes's work in Keynes (1921, 1973).

Of course, Keynes's ethical outlook and ethical foundation is based on a Platonic-Aristotelian mixture that is based directly on Moore's version of Virtue Ethics .Moore presented his version of Virtue ethics in his 1903 *Principi*a *Ethica*, of which chapter six attracted Keynes's interest .However, nowhere in Keynes (1921, 1973) does Keynes mention Plato, Platonism, Platonic, metaphysical relations, probabilities as being Platonic entities that have to be intuited in order to understand their essence, Plato's theory of Forms, or Neo Platonism.

It was the severely erroneous claims of F P Ramsey, where Keynes's Boolean, logical relations between the premises and conclusions were characterized by Ramsey as being "…Mr. Keynes's mysterious logical relations", that has led practically all economists and philosopher doing work on Keynes's logical theory of probability astray. Ramsey simply had no idea what he was talking about. Attempting to find some type of positive reaction on Keynes's part to Ramsey's many erroneous characterizations of Keynes's work can only occur because the so-called Keynes scholars read into Keynes's work assessments that are nonexistent, such as supporting Ramsey's claims about an "…Axiom I…" that never existed anywhere in any of Keynes's work on probability except in Ramsey's mind.

No progress can be made in Keynes studies until it is recognized that Keynes's theory is one of imprecise probability, which was based on Boole's original, imprecise interval valued approach to probability, and has nothing to do with any notion of ordinal probability.

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Declaration of Competing Interest

The author declares that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Did the Economic Reforms Change the Macroeconomic Drivers of the Indian Economy in the Post-Reform Era? An ARDL Bounds Test Approach

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Abstract: *Purpose: The purpose of this study is to investigate the macroeconomic forces that have been driving the Indian economy during both the pre-reform and post-reform eras, that is, from 1950-1951 to 1990-1991 and from 1991-1992 to 2022-2023 respectively.*

Problem: The Indian economy underwent significant economic and financial sector reforms in 1991-92, with the goal of reviving its stagnant growth. These reforms are intended to spur the economic growth of India. What were the main forces behind the Indian economy before and after the reforms? Is the research question. The goal of the current study is to determine if the economic reforms shifted or maintained the pre-reform era's driving forces for the Indian economy in the post-reform era.

Design/Methodology/Approach: The gross domestic product (GDP), the gross domestic savings (GDS), the private consumption expenditure (PFCE), the government final consumption expenditure (GFCE), the inflation rate, the exchange rate, the exports, the imports, the internal and external borrowings of the government, personal remittances, foreign direct investment (FDI), and foreign portfolio investments (FPI) are all taken into consideration in order to fill the research gap that has been identified as a result of the comprehensive review of the literature. Following an analysis of the selected variables' fundamental characteristics, an econometric model is developed using the Autoregressive Distributed Lag (ARDL) Bounds Test Model.

Findings: There is no evidence of long-run causation and association between the variables, but the findings of the ARDL Bounds Test showed that in the pre-reform period, PFCE is the major driver of the GDP in the short-run, with strong support from imports. However, since the reform, PFCE, GDS, and Exports are the primary short- and long-term contributors to GDP.

Practical Implication: These findings indicate that India's macroeconomic system is shifting. The Indian economy has undergone a dramatic shift, moving away from a reliance on imports and toward one that is consumer-driven and export-driven. As savings and consumer expenditures are the main drivers of the Indian

economy's growth in the post-reform era, policies should be designed to increase savings and consumption as well as increase exports.

Keywords: economic growth; domestic savings; private consumption expenditure; government consumption expenditure; inflation.

JEL Classification: O11; P52; P41.

Introduction

Due to a severe economic and financial crisis, the Indian economy experienced significant shifts in the year 1991-92. The period known as the pre-reform period began with the declaration of the Independence and ended with the year that economic reforms were put into effect (1950-51 to 1991-92). The post reform period followed the implementation of the reforms (from 1991-92 to 2022-23). The Indian economy transitioned from a controlled state economy (1950-51 to 1991-92) to one that was heavily influenced by the market forces (1991-92 to 2022-23).

Following the independence, the Indian economy underwent structural changes. The Indian economy is set up to be mixed, with the public and private sectors coexisting. Increasing employment opportunities, industrialization, reducing the income disparities and decentralization of economic power are the main objectives of India's economic plans. various strategies were followed by the Planning Commission of India during the pre-reform period to achieve these objectives.

During this pre-reform period, the government was heavily involved in economic development and planning. To boost the country's economic performance, Indian policymakers instituted the Green Revolution (1960-70), which was farmers try to raise agricultural productivity by introducing high-yielding varieties of seeds, modern farming methods and better irrigation. To promote economic growth and provide financial services to the rural community, the Indian government nationalized banks in two phases. Along with establishing numerous industrial plans, India's economic planners also conducted several poverty alleviation programs to alleviate socioeconomic inequalities and provide the groundwork for the country's capital goods industry.

The Indian economy encountered several difficulties and setbacks throughout this period. Before the reforms, the country's GDP growth rate was relatively modest, averaging three to four percent annually. Inefficiencies and a lack of competition were caused by aggressive government intervention and control over many industries. Key industries were controlled by the public sector, which resulted in red tape, corruption, and poor performance. India implemented an Import Substitution Industrialization (ISI) strategy, emphasizing homegrown manufacturing of goods to reduce dependence on imports. Nevertheless, this approach frequently contributed to manufacturing of inferior goods, inefficiencies, and a loss of competition in the global marketplace. The country was struggling with a long-term imbalance in trade and falling foreign exchange reserves. The rupee's overvaluation was an aspect in this issue. Persistent high rates of inflation reduced people's purchasing power and endangered the resilience of the economy as a whole. The government's policies of funding deficit often made inflationary pressures worse. Both the growth of industry and the development of the economy were hindered by a lack of infrastructure, including electricity shortages, inadequate transportation, and an absence of modern services. Strict regulations and a great deal of bureaucratic red tape restricted the growth of companies and disappointed entrepreneurship. Investment was thwarted by the laborious procedure of obtaining licenses and approvals. Poverty and inequality persisted despite economic expansion. Due to the uneven distribution of the benefits of growth, there is a substantial disparity in wealth between different sections of the society.

India from the beginning depends on the mobilization of domestic savings especially from households and corporations to undertake capital projects. But unfortunately, due to vicious circles of poverty, a sufficient amount of savings could not be mobilized. Though the rate of domestic savings increased from 14 percent to 28 percent during the pre- and post- reform periods it is not sufficient when compared to international standards. Hence, the government of India started borrowing money from both internal and external sources. Since the savings are low, the internal borrowings are lesser than the external borrowings. India still depends on external borrowings heavily both in the pre- and post-reform period, but the nature of utilization of these borrowings has shifted. Government expenditure or public expenditure also plays an important role in the process of economic development of underdeveloped countries. Internal and external borrowings of the government form part of the government expenditure. The efficacy of the public debt can be judged based on the nature of the government spending, if the government spends the money on projects or programs that do not generate income and employment in the long run, then the very purpose of borrowing money will be wasted and that will create financial disturbances in the economy in the long-run. Recently, many economies have been characterized by

consumption-based economies rather than savings-based economies. Gross Domestic Product (GDP) is a key economic indicator that represents the total monetary value of all goods and services produced within a country's borders during a specific period, typically a year or a quarter. The most commonly used approach is Expenditure Approach to measure GDP. It measures GDP by adding up all the expenditures made within a country, which include consumption, investment, government spending, and net exports. GDP=C+I+G+ (Exports-Imports). C represents consumer spending, I represent Investment spending, and G represents government spending. The average private final consumption expenditure accounts for 80 percentage of GDP during the pre-reform era and it went down to an average of 60 percentages during the post-reform era. Private final consumption expenditure (PFCE) plays a critical role in improving the performance of the economy in both periods. India heavily depends on importing crude oil which is known as the engine of the economy and the payments are made in the US Dollars. The Balance of trade is severely affected by the changes in the crude oil prices and the exchange rates. In the process of economic growth of any economy, it is a natural phenomenon that imports are greater than exports since crude oil, technology, machinery, equipment, etc., are imported from other countries to lay foundation for the economic growth and India exports basic raw materials and agricultural products. The balance of trade has been always negative due to greater imports than exports and the devaluation of the Indian currency against the US Dollar.

To improve the state of the economy and get over the enduring socioeconomic problems, such as the serious balance of payments crisis, declining foreign exchange reserves, mounting levels of external debt, and slower growth in the economy, the Indian government proclaimed a structural shift in the economy under the guise of globalization, privatization, and liberalization. The main driving forces that have shaped the economy since then including welcoming international corporations into the country, integrating the domestic economic and financial sectors with the rest of the world.   Both foreign direct investment and foreign portfolio investments started coming to the Indian economy as a result of globalization. FDI is a long-term investment and has a long-lasting impact on the economy as portfolio investment from overseas is highly volatile and creates economic shocks. India received Rs. 39,63,879 Crore of FDI and Rs.13,67,625 Crore of FPI during the post-reform period. When migrants send home part of their earnings in the form of either cash or goods to support their families, these transfers are known as workers' or migrants' remittances. They have been growing rapidly in the past few years and now represent one of the biggest sources of foreign income for many developing countries. Personal remittances include personal transfers and compensation of the employees. Personal transfers consist of all current transfers in cash or in kind made or received by resident households to or from non-resident households. India is one of the world's largest recipients of remittances and received USD 87 Billion during the year 2020-21, and out of these 20 percentages of remittances are coming from the US as per the World Bank reports. Remittances flows tend to be more stable than foreign capital flows, and they also tend to be countercyclical – increasing during the economic downturn or after a natural disaster in the migrants' home countries. More recently remittances proved to be resilient during the financial crisis in source countries such as the US or western EU. Before the era of globalization, which can be roughly considered as before the 1990s in the case of India, the movement of people across borders was relatively limited. Remittances during this period were typically sent by Indians working in countries with historical ties, such as the Middle East, the United Kingdom, and other Commonwealth nations. During this time, remittances were significant but not as large as they became in the post-globalization era. The process of sending and receiving remittances was often more cumbersome, involving traditional banking channels and paperwork. However, these remittances played a crucial role in supporting families and sometimes even had an impact on local economies. With the advent of globalization, labor migration from India to several nations throughout the world increased significantly. For Indian workers looking for better employment possibilities, the Gulf nations, the United States, Canada, and other industrialized countries were important destinations. Remittances significantly increased as a result of this growth in labor mobility.

Since 1991–1992, these reforms have been a turning point in India's economic trajectory. Although they brought about some difficulties and adjustments, they ultimately helped to promote more economic expansion, more foreign capital inflows, and a more interconnected global economy. By focusing on the important macroeconomic factors, this research aimed to explore the primary economic forces that shaped the economy before and after the reform.

1. Literature Review

A. Theoretical Evidence

Economists developed a variety of growth models in the post-World War-II period and countries adopted different economic models which suited their socioeconomic conditions to enhance the economic growth process. For the classical economists from Adam Smith, and notably, Ricardo, Marx, and Malthus understanding the process of economic growth and what determines then rate of growth is a central issue in development economics (Stern 1991). According to the neo-classical theory of economic growth (Solow 1956), economies will expand more quickly in nations with higher savings rates and lower population growth rates (N.Gregory Mankiw, David Romer, 1992).

Financial resources play a paradigm role in the economic development of any nation. At the early stage of economic development, domestic savings are the major source for driving the economy (Kuznets 1955), and sourcing financial resources internally by mobilizing the savings of the various sectors of the economy for economic development has been propounded by Harrod (1939) - Domar (1946). The reason behind giving top priority to domestic savings for economic development is the policymakers believed that economic growth achieved with domestic savings is more sustainable than the growth that is achieved through borrowed capital (Patra *et al.* 2017a). Higher savings lead to higher investment which in turn will increase real output and employment (Lewis W.A. 1954). But the domestic savings again will depend on economic growth and other macroeconomic factors, hence without achieving a sufficient amount of economic growth, it is not possible to enhance the domestic savings which will again lead the economic growth. During the pre-reform era, the average rate of domestic savings was 14 percent of the GDP which was not sufficient to encourage economic growth. Poverty and unemployment discouraged domestic savings during this period (Martin Muhleisen 1997). When governments fail to meet their growth needs, they are obliged to welcome financial assistance mostly from the external sector (Dey and Tareque 2020). Borrowings by the government either from inside or outside the nation is another important source of money for economic development which is known as external or internal public debt. Too much public debt reduces economic growth performance. The external borrowings should be used for long-term growth and create employment opportunities, on the contrary, if this debt is used for non-growth purposes, it will create fiscal imbalances and the country will be vulnerable to external shocks and crisis (Poirson 1998; Gazi M Hassan and Mark J Holmes 2013). The average public debt was around 37 percentage of the gross domestic product of India during the pre-reform period which was used mainly for poverty alleviation and non-capital expenditure purpose and hence the public debt could not achieve its targeted purpose.

Poor countries with sound economic policies benefit directly from the policies and in this environment, foreign aid accelerates growth (Dollar 2014). Most underdeveloped countries depend heavily on external resources to increase their per capita income (Hollis B Chenery 1966). In case the domestic resources fall short of what has to be raised, it is rational to seek foreign aid from foreign sources. The implication is that foreign aid positively contributes to the economic growth of many developing countries (Hollis B Chenery 1966).

Apart from domestic and external finance, another important macroeconomic driver is the Government Final Consumption Expenditure (GFCE), and the relationship between GFCE and GDP has received much attention in recent years as economists and politicians try to figure out how government spending affects the growth of an economy (Segun and O. A. 2015). Empirical studies revealed that government expenditure has been rising across economies and across times but this increase has not produced the same effect across time and regions leading to doubt as to the efficacy and potency of the Keynesian fiscal policy as a veritable instrument of economic stabilization (Matthew and Dada 2013). The government undertakes expenditures to pursue a variety of goals, one of which may be an increase in per-capita income (Devarajan *et al.* 1996). The efficiency of government expenditure can be judged when these resources are utilized to the maximum extent and this public expenditure is more effective in promoting economic growth when these resources are secured from external sources (Kimaro *et al.* 2017). In the case of developing economies like India, government spending tends to diminish economic growth since the majority of public projects rely on the importation of technology and other compulsory resources (Prasetyo and Zuhdi 2013). The share of imports out of the public expenditure during the pre-reform period was around 87 percent and it increased to 213 percentage during the post-reform era. A striking feature of the recent economic development of many countries is that government investment plays a relatively minor role (Kharroubi and Kohlscheen 2017).

Apart from Public spending, private consumption expenditure also plays a key role in Keynesian economics and the relationship between private consumption expenditure and GDP has been the focus of much research in economics (Hong and Seng 2019). As such, Keynes (1936) argues that changes in aggregate private

consumption are caused primarily by changes in the current real national income. Keynes suggested that individuals tend to increase consumption as their income increases, but to a lesser extent and the modern economies are developing to a greater extent of modernization and the standard of living is rising, the levels of consumption and income increase (Deacon and Maha 2015). GDP growth has increasingly been led by consumption and private consumption has been one of the key drivers of demand growth in the past few years in many economies (Kharroubi and Kohlscheen 2017).

Among all the macroeconomic variables, International trade has a great role in the process of reaching desired economic growth (Ezzaher *et al.* 2022). Trade liberalization is a prerequisite to a transition from relatively closed to relatively open economies (Pradeep Agarwal 2014). It has been widely argued that public debt can stimulate aggregate demand and have a positive growth effect in the short-run and this public debt crowds out private investment and deteriorates economic performance in the long run (Calderón and Fuentes 2013). Neoclassical economists have observed since the 1960s that tax hikes to pay for interest on the nation's rising domestic and international government debt harm gross capital stock formation (Peter A. Diamond*, 1965).

As noted by Alfaro and Charlton (1996), Borensztein, E., De Gregorio J. (1998), Hirschman A. (1958), the rate of growth of a lower-income country depends on the extent to which this country adopts and implements advanced technologies applied in higher-income countries. FDI by multinational corporations based in higher-income countries is considered a major mechanism through which lower-income countries may access advanced technologies (Findlay 1978). FDI is widely regarded as a composite bundle of capital inflows, knowledge, and technology transfers. FDI can promote growth through productivity gains resulting from spillovers to local firms (Balasubramanyam 1996). The nexus between FDI and economic growth has remained vexing and inconclusive in the history of pre and post-liberalization studies of development economics (Jana *et al.* 2019). FDI and economic growth relationship cannot be generalized mainly because it is highly subject to alteration with changing institutional, policy, and regulatory environment (Herzer *et al.* 2008). The relationship between inflation and economic growth in developing countries is a subject on which there are still very wide differences of opinions (Wai 1959) The economists believe that appropriate rate of inflation is essential for economic growth, whereas the monetarists see inflation is detrimental to economic progress (Salian, n.d.) (Atigala *et al.* 2022).

B. Empirical Evidence

Patra *et al.* (2017b), Pravakar Sahoo (2016), Jangili (2011) investigated the relationship between the Gross Domestic Product and domestic savings and discovered a causal relationship that runs from GDP to domestic savings. Their findings are consistent with the idea that economic growth affects saving. However, Sinha and Sinha (1998) found that there is no causality between them. Verma (2015), Yadav *et al.* (2018) found that domestic savings strongly affect the gross domestic product and causality is directed from savings to growth. Besides increasing the savings, strengthening the financial markets which converts the savings into investments is advocated by Patra *et al.* (2017b), Seth *et al.* (2020). Bidirectional causality is found between domestic savings and economic growth (Hashmi and Sedai, 2016) and in their study savings are positively associated with GDP growth and quite opposite results are found in (Upendra M, 2007) which states that there is not relation between them.

Ahuja and Pandit (2020), Manoj Kumar DAS (2020), Devarajan *et al.* (1996) found that there is a unidirectional causality running from public expenditure to economic growth, and the results support the Keynesian framework that government expenditure stimulates economic growth, but the results (Landau 2013) showed that there is a negative association between government expenditure and economic growth. Export-led growth hypothesis (ELGH) has been proved in the result of (Pradeep Agarwal 2014) and causality is running from exports to economic growth during the post-reform period. Reddy (2020) found that both exports and imports increase economic growth in India. But in another study (Raghuramapatruni and Reddy 2020) exports are positively associated with economic growth while imports are negatively related to economic growth in India

Barik and Sahu (2022), Manik and Khan (2018) found that both internal and external debt has a significant negative effect on economic growth in India in the long run, but Singh (2018) found that the effect of domestic debt on economic growth in India is neutral which supports the Ricardian equivalence hypothesis. Rangarajan and Srivastava (2005) argued that recent growth has been negatively impacted by substantial structural primary deficits and interest payments relative to GDP. It is obvious that the ratio of total debt to GDP, which is currently above 80% of GDP, needs to be reduced and even (Bal and Rath 2014) results also supports that central government debt, total factor productivity growth and debt services are affecting the economic growth in the short-run.

Causality is running from GDP to FDI (Chakraborty and Mukherjee 2012) and the trade liberalization policy of the Indian government had some positive short-run impact on the FDI flows and quite opposite results are found in (V.Reddy Dondeti and Bindu B. Mohanty, 2007) where causality is running from FDI to GDP and the study confirmed that FDI promotes economic growth, but Real Effective Exchange Rate is negatively affecting FDI inflows (Manoj Kumar DAS, 2020). A one percent increase in FDI would result in a 0.07 percent increase in GDP in China and a 0.02 percent increase in Indian GDP (Agrawal and Khan 2011). This indicates that India is not able to take immediate advantage of the FDI in increasing the GP, but may become possible in the long run. FDI flows into India improved the total factor productivity growth through a positive spillover effect (Choi and Baek 2017). Sahoo and Sethi (2017) finds that in the long-run domestic investment has shown a significant positive impact on economic development whereas Official Development Aid (ODA), and FDI have shown a negative impact on the GDP of 14 countries. Government final consumption expenditure and foreign direct investments have a positive and significant impact on the economic growth and exchange rate and foreign aid harms economic growth (Manoj Kumar DAS, 2020). Inflation harms GDP in India (Salian, n.d.). Veni and Choudhury (2007) found in their results that economic growth and inflation are independent of each other. The oil prices, the wholesale price Index (WPI), Consumer Price Index (CPI) inflaiton rates and industrialization positively affect India's economic growth (Al Dulaimi 2022).

It is also found that energy use, trade, capital flows, labour, human capital development and FDI play a positive and significant impact on the economic growth of large economies including India (Rahman and Alam 2021). (Gulshan Farooq Bhar 2022) found that gross fixed capital formation rate, exports played a vital role in the economic growth of China, Japan, South Korea and India and suggested that improvement in technology, reduction in corruption are recognized for the benefit of growth and development. Gulshan Farooq Bhar (2022) indentified in their research that environmental sustainability, renewal energy practices and regulatory pressure and ecofriendly polcies and sustainable use of natural resources considered as green economic growth and environmental sustainability.

2. Research Gap

Reviewing the substantial amount of previous research work on the macroeconomic drivers of the Indian economy done in this field reveals that there is a significant knowledge gap in the outcome of the analysis, which means that the previous conclusions on the macroeconomic factors of India contradict one another. The vast majority of previous research has been centered on domestic savings, foreign direct investments, and their impact on economic growth. Based on the extensive review of past research work, apart from the above-mentioned variables, some other macroeconomic variables like Private Final Consumption Expenditure (PFCE), Government Final Consumption Expenditure (GFCE), Internal and external borrowings of the government, exchange rate, inflation rate, exports, imports, foreign portfolio investments, personal remittances also affect the performance of the Indian economy. However, previous research has given these factors the least amount of weight possible. There has been very little research done on the macroeconomic drivers of the Indian economy before and after the economic reforms to examine the changes in the drivers of the Indian economy during these two periods. As a consequence of this, the research in question makes use of voluminous macroeconomic data and divides the investigation into two parts, such as before and after the economic reforms, to investigate the possibility of a regime shift.

3. Research Objectives and Rationale of the Study

The purpose of this research paper as well as the motivation behind it, is to investigate the primary macroeconomic drivers of the Indian economy both before and after the implementation of the economic reforms in 1991 - 92. It is hypothesized that the economic reforms changed the macroeconomic drivers in the post-reform period. This research is being carried out to evaluate this notion. For the study, the 1950 - 51 to 1990 - 91 period is known as the pre-reform period, while the 1991 - 92 to 2022 - 23 period is known as the post-reform period.

4. Research Methodology

4.1. Variables and Data

The following macroeconomic variables have been identified based on the review of the literature and to address the research gap. Gross Domestic Product(GDP), Gross Domestic Savings (GDS), Government Final Consumption Expenditure (GFCE), Private Final Consumption Expenditure (PFCE), Government Internal Borrowings (Internal Debt), Government External Debt (ED), Exchange Rate (ER), Exports, Imports, Inflation

Rate are the hypothesized variables that drove the Indian economy during the pre-reform period and apart from the previously mentioned variables, Foreign Direct Investments (FDI), Foreign Portfolio Investments (FPI) and Personal Remittances Paid by India (PRP) are identified as other key drivers of the Indian economy during the post-reform era. Annual time series observations for these variables have been collected from the Economic Survey Reports, Handbook of Statistics of the Indian Economy, and Report on Currency and Finance of Reserve Bank of India (RBI).

4.2. Research Design

In light of the fact the data is related to the time series, an appropriate econometric model ought to be developed to conduct further research. To get a normal distribution for the data, the original values of all the variables are transformed into natural logarithm form. As a result, the prefix "differenced log" (DL) is added to the beginning of each variable such as DL GDP. To design a suitable econometric model, it is necessary to apply fundamental tests of features such as Normality, Autocorrelation, Homoscedasticity, and Multicollinearity. The data and the variables are cleaned according to the results of the tests that were run previously. A test of stationarity is carried out so that the Johansen Cointegration or Auto-Regressive Conditional Heteroscedasticity (ARDL) test can be selected. If all the variables are stationary in the same order either at the original data I (0) or at the first difference I (1), then the Johansen Cointegration test is the appropriate model. If, on the other hand, the variables are integrated in different orders, then the ARDL model should be used to investigate short-run and long-run association among the variables. ARDL Bounds test for long-run association and Error Correction Model for returning to the equilibrium or speed of adjustment is conducted after the ARDL Test. The Engle-Granger Causality test is conducted to understand the cause and effect among the variables. The target variable is Gross Domestic Product (DLGDP) which is used as a proxy for the measurement of the economic performance of a nation and the other variables are considered as independent variables for this study.

Not much study was done to identify the economic drivers during the two phases of the Indian economy's transition. Owing to the limited number of variables to examine and the identical intgration order, earlier studies used the Johansen cointegration test. The present research is novel in that it divides the period into two parts and incorporates significant macroeconomic variables that were considered in previous research. Because of this, the variables have different orders of integration, and the Autoregressive Distributed Lag (ARDL) Bounds Test is an appropriate cointegration test. The Autoregressive Distributed Lag (ARDL) Bounds test can be used to a larger set of variables under consideration. To provide more accurate inferences in finite samples, this ARDL Bounds Test uses critical values that are specific to the number of included lagged differences in the model. This model is less sensitive to the choice of lag length and is considered to be robust in the presence of structural breaks.

4.3 Econometric Model

ARDL Bounds Test Model:

$$\Delta Y_t = \left(\beta_0 + \sum_{i=1}^{p} \lambda_i \, \Delta Y_{t-i} + \sum_{i=0}^{q} \delta_i \, \Delta X_{t-i} \right) + (\; \varphi_1 Y_{t-1} + \varphi_2 X_{t-1} + \nu_t)$$

$$\text{Short-run equation} \qquad\qquad\qquad \text{long-run equation}$$

5. Research Results and Discussion

Conducting a test of normality on the grouped time series data is the very first thing that is done in the process of developing a suitable econometric model. If the p-value of the Jarque-bera test is not statistically significant, then the null hypothesis that the residuals have a normal distribution will be accepted. Both Figure 1 and Figure 2 demonstrate the aggregate data are normally distributed. Since the p-value (Pre-reform period 0.486653) (post-reform period 0.6111914) is statistically significant, the null hypothesis cannot be rejected rather it should be accepted. Breusch-Godfrey Serial Correlation test findings are shown in Table 2, and for both the pre- and post-reform periods, the probability value of the Chi-square is not statistically significant. Thus, it is not possible to rule out the null hypothesis that the residuals are not serially connected. Bruesch-Pagan-Godfrey Results of the heteroscedasticity test are displayed in Table 3. The p-value is statistically insignificant; hence the null hypothesis of the residuals is homoscedastic and cannot be rejected. The Variance Inflation Factor (VIF) test is conducted to check whether the independent variables are correlated with each other or not. If the calculated value of Centered VIF is lower than 10, then there exists no correlation and if is above 10 there is a correlation. The results of Centered VIF (Table 4) demonstrated that there is no correlation among the independent variables

during the pre-and post-reform periods., indicating that there is no Multicollinearity among the independent variables. Finally, the Ramsey RESET Model Specification test is conducted to understand the error specifications in the proposed model and the results are displayed in Table 5 which shows that the p-value of the F-statistic is not statistically significant indicating that the null hypothesis of no specification errors in the model should not be rejected.

To choose the suitable econometric model for analyzing the long-run and short-run causation, it is necessary to first determine whether the data variables are stationary or not for that the Augmented Dickey-Fuller (ADF) Test is applied, and the results are shown in Table 6 contains a summary of the ADF test results for each variable. The findings of the ADF Test demonstrated that some of the variables are stationary at the level I(0) and that the remaining variables are stationary after the first difference I(1). The ideal model in this situation is the Autoregressive Conditional Heteroscedasticity Test (ARDL) Test. Personal Remittances Received (DL PRR) is stationary at the second difference, hence it is deleted from the model.

The results of Autoregressive Conditional Heteroscedasticity (ARDL) and ARDL Bounds test for the pre- and post-reform period are displayed separately in Table 7.1 and Table 7.2. DL GDP is the dependent variable in both periods. Conditional Error Correction Regression results demonstrate the short-run association and Unrestricted Constant and No-trend results of the ARDL Bounds Test display the long-run association among the variables.

The conditional Error Correction Regression equation of the ARDL Bounds Test results (Table 8.1) demonstrates that the DLPFCE positively affects the GDP and one-year lagged GDP (GDP-1) negatively affects the current year DLGDP in the short-run. However, in the long run, none of the independent variables affect the DLGDP in any direction. For every one percent increase in DLPFCE, the DLGDP increased by 0.67 percent and vice versa, and for every one percent increase in the current year's DLGDP, the DLGDP of the subsequent year will be decreased by 1.16 percent and vice versa. The long-run association of the variables is analyzed with the Unrestricted Constant and No Trend equation of the ARDL Bounds Test. There is no evidence of long-run causality from any independent variable to the DLGDP as the p-values are not statistically significant. The long-run association of the selected variables is tested with the Bounds test. The calculated F-statistic (1.240) and T-statistic (-2.212) absolute values are lower than the lower bound I(0) values of F-statistic (2.14) and T-statistic (-2.86) values representing that there is no long-run association among the variables. When there is no long-run association among the variables, the Error Correction Mechanism need not be tested. The Engle-Granger causality test is conducted to study the direction of causality among the variables and the results (Table 9) show that there was a bidirectional causality between the DLGDP and DLGDS, but unidirectional causality running from DLPFCE to DLGDP.

It is important to note that this period was characterized by a mixed economy with a significant degree of government controls and regulations, which had both positive and negative consequences. Due to a lack of competition, inefficiencies in the public sectors, and rigid government policies, the growth rate was below 5%, and sometimes times Indian economy experienced a negative growth rate. As a result, the economy's overall growth rate was constrained. Inefficient public sector, bureaucratic red tape, trade barriers, subsidies and price controls, monetary policy issues, fiscal deficit, lack of incentives for innovations and new venture creations, low foreign investment, and agriculture dominance were the persisting issues that suppressed the economic growth rate during this period. The growth of the Indian economy primarily depended on imports during this period. pharmaceuticals and chemicals, food and agriculture products, consumer goods like electronics, automobiles, and luxury items, crude oil and petroleum products, and intermediate goods were the major imports during this period and these imports supported the private consumption expenditure and which drove the Indian economy in the short-run only. Vicious circles of poverty prevailed during this period. The Indian government pursued a policy of repressed inflation, which means that it kept prices artificially low for essential goods and services by regulating and controlling various sectors of the economy. This was done to maintain affordability for the masses but often led to demand outstripping supply, resulting in inflationary pressures building up, and inflation was imported from global markets. The Indian economy was not as open to the global markets as it is today, but fluctuations in global commodity prices, especially for oil, could still have a significant impact on domestic inflation. Finally, during this period, imports drive the economy through private consumption expenditure.

After that, the long-run and short-run causality among the variables is tested for the post-reform period by taking the DLGDP as the dependent and others are independent variables, and the results are displayed in Table 8.2. The short-run causality from the independent variables to the dependent variables can be analyzed with Conditional Error Correction Regression equation of the ARDL Bounds Test. Current year Exports, internal borrowings of the government (DLID) one-year lagged DLGDS (DLGDS-1), DLPFCE (DLPFCE-1) are strongly

supporting the current year DLGDP and one-year lagged DLGDP (DLGDP-1) and DLGFCE (DLGFCE-1) are negatively affecting the current year DLGDP. For every one percentage increase in current-year exports, and one-year lagged DLGDS (DLGDS-1) and DLPFCE(DLPFCE-1), the current year DLGDP will increase by 0.20, 0.49, and 2.13 percent respectively. And for every one percent increase in one-year lagged DLGFCE (DLGFCE-1), the current year DLGDP decreases by 0.03 percent and vice versa. Domestic savings (DLGDS), private final consumption expenditure (DLPFCE), and exports (DL Exports) are the key short-run drivers of the Gross Domestic Product (DLGDP) in the post-reform period. The level equation of the Unrestricted Constant and No Trend is studied for the long-run causality and the result signifies that DLPFCE, DLGDS, and DL Exports are positively affecting the DLGDP and the DLGFCE negatively affect the DLGDP in the long-run. DLPFCE (0.83), DLGDS (0.19), and DL Exports (0.07) support the DLGDP in the long-run during the post-reform era. The null hypothesis of no long-run association is rejected when the calculated F-statistic and T-statistic values are greater than the upper bound I(1) values of F-statistic (2.06) and T-statistic (-4.03), otherwise the null hypothesis is accepted. The calculated values of F-statistic (3.348) and T-statistics (-4.26) are greater than the upper bound I(1) values representing there is a strong long-run association among the variables during the post-reform period. The Error Correction Model is applied to study the speed of adjustment of the dependent variable and the results are shown in Table 8. Whenever there is disequilibrium in the dependent variable (DLGDP) *i.e.*, deviates from the equilibrium path, the inflation rate, domestic savings, internal borrowings by the government and private final consumption expenditure bring it to the equilibrium path with a speed of adjustment of -2.565. The Engle-Granger Causality test results support the same representing that the causality is running from domestic savings (DLGDS) to gross domestic product (DLGDP) and not in opposite. Even the unidirectional causality is running from GFCE to DLGDP. There is a bidirectional causality running between DLGDP and DLGDS.

Since most of the prior research in India concentrated on the factors influencing the Indian economic growth solely during the post-reform era. Analysis of the macroeconomic drivers during the two regimes is either unresearched or under researched. Thus, there are diverse outcomes.

The current results contracts with the previous research conducted by Anh Tru Nguyen (2022), Gupta et al., (2022), Shaik and Rao (2020) and Hayat (2019), who found that FDI, Exchange Rate and trade openness drive the Indian economy. One finding is that during the post-reform era, government spending had a detrimental impact on the economic growth, and this is consistent with the results of Hook et al. (2021), Mohsin et al., (2021) and Manik and Khan (2018). Exports are one of the components of trade openness and in the above results, exports have a coefficient with the economic growth and this outcome strongly supports the resent findings of Arif (2020), Dinh (2019) and Guntukula (2018), but inconsistent with the result of Rahman and Alam, 2021) or Kumari and Saleem (2023) who found that trade openness and economic growth are not associated with each other. Inflation as measured in the form of Consumer Price Index (CPI) and exchange rate did not exert any influence on the economic growth in the above results and these findings are contradictory with the findings of Samsuddin and Amar (2020), but strongly supports the results of Makur (2023).

Structural changes in the Indian economy began from 1991-92 onwards due to various economic issues like severe balance of payment crisis, stagnant economy, high inflation, high fiscal deficit, inefficiency of the government enterprises due to excessive regulations and controls and government of India embarked on economic reforms to remove all economic and financial weakness of the Indian economy. Indian Financial sector is integrated with the global financial markets and this integration brought in foreign direct investment in the financial sector and healthy competition among the financial institutions in India. The healthy competition enables financial institutions to mobilize savings from different sectors of the economy and channel them towards capital formation. This is evident that savings in the household sector increase gradually and investment in financial assets is an indication that savings are contributing to the growth of the economy. Foreign enterprises entered into the economy by bringing direct investments which has a multifaced effect on the economy. FDI generated employment opportunities, increased the productivity and efficiency of the economy, reduced imports, and strengthened the manufacturing and services sectors' contribution to the GDP. FDI harms the economy as it increases the money supply in the economy which leads to an increase in inflation. Information Technology (IT) and Enabled Services (ES) industry is an emerging industry in the post-reform period that strongly supports the growth of the Indian economy by exporting software and other IT services. India is a leading country in exporting software services in the world. In the recent past, there has been a transformation like the Indian economy from savings driven economy to a consumption-driven economy and it is clear in the ARDL Bounds Test. Private Consumption Expenditure (PFCE) is the major driver of the Indian economy in the long run. Due to changes in the living standards of the people, the size of the elite and middle class has been increased and poverty is gradually reduced. Private consumption expenditure is strongly supported by elite and middle-class people.

6. Key Findings

To revitalize the Indian economy, policymakers were forced to implement significant economic and fiscal reforms in the years 1991–1992. The current study aims to identify any macroeconomic regime change by analyzing the main economic drivers of the Indian economy before and during the reform period.

During the pre-reform period, no significant macroeconomic drivers were identified in the ARDL Bounds Test in the long-run, but PFCE supported the growth in the short-run. The growth of the Indian economy primarily depended on imports during this period, consumer goods, crude oil, textile products, and fertilizers were major chunks of imports. These imported goods strongly supported and enhanced private consumption (PFCE). The gradual increase in PFCE increased the GDP during this period. The increased GDP started increasing domestic savings. There was no role for the exchange rate during the pre-reform period since the exchange rate was under the control of RBI. But this exchange acts as a fulcrum and is influenced by domestic savings, government final expenditure (GFCE), and private expenditure (PFCE).

But in the post-reform period, the drivers of the Indian economy changed. The Indian economy has been transformed from an import-oriented economy to a savings-based, consumption-based, and exported-oriented economy. Private expenditure (PFCE), followed by domestic savings (GDS) and Exports are the major drivers of the Indian economy. India adopted a variable exchange rate regime and the determination of exchange rates of Indian currency was purely left to the market forces. The advent of foreign capital in the form of direct investment and portfolio investments and government borrowings in foreign currencies boosted the money circulation in the economy, this excess money circulation often led to higher inflation rates. The economic reforms started giving fruits in the form of the creation of employment opportunities, increasing productivity, the establishment of new businesses, improving the performance of the industrial and services sector, and integration with the international economies. The increased domestic savings and foreign capital have been converted into effective capital formation. New-generation companies like IT, Telecom, and Software companies came into existence. Industries are freed from the cobweb of restrictions. Industries started exporting the surplus production and services to other countries. Even though, exports started their momentum, still India imported technology, equipment, chemicals, etc., but the nature of imports shifted from importing consumer goods to capital goods to create a long-lasting impact on economic growth. These heavy imports devalued the Indian currency. Exporting firms benefited from this devaluation of Indian currency and earned a huge number of profits. Thus, the disposable income of the people has been increased which led to the growth of private consumption. Through the exchange rate and foreign capital inflows and exports, the private consumption expenditure (PFCE) and domestic savings (GDS) strongly support the growth of the Indian economy.

Conclusion

The central macroeconomic variable during the two periods is the rate of inflation which affect the GDP directly and indirectly with other variables negatively and positively during the pre- and post-reform period respectively. The major drivers of the Indian economy during the pre-reform period were PFCE. Imports of consumer goods and the inflation rate positively affected the PFCE. The money circulation was less during the pre-reform period, due to restrictions on the entry of foreign capital. Hence, the rate of inflation was relatively moderate during the initial periods of Independence because the country followed import substitution and self-reliance. Due to oil price shocks (the 1970s) and the balance of payment crisis in the 1980s, India faced a severe financial crisis. The government took steps like devaluation of currency and borrowings from international financial agencies, which impacted prices and inflation. The nature of the inflation rate during this period is a combination of demand-pull and cost-push factors. The demand-pull inflation occurred because of increased government spending and this is also evident in the results that CPI positively affected the GFCE during this period. However, in the post-reform period, inflation has a positive impact on the GDP and a negative impact on FDI. FDI brings in huge amounts of foreign capital that increases the money circulation in the economy leading to an increase in the inflation rate. Moderate inflation can encourage consumer spending because people choose to spend their money rather than save it. When people spend more, it can boost aggregate demand, leading to an increase in GDP. The rate of inflation has been under control for most of the years in the post-reform period, a controlled level of inflation can make a country's exports more competitive in the global market. This increase in exports contributed to the GDP. Hence, the rate of inflation should be at the tolerance level.

Policy Recommendations

The RBI should adopt appropriate monetary policies to stabilize the prices so that the rate of inflation can be controlled. However, stabilization of the prices depends on the money supply in the economy. The demand and

supply of money within the boundaries of the nation can be controlled by changing the policy rates, but sudden inflow or outflow of foreign capital cannot be controlled with those monetary policies. Foreign capital comes in two ways, *i.e.*, direct investment and portfolio investment. The prior is the long-term investment, and the latter is the short-term investment. Quality FDI enhances the productivity of the economy and supports the GDP by creating jobs, and transfer of technology and knowledge. However, most of the FDI that comes to the Indian economy is quantitative FDI which does not support the GDP. Even the FPI does not support the growth of the economy as it is hot money evaporates easily. Hence, the policymakers should try to make FDI policies that attract quality FDI that support economic growth, and at the same time, the money circulation should be kept under control, so that inflation will not cross the minimum tolerance level.

The current study's limitations are as follows. It is applicable to the Indian economy from 1950-51 to 2022-23. Another significant research gap that the current study aims to fill is the absence of prior studies on the study of the drivers of the Indian economy under two regimes.

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Credit Authorship Contribution Statement

Pujari Sudharsana Reddy: This first author, Dr. Pujari Sudharsana Reddy, has contributed to the present research work by designing the research methodology and research results and discussion.

Chaya Bagrecha: She has contributed to the literature review, identified the research, and prepared the research objective.

Muthu Gopala Krishnan has contributed to the introductory part of the research work.

Declaration of Competing Interest

The authors declare that they have no known financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix:

Figure 1. Normality Test Results (Pre-reform Period)

Series: Residuals	
Sample 1951 1990	
Observations 40	
Mean	-1.42e-17
Median	-0.001295
Maximum	0.033107
Minimum	-0.025639
Std. Dev.	0.014591
Skewness	0.392365
Kurtosis	2.501559
Jarque-Bera	1.440407
Probability	0.486653
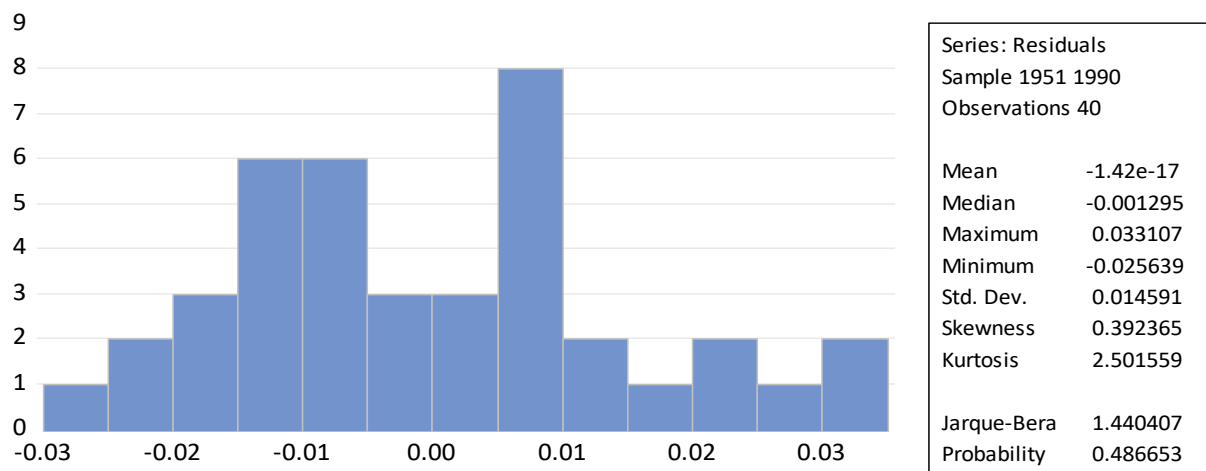
Source: Authors calculations using EViews@12

Figure 2. Normality Test Results for Post-reform period

Series: Residuals	
Sample 3 30	
Observations 28	
Mean	7.99e-18
Median	-0.000343
Maximum	0.014907
Minimum	-0.010475
Std. Dev.	0.006841
Skewness	0.348091
Kurtosis	2.402233
Jarque-Bera	0.982328
Probability	0.611914
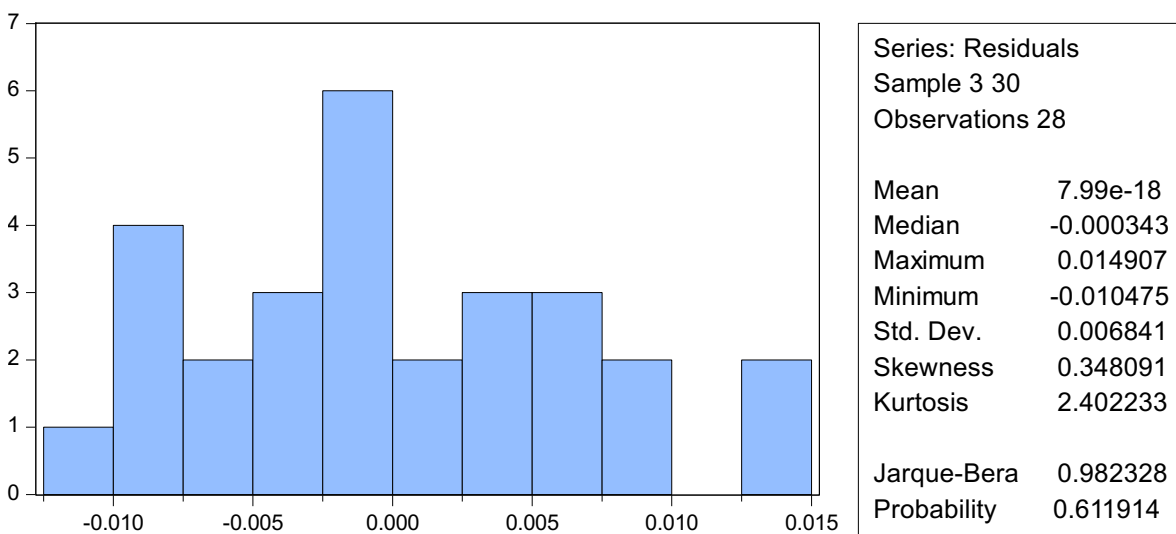
Source: Authors calculations using EViews@12

Table 1: OLS Regression Test Results Summary							
Dependent Variable: DLGDP							
Method: Least Squares							
Pre-reform era (1951-1990)				**Post-Reform era (1991-2022)**			
Variable	Coefficient	Std. Error	t-Statistic	p-value	Coefficient	Std. Error	t-Statistic	p-value
DLGDS	0.058001	0.030456	1.904400	0.0662*	0.171108	0.036338	4.708795	0.0003*
DLGFCE	0.012001	0.033347	0.359876	0.7214	-0.002142	0.003187	-0.672021	0.5118
DLPFCE	0.796675	0.056918	13.996910	0.0000*	0.591066	0.100854	5.860593	0.0000*
DL_EXTERNAL_DEBT	-0.009240	0.014499	-0.637253	0.5286	-0.024294	0.011777	-2.062945	0.0569*
DL EXCHANGE RATE	0.040019	0.041798	0.957444	0.3458	-0.025051	0.041884	-0.598109	0.5587
DL EXPORTS	0.048822	0.030625	1.597444	0.1210	0.040006	0.043090	0.928425	0.3679
DL IMPORTS	-0.025913	0.023898	-1.084305	0.2866	0.026138	0.041108	0.635827	0.5345
DL INTERNAL DEBT	0.064279	0.052127	1.233128	0.2268	-0.089235	0.098066	-0.909951	0.3772
DFPI					0.000005	0.0000001	0.299687	0.7685
DLFDI					-0.000313	0.006164	-0.050768	0.9602
DLPRP					0.003374	0.004063	0.830467	0.4193
CPI	-0.001228	0.000634	-1.938856	0.062	0.031046	0.015100	2.056510	0.0506*
CONSTANT	0.007680	0.008698	0.883026	0.384000	0.007790	0.013956	0.558182	0.5850
R-squared				0.928764				0.971819
Adjusted R-squared				0.910380				0.949274
F-statistic				50.521540				43.106140
prob (F-statistic)				0.000000				0.000000
Durbin-Watson stat				2.099701				2.322267
Source: Author's calculations using Eviews@12								

Table 2: Breusch-Godfrey Serial Correlation LM Test Results Summary				
H_0= Residuals are not serially correlated H_1 = Residuals are serially correlated				
Pre-reform Era (1950-51 to 1990-91)				
F-statistic	0.872377	Prob.F(2,29)		0.4286
Obs*R-Squared	2.269987	Prob.Chi-square(2)		0.3214
Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(-1)	-0.11148	0.202792	-0.549726	0.5867
RESID(-2)	-0.258269	0.2025694	-1.274181	0.2127
Post-reform Era (1991-92 to 2021-22)				
F-statistic	0.890754	Prob.F(2,29)		0.4340
Obs*R-Squared	3.374638	Prob.Chi-square(2)		0.1850
Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(-1)	-0.047788	0.334209	-0.1430	0.8885
RESID(-2)	-0.488468	0.365972	-1.3347	0.2049
Source: Author's calculations using Eviews@12				

Table 3: Heteroscedasticity Test Results Summary: Breusch-Pagan-Godfrey			
H_0= Residuals are homoscedastic			
H_1 = Residuals are heteroscedastic			
Pre-reform Era (1950-51 to 1990-91)			
F-statistic	0.575935	Prob.F(2,29)	0.7895
Obs*R-Squared	5.175854	Prob.Chi-square(12)	0.7386
Scaled Explained SS	2.333984	Prob. Chi-Square (12)	0.9690
Post-reform Era (1991-92 to 2021-22)			
F-statistic	0.625299	Prob.F(2,29)	0.7911
Obs*R-Squared	9.336308	Prob.Chi-square(12)	0.6740
Scaled Explained SS	1.87859	Prob. Chi-Square (12)	0.9996
Source: Author's calculations using Eviews@12			

Table 4: Multicollinearity Test (Variance Inflation Factor) Test Results Summary						
Pre-reform era (1951-1990)			Post-reform era (1992-2022)			
Variable	Coefficient Variance	Uncentered VIF	Centered VIF	Coefficient Variance	Uncentered VIF	Centered VIF
DLGDS	0.000928	3.385845	1.267907	0.001551	11.151690	2.987170
DLGFCE	0.001112	3.520074	1.189564	0.000012	1.581493	1.524846
DLPFCE	0.003240	6.006026	1.758992	0.005418	25.725120	2.500285
DLETERNAL DEBT	0.000210	2.119914	1.301423	0.000159	3.049596	2.542397
DL EXCHANGE RATE	0.001747	1.767202	1.369522	0.002200	3.036224	2.348041
DL EXPORTS	0.000938	3.234095	1.825573	0.002055	20.439150	6.440443

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Table 4: Multicollinearity Test (Variance Inflation Factor) Test Results Summary						
Pre-reform era (1951-1990)				**Post-reform era (1992-2022)**		
DL IMPORTS	0.000571	3.330039	2.377680	0.001824	20.133190	8.081646
DL INTERNAL DEBT	0.002717	7.257119	1.509139	0.011592	61.583990	2.019619
DFPI				0.000003	3.049596	2.542397
DLFDI				0.000038	1.893752	1.319356
DLPRP				0.000020	2.742921	2.641729
DLPRR				0.000399	4.324811	2.554525
CPI	0.0000004	4.827945	2.558757	0.000228	56.288730	2.773643
CONSTANT	0.000000	11.297320	NA	0.000252	83.711400	NA
Source: Author's calculations using Eviews@12						

Table 5: Ramsey RESET Model Specification Test Result Summary			
H_0= No specification errors in the model			
Pre-reform Era (1950-51 to 1990-91)			
	Value	df	probability
t-statistic	1.864192	30	0.0721
F-statistic	3.475212	(1,30)	0.0721
Likelihood Ratio	4.384314	1	0.0363
Post-reform Era (1991-92 to 2021-22)			
t-statistic	1.863831	14	0.0835
F-statistic	3.473865	(1,14)	0.0835
Likelihood Ratio	6.206172	1	0.0127
Source: Author's calculations using Eviews@12			

Table 6: Results Summary of Augmented Dickey Fuller (ADF) Unit Root Test									
	When the variable is Constant			When the variable is constant and linear trend			When there is no trend and constant			Result
Variable	ADF Statistic value	T-Statistic value @5%	probability Value	ADF Statistic value	T-Statistic value @5%	probability Value	ADF Statistic value	T-Statistic value @5%	probability Value	
With Original Data I(0) (PRE-REFORM ERA- 1950-51 TO 1990-91)										
DLGDP	-1.517111	-2.95711	0.5123	-3.84874	-3.54849	0.0258*	1.459638	-1.951687	0.9612	Unit root
DLGDS	-5.231208	-2.938987	0.0001*	-5.836743	-3.529758	0.0001*	0.000495	-1.950394	0.6762	Unit root
DLGFCE	-7.531246	-2.938987	0.0000*	-8.336209	-3.529758	0.0000*	-0.300594	-1.950394	0.5704	Unit root
DLPFCE	-1.562815	-2.95711	0.4895	-4.457162	-3.54849	0.0061*	1.156661	-1.951687	0.9327	Unit root
DLED	-1.343528	-2.954021	0.5974	-1.263112	-3.552973	0.8796	-1.435276	-1.951332	0.1383	Unit root
DLID	-1.399212	-2.948404	0.5715	-6.57789	-3.529758	0.0000*	0.457192	-1.950687	0.8081	Unit root
DLER	-4.417631	-2.938987	0.0011*	-5.197718	-3.529758	0.0000*	-0.561579	-1.950117	0.4671	Unit root
DLEXPORTS	-4.2498223	-2.938987	0.0018*	-5.600738	-3.529758	0.0002*	-2.954034	-1.949609	0.0042*	No Unit root
DLIMPORTS	-5.465582	-2.938987	0.0001*	-6.098247	-3.529758	0.0001*	-4.400165	-1.949609	0.0001*	No Unit root
CPI	-3.757249	-2.938987	0.0068*	-4.056774	-3.536601	0.0152*	-0.016712	-1.951	0.6702	Unit root
With Original Data I(0) (POST-REFORM ERA 1990-91 TO 2021-22)										
DFPI	-1.58997	-2.991878	0.4721	-1.932308	-3.612199	0.6068	-1.68493	-1.955681	0.0864	Unit root
DLED	-3.434993	-2.963972	0.0175*	-3.314514	-3.568379	0.0832	-2.628606	-1.952473	0.0104*	Unit root
DLER	-6.51728	-2.963972	0.0000*	-6.292239	-3.568379	0.0001*	-5.168038	-1.952473	0.0000*	No Unit root
DLEXPORTS	-4.855607	-2.963972	0.0005*	-5.162699	-3.568379	0.0012*	-1.090551	-1.95291	0.243	Unit root
DLFDI	-3.735985	-2.963972	0.0085*	-3.992548	-3.568379	0.0200*	-3.481457	-1.952473	0.0011*	No Unit root
DLGDP	-3.745274	-2.963972	0.0083*	-3.795338	-3.568379	0.0309*	-0.862934	-1.953381	0.3332	Unit root
DLGDS	-3.261755	-2.971853	0.0267*	-4.31616	-3.580623	0.0102*	-1.232367	-1.953858	0.1944	Unit root
DLGFCE	-8.260666	-2.981038	0.0000*	-1.64977	-3.595026	0.0000*	-3.843683	-1.953381	0.0004*	No Unit root
DL INTERNAL DEBT	-3.533719	-2.963972	0.0139*	-4.415273	-3.568379	0.0076*	-0.983633	-1.95291	0.2837	Unit root
DL IMPORTS	-4.251684	-2.963972	0.0023*	-4.275087	-3.568379	0.0105*	-1.143977	-1.953858	0.2235	Unit root
DL PFCE	-3.858406	-2.963972	0.0063*	-3.798119	-3.568379	0.0307*	-0.680497	-1.953381	0.4131	Unit root
DL PRP	-4.242706	-2.991878	0.0031*	-11.698489	-3.632896	0.0000*	-4.522444	-1.953381	0.0001*	No Unit root
DL PRR	-14.5829	-2.9637	1.0000	13.5699	-3.5684	1.0000	2.3444	-1.9529	0.9940	Unit root
LCPI	-6.1869	-2.9981	0.0000*	-6.5607	-3.6220	0.0001*	-1.0754	-1.9525	0.2488	Unit root

	When the variable is Constant			When the variable is constant and linear trend			When there is no trend and constant			Result
Variable	ADF Statistic value	T-Statistic value @5%	probability Value	ADF Statistic value	T-Statistic value @5%	probability Value	ADF Statistic value	T-Statistic value @5%	probability Value	
With First Differenced Data I(1) (PRE-REFORM ERA 1950-51 TO 1990-91)										
DLGDP	-4.89162	-2.95711	0.0004*	-3.587235	-3.574244	0.0487*	-5.208386	-1.951332	0.0000*	No Unit root
DLGDS	-8.016973	-2.945842	0.0000*	-7.876892	-3.540328	0.0000*	-8.036114	-1.950394	0.0000*	No Unit root
DLGFCE	-6.642468	-2.945842	0.0000*	-6.595437	-3.540328	0.000*	-6.700186	-1.950394	0.0000*	No Unit root
DLPFCE	-3.661076	-2.967767	0.0104*	-4.163793	-3.574244	0.0140*	-5.27813	-1.951687	0.0000*	No Unit root
DLED	-5.57891	-2.954021	0.0001*	-5.367786	-3.552973	0.0006	-5.618609	-1.951332	0.0000*	No Unit root
DLID	-4.723084	-2.948404	0.0005*	-4.621392	-3.544284	0.0039*	-4.674683	-1.950687	0.0000*	No Unit root
DLER	-7.775935	-2.943427	0.0000*	-7.778596	-3.536601	0.0000*	-7.773856	-1.950117	0.0000*	No Unit root
DCPI	-5.012639	-2.951125	0.0003*	-5.043244	-3.54849	0.0014*	-4.946411	-1.951	0.0000*	No Unit root
With First Differenced Data I(1) (POST-REFORM ERA 1991-92 TO 2021-22)										
DFPI	-5.571507	-2.991878	0.0001*	-3.661249	-4.440739	0.0474*	-5.6843	-1.955681	0.0000*	No Unit root
DLED	-6.143521	-2.967767	0.0000*	-6.209793	-3.574244	0.0001*	-6.205443	-1.95291	0.0000*	No Unit root
DLEXPORTS	-9.782633	-3.679322	0.0000*	-9.726315	-3.574244	0.0000*	-9.965586	-1.95291	0.0000*	No Unit root
DLGDP	-5.188544	-2.971853	0.0002*	-4.978632	-3.580623	0.0022*	-5.266634	-1.953381	0.0000*	No Unit root
DLGDS	-8.405627	-2.976263	0.0000*	-8.435672	-3.587527	0.0000*	-8.457225	-1.953858	0.0000*	No Unit root
DL INTERNAL DEBT	-9.511992	-2.967767	0.0000*	-9.411648	-3.574244	0.0000*	-9.614022	-1.95291	0.0000*	No Unit root
DL IMPORTS	-4.9475	-2.976263	0.0005*	-4.830969	-3.587527	0.0033*	-5.035627	-1.953858	0.0000*	No Unit root
DL PFCE	-4.949874	-2.971853	0.0004*	-4.698373	-3.580623	0.0042*	-5.054741	-1.953381	0.0000*	No Unit root
DL PRR	4.8042	-2.9763	1.0000	4.8482	-3.5875	1.0000	5.0522	-1.9539	1.0000	UNIT ROOT
DLCPI	-6.6635	-2.9678	0.0000*	-6.5980	-3.5742	0.0000*	-6.7258	-1.9529	0.00000*	No Unit root
Source: Author's calculations using Eviews@12										

Table 6: Results Summary of Augmented Dickey Fuller (ADF) Unit Root Test

Table 8.1. Results Summary of ARDL Bounds Test for Short-run and Long-run Causality						Table 8.2. Results Summary of ARDL Bounds Test for Short-run and Long-run Causality				
Dependent Variable: D(DLGDP)						Dependent Variable: D(DLGDP)				
Model: ARDL Long Run Form Bounds Test						Model: ARDL Long Run Form Bounds Test				
Sample: (39) 1952-1991 (Pre-reform Era)						**Sample: (32) 1991-22-2022-23**				
Independent Variable: DLGDS, DLGFCE, DLPFCE, DLED, DLER, DLEXPORTS, DLIMPORTS, DLID, DCPI						Independent Variable: DLGDS, DLGFCE, DLPFCE, DLED, DLER, DLEXPORTS, DLIMPORTS, DLID, DCPI				
Selection Model: ARDL (2,1,1,1,1,1,1,1,1,1)						Selection Model: ARDL (1,0,1,1,0,0,1,1,1,1,1,1)				
Conditional Error Correction Regression						**Conditional Error Correction Regression**				
Variable	**Coefficient**	**Std.Error**	**t-Statistic**	**Prob***		**Variable**	**Coefficient**	**Std.Error**	**t-Statistic**	**Prob***
CONSTANT	0.021096	0.040354	0.522787	0.615300		CONSTANT	-0.008817	0.018870	-0.467252	0.6600
DLGDP(-1)	**-1.163935**	**0.526172**	**-2.212080**	**0.0579***		**DLGDP(-1)**	**-2.565146**	**0.601156**	**-4.267020**	**0.0080***
DLGDS(-1)	0.040288	0.152187	0.264724	0.797900		DFPI	0.000000	0.000000	-1.740979	0.1422
DCPI(-1)	-0.002761	0.003241	-0.851920	0.419000		DLCPI(-1)	0.029817	0.023781	1.253831	0.2653
DL EXCHANGE RATE(-1)	0.058453	0.148617	0.393313	0.704400		DLED(-1)	0.002533	0.024233	0.104517	0.9208
DL EXPORTS(-1)	0.025255	0.125682	0.200940	0.845780		DLER	-0.119320	0.077062	-1.548374	0.1822
DL EXTERNAL DEBT(-1)	-0.013380	0.046153	-0.289901	0.779300		**DLEXPORTS**	**0.201122**	**0.062859**	**3.199556**	**0.0240***
DL GFCE(-1)	0.077179	0.093352	0.826761	0.432300		DLFDI(-1)	0.004653	0.008954	0.519645	0.6255
DL IMPORTS(-1)	0.022058	0.081710	0.269951	0.794000		**DLGDS(-1)**	**0.497666**	**0.100841**	**4.935153**	**0.0043***
DL INTERNAL DEBT(-1)	0.030326	0.133761	0.226721	0.826300		**DLGFCE(-1)**	**-0.038169**	**0.013065**	**-2.921363**	**0.0330***
DL PFCE(-1)	0.805691	0.542397	1.485427	0.175700		DLID(-1)	-0.038393	0.121795	-0.315224	0.7653
D(DLGDP(-1))	0.247947	0.187767	1.320504	0.223200		DLIMPORTS	-0.083882	0.052110	-1.609711	0.1684
D(DLGDS)	0.086282	0.107178	0.805031	0.444100		**DLPFCE(-1)**	**2.134556**	**0.554202**	**3.851585**	**0.0120***
D(DCPI)	-0.001288	0.002161	-0.596037	0.567600		DLPRP(-1)	-0.008722	0.006524	-1.336925	0.2388
D(DL EXCHANGE RATE)	0.061519	0.077257	0.796290	0.448800		D(DLCPI)	0.032997	0.018267	1.806354	0.1307
D(DL EXPORTS)	0.020506	0.067636	0.301708	0.770600		D(DLED)	-0.032943	0.015036	-2.191004	0.08
D(DL EXTERNAL DEBT)	0.005119	0.066042	0.077503	0.940100		D(DLFDI)	0.001687	0.008599	0.196158	0.8522
D(DL GFCE)	0.036519	0.064193	0.568749	0.585100		**D(DLGDS)**	**0.220125**	**0.049306**	**4.464504**	**0.0066***
D(DL IMPORTS)	0.029925	0.088189	0.339329	0.743100		**D(DLGFCE)**	**-0.019826**	**0.006048**	**-3.278007**	**0.0220***
D(DL INTERNAL DEBT)	0.037879	0.123603	0.306457	0.767100		**D(DLID)**	**0.404021**	**0.160836**	**2.512008**	**0.0537***
D(DL PFCE)	**0.671508**	**0.265666**	**2.527642**	**0.0354***		D(DLIMPORTS)	-0.103058	0.048781	-2.112669	0.0883
Level Equation						**D(DLPFCE)**	**1.147845**	**0.202635**	**5.664580**	**0.0024***
Case:3 Unrestricted Constant and No Trend						D(DLPRP)	0.014172	0.006083	2.329948	0.0672
Variable	**Coefficient**	**Std.Error**	**t-Statistic**	**Prob***		**Level Equation**				
DL GDS	0.003461	0.121853	0.284058	0.7836		**Case:3 Unrestricted Constant and No Trend**				
DCPI	-0.002372	0.002829	-0.838537	0.4261		**Variable**	**Coefficient**	**Std.Error**	**t-Statistic**	**Prob***

Table 8.1. Results Summary of ARDL Bounds Test for Short-run and Long-run Causality						Table 8.2. Results Summary of ARDL Bounds Test for Short-run and Long-run Causality				
DL EXCHANGE RATE	0.050220	0.122236	0.410844	0.692		DFPI	0.000000	0.000001	-1.844879	0.1244
DL EXPORTS	0.021698	0.109794	0.197621	0.8483		DLCPI	0.011624	0.009975	1.165354	0.2964
DL EXTERNAL DEBT	-0.011495	0.038914	-0.295405	0.7752		DLED	0.000987	0.009422	0.104791	0.9206
DL GFCE	0.066309	0.074278	0.892713	0.3981		DLER	-0.046516	0.021913	-2.122775	0.0872
DL IMPORTS	0.018951	0.070079	0.270424	0.7937		**DLEXPORTS**	**0.078406**	**0.022460**	**3.490853**	**0.0175***
DL INTERNAL DEBT	0.026055	0.115373	0.225834	0.827		DLFDI	0.001814	0.003391	0.534989	0.6156
DL PFCE	0.692213	0.392393	1.762736	0.116		**DLGDS**	**0.194011**	**0.040545**	**4.785133**	**0.0049***
H0= No long run relationship among the variables						**DLGFCE**	**-0.014880**	**0.003569**	**-4.169711**	**0.0087***
						DLID	-0.014967	0.048852	-0.306376	0.7717
F-Bounds Test						DLIMPORTS	-0.032701	0.022728	-1.438774	0.2097
Test-Statistic	Value	Signif	I(0)	I(1)		**DLPFCE**	**0.832138**	**0.038523**	**21.600810**	**0.0000***
F-statistic	1.240	5%	2.14	3.3		DLPRP	-0.003400	0.002369	-1.435388	0.2107
t-Bounds Test						H0= No long run relationship among the variables				
t-statitic	-2.212	5%	-2.86	-4.72		F-Bounds Test				
						Test-Statistic	Value	Signif	I(0)	I(1)
						F-statistic	3.348715	5%	2.06	3.24
						t-Bounds Test				
						t-statitic	-4.26702	5%	-2.86	-4.03
Source: Author's calculations using Eviews@12										

Table 8.1: ARDL Error Correction Regression Model						Table 8.2: ARDL Error Correction Regression Model				
Dependent Variable: D(DLGDP)						Dependent Variable: D(DLGDP)				
Selected Model: ARDL (1,0,0,1,1,0,1,0,0)						Selected Model: ARDL (1,0,1,1,0,1,1,1,1,1,1)				
Case 3: Unrestricted Constant and No Trend						Case 3: Unrestricted Constant and No Trend				
Sample: 1950-51 to 1990-91 (Pre-reform era)						Sample: 1991-92 to 2020-21 (Pre-reform era)				
ECM Regression						ECM Regression				
Case 3: Unrestricted Constant and No Trend						Case 3: Unrestricted Constant and No Trend				
Variable	Coefficient	Std.Error	t-Statistic	Prob*		Variable	Coefficient	Std.Error	t-Statistic	Prob*
CONSTANT	0.015969	0.002261	7.063376	0.0000		CONSTANT	-0.008817	0.001007	-8.759881	0.0003*
D(DLEXPORTS)	0.028277	0.02197	1.287097	0.2094		**D(DLCPI)**	**0.032997**	**0.004887**	**6.752308**	**0.0011***

D(DLEXTERNAL DEBT)	0.020358	0.011815	1.722989	0.0968	D(DLED)	-0.032943	0.004145	-7.947292	0.0005*
D(DLIMPORTS)	-0.021515	0.015206	-1.414884	0.1690	D(DLFDI)	0.001687	0.002314	0.728831	0.4988
CointEq(-1)*	-0.948203	0.038107	-24.88238	0.0000	D(DLGDS)	0.220125	0.011792	18.666530	0.0000*
R-squared				0.963602	D(DLGFCE)	-0.019826	0.001684	-11.772980	0.0001*
Adj R-squared				0.959320	D(DLID)	0.404021	0.050480	8.003574	0.0005*
F-statistic				225.0287	D(DLIMPORTS)	-0.103058	0.139880	-7.367682	0.0007*
Prob(F-statistic)				0.0000	D(DLPFCE)	1.478450	0.528700	21.710680	0.0000*
Source: Author's Calculations using EVIews@12					D(DLPRP)	0.014172	0.001574	9.005961	0.0003*
					CointEq(-1)*	-2.565146	0.210844	-12.166070	0.0001*
					R-squared				0.987269
					Adjusted R-squared				0.97978
					F-statistic				131.8303
					Prob (F-statistic)				0.00000
Source: Author's Calculations using EVIews@12									

YouTube as a Source of Information for Agribusiness: Audience Perspective and Content Video Analysis

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Abstract: *Agribusiness forms the cornerstone of many economies worldwide. Access to agribusiness information is crucial, as it is a valuable resource, catering to a diverse audience, including farmers and the general public. YouTube is a prominent online platform extensively used by people to seek information about agribusiness. The videos and content uploaded on YouTube offer an in-depth comprehension and provide diverse perspectives from various angles on the discussed topics. In agriculture, visual content plays a pivotal role in elucidating intricate concepts such as farming techniques, pest and disease management, crop variety selection, and the latest advancements in agricultural technology. This research endeavors to assess the utility of YouTube as a source of information and scrutinize the content of YouTube videos in the context of agribusiness information. The results of this data analysis reveal that most viewers accessing agribusiness-related content on YouTube are notably influenced by cognitive effects. Furthermore, the study identifies affective effects, personal integration effects, and encouragement as additional factors that impact the audience's inclination to view videos about agribusiness on YouTube. The findings from this analysis underscore the significance of factors such as the number of likes, dislikes, views, reliability assessment, video quality, and completeness evaluation in establishing a substantial correlation with audience preferences and behaviors.*

Keywords: YouTube; agribusiness; source of information; content analysis.

JEL Classification: Q13; D80; L86; Q55; A12.

Introduction

The Agribusiness is the foundation of economies in many countries around the world (Darmawan, Arisena, Djelantik, Krisnandika, Utari, *et al.* 2023). Piwowar and Harasym (2020) state that agribusiness includes agricultural production and all stages of production, processing, distribution, and marketing of agricultural and forest products. Idpo (2023) stated that, in an ideal scenario, agricultural areas play a multifaceted role, extending beyond their primary function of providing sustenance for the community. These areas rather than being solely food production hubs, have the potential to evolve into dynamic centers for agricultural education activities, catering specifically to the younger generation. Beyond the cultivation of crops, these spaces can be transformed into educational hubs, imparting essential knowledge about farming techniques, sustainable practices, and the intricate workings of agribusiness. This, in turn, contributes to the cultivation of a new generation of agriculturists who are well-versed in the complexities of modern agriculture.

Moreover, envisioning agricultural areas not just as productive landscapes but also as recreational infrastructure introduces an additional layer of significance (Suamba *et al.* 2023). These spaces can be designed and utilized to provide recreational opportunities for the community, fostering a connection between urban dwellers and the agricultural environment. Such a dual-purpose approach not only addresses food security

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concerns but also contributes to the holistic development of urban areas. Darmawan, Arisena, Djelantik, Krisnandika, Dewi, *et al.* (2023) stated that integrating agricultural education and recreational components, these areas become vibrant, engaging spaces that serve not only the immediate needs of the community but also contribute to the long-term sustainability and resilience of urban environments.

Access to agribusiness information is essential as it provides information related to agribusiness for everyone, including farmers and the general public. Silveira, Alves, and Raineri (2022) stated that YouTube obtains agribusiness information for the general public. Ibrahim and Gawuna (2023) suggest that YouTube is used to obtain agribusiness information for the general public. According to We Are Social and Hootsuite reports, there were 2.51 billion YouTube users worldwide in January 2023. According to Rohman and Jurusan (2017) YouTube is an expansive digital platform renowned for its prominent status as a globally acclaimed video-sharing community. Individuals from every corner of the world can effortlessly and conveniently utilize any web browser to upload their diverse selection of videos and partake in the immersive experience of viewing an extensive array of online content. Before the existence of YouTube, traditional media such as television, radio, and newspapers were the only significant sources of information. However, YouTube changed this paradigm by providing video-based content that is more in-depth, interactive, and varied.

Nowadays, YouTube has become one of the significant sources of information for people who want to access information on various topics, ranging from news, education, politics, and technology to entertainment (Siregar *et al.* 2022). Videos or content that are uploaded on YouTube can provide a deeper understanding of details and provide different perspectives from various aspects of a topic discussed. In Indonesia, agriculture is a less well-developed sector through the internet and social media. According to Chakma, Ruba, and Riya (2022) YouTube is a platform that helps spread information with solid communication visual displays and provides entertainment for its audience. Ginting *et al.* (2023) stated that people tend to like video information because of its easy and efficient search, where only by using text related to the video and the video they are looking for will appear.

In the agricultural field, visual information can help explain complex subjects, such as farming techniques, pest and disease management, crop variety selection, and the latest agricultural technologies (Suardi *et al.* 2022). Banmeke *et al.* (2019) argue that YouTube can be an effective and efficient media for information about agriculture to various audiences. Azak *et al.* (2022) say that YouTube is a platform for sharing ideas. It provides an excellent opportunity for viewers to express their opinions through the comment section on the videos they watch. YouTube can facilitate interaction and collaboration between different stakeholders in agriculture. Based on the points mentioned previously, this study was conducted to (i) examine how the audience responds to YouTube as a source of agribusiness information and (ii) analyze the reliability, quality, and accuracy of the information in videos about agribusiness as a source of information on the YouTube platform.

This study delves into the increasingly pivotal role of YouTube as a disseminator of agribusiness information, shedding light on its transformative impact on the accessibility and comprehensibility of agricultural knowledge. The novelty lies in recognizing YouTube as a dynamic platform that transcends traditional media, enabling a more interactive and varied approach to understanding agribusiness. By elucidating the effectiveness and efficiency of YouTube in conveying complex agricultural concepts through visual content, this research contributes to the broader discourse on leveraging digital platforms for knowledge dissemination. Moreover, the study highlights the interactive nature of YouTube, offering a space for viewers to express opinions and fostering collaboration among diverse stakeholders in agriculture. In essence, this research positions YouTube as a catalyst for democratizing agribusiness information, empowering farmers and the general public with easily accessible, visually enriched content that goes beyond the limitations of traditional media.

1. Literature Review

Akbar (2018) researched the effectiveness of YouTube as a medium for information dissemination. This study aims to determine the effectiveness of YouTube in disseminating information and to find out the obstacles experienced in spreading information through YouTube. Azak et al. (2022) studied YouTube as a source of information about COVID-19 for children. This study aimed to analyze the content quality, reliability, and audience participation analysis of YouTube videos as a source of information about COVID-19 for children. Ibrahim and Gawuna (2023) examines the role played by YouTube in providing the information needed that can guide and teach new intake educated youth participation into farming in Kano state, Nigeria. The findings indicate that the use of YouTube by educated youth has been found positively significant in influencing their participation in farming.

This study is essential to find out how the audience responds to making YouTube a source of agribusiness information, as well as analyzing the reliability, quality, and completeness of information in videos about agribusiness as a source of information on the YouTube platform. This research was conducted to see how effective YouTube is in spreading information. This research will directly observe why the audience looks for certain agribusiness information on YouTube. This research was also conducted to analyze video content about agribusiness uploaded by YouTube content creators, where this study examined factors related to YouTube content that affect the effectiveness of YouTube as a source of information.

2. Research Methodology

This research took place in Bali Province. The sample selection for objective one is five subscribers from 10 YouTube content creators who make videos about agribusiness in agriculture, animal husbandry, fisheries, and culinary, which have 11,000 subscribers and above and live in Bali Province. So, the sample used to analyze objective (i) is 50 subscribers. The sample selection for objective two is the most watched video from the channel of each content creator. So, the total sample used to analyze objective (ii) is ten videos. The selection of locations and samples in this study was purposive to make it easier for researchers to conduct interviews and obtain the necessary data. The data collection method used in this research is a structured interview, which uses an instrument in the form of a questionnaire that has been previously prepared.

The data analysis used for objective (i) in examining how the audience responds to YouTube as a source of agribusiness information is descriptive. This method aims to describe in a systematic and detailed manner the characteristics, themes, patterns, and meanings that emerge from qualitative data obtained from interviews with the sample.

The data analysis used for objective (ii) in analyzing the reliability, quality, and completeness of information in videos about agribusiness as a source of information on the YouTube platform is descriptive statistical analysis and Spearman rank correlation assisted by using the IBM SPSS Statistics 26 application. This study used descriptive statistical analysis to determine the descriptive value of sample variables (mean, median, maximum, minimum, and standard deviation). Spearman rank correlation analysis in this study was conducted to evaluate or see if there is a correlation relationship between each indicator variable studied. In knowing the correlation relationship between the variables studied using Spearman rank correlation analysis, it can be seen from the p-value if the p-value <0.05, then there is a significant correlation relationship between variables. Data analysis was carried out by giving a score for each video tested with three assessment criteria: video completeness evaluation assessment, video reliability, and video quality measurement scale.

Video comprehensiveness evaluation

The scoring is done by giving a score if the evaluated video content meets the evaluation criteria that the researcher has arranged. Each "YES" answer will be given 1 point, and each "NO" answer will be given 0 points.

Video reliability evaluation

The scoring is done by giving a score if the evaluated video content meets the evaluation criteria that the researcher has arranged. Each "YES" answer will be given 1 point, and each "NO" answer will be given 0 points.

Video quality measurement scale

Video quality scale scoring is done by giving a checklist with the value criteria "very bad" is given a score of 1, "bad" is given a score of 2, "medium" is given a score of 3, "good" is given a score of 4, and "very good" is given a score of 5.

The criteria used to analyze the video content are shown below:

Table 1. Video assessment criteria

Video comprehensiveness evaluation	
Features	Points given if
Video resolution	≥ 480p
Audio	Clear
Clips	Relevant
Video comprehension	Easy to understand
Video flow	Good

Objective of the video	Fulfilled
Topic discussed	On topic
Evaluation of Video Reliability	
Are the explanations given in the video clear and understandable?	
Are useful reference sources given?	
Is the use of reference sources applicable to the audience?	
Does the information presented in the video have balance and is unbiased?	
Does the video evaluate areas of controversy or uncertainty?	
Measuring Scale of Video Quality	
Very poor, video quality is poor, video flow is unclear, a lot of information is missing, not useful for the audience	
Generally poor, there is some information in the video but it is not useful to the viewer	
Moderate, covers some important information	
Good, video flow is clear, covers some important information, and is useful to the audience	
Very good, the quality and flow of the video is very good, and the information provided is very useful to the audience	

Source: Chakma, Ruba, and Riya 2022; Azak *et al.* 2022

3. Research Results

3.1 Audience Responds to Youtube as a Source of Agribusiness Information

Based on Table 2. It is known that from the 50 samples that have been interviewed, 52% (n = 26) of the samples are male, 48% (n = 24) of the samples are female, and 46% (n = 23) of the samples are dominated by viewers with ages between 16-26 years with the dominant type of work as a private employee with a percentage of 34% (n = 17). From the list of subscribed channels, it is known that 30% (n=15) of the sample subscribed to agricultural channels, 20% (n=10) of the sample subscribed to fishery channels, 20% (n=10) of the sample subscribed to livestock channels, and 30% (n=15) of the sample subscribed to culinary channels.

Table 2. Respondent Characteristics (N = 50)

Variables	Dimensions	Total Respondents	Percentage
Gender	Male	26	52%
	Female	24	48%
Age	16-26	23	46%
	27-37	5	10%
	38-48	11	22%
	49-59	9	18%
	60-70	2	4%
Jobs	Students	3	6%
	University Students	14	28%
	Private	17	34%
	Civil Servant	5	10%
	Farmers	3	6%
	Unemployed	8	16%
Subscribed YouTube channel	Agriculture	15	30%
	Fisheries	10	20%
	Livestock	10	20%
	Culinary	15	30%

Source: Authors based on respondent characteristics

YouTube is a new media innovation that helps disseminate accurate information, provides visual displays, and also provides entertainment for its audience Chakma, Ruba, and Riya (2022). Content creators choose to use YouTube as their media for uploading content because on YouTube, they can express themselves through visual media, provide creative and valuable information for their users, and they can upload long-duration content. In selecting the type of content they want to watch, the viewers of YouTube are looking for information based on several aspects of their information needs. The need for information search conducted by YouTube viewers is described in Table 3:

Table 3. Types of Information Needs (N = 50)

Types of Information Needs	Total Respondents	Percentage
Cognitive Effects	17	34%
Affective Effect	14	28%
Personal Integration Effect	12	24%
Behavioral Effect	7	14%

Source: Authors based on respondent characteristics

Based on the research results described in Table 3, it shows that the viewers' needs in watching videos on YouTube are influenced by cognitive effects (N = 17), affective effects (N = 14), personal integration effects (N = 12), and cheering effects (N = 7). Akbar, (2018) says viewers seek information and knowledge to fulfill their needs. This relates to the desire to satisfy curiosity, where they access YouTube to get the information needed. The cognitive effects the audience feels refer to the need to gain information, knowledge, or understanding, where they use YouTube to satisfy their need for information and knowledge. Affective Effects refer to the need for individuals to feel positive or negative emotions when they use YouTube for entertainment, relaxation, or coping with their stress. Personal Integration Effects refer to the need for individuals to gain knowledge of individual credibility, trust, stability, and status, where they use YouTube as a medium to achieve some specific information that can help increase their knowledge. The Escapist Effect refers to the need for individuals to escape from reality or the stresses in their lives, where they use YouTube as a medium to experience a specific type of fantasy.

3.2 The Reliability, Quality and Comprehensiveness of Information in Videos about Agribusiness as a Source of Information on Youtube Platform

Table 4 shows that from the ten videos analyzed, three videos came from an agricultural channel, three from a culinary channel, two from a fisheries channel, and three from a livestock channel. From the evaluation of the comprehensiveness of the video, it is known that there was 1 video that received a score of 3, 2 videos that received a score of 4, 2 videos that received a score of 5, 2 videos that received a score of 6, and 3 videos that received a score of 7.

Table 4. Data Characteristics

Variable	Total (Frequency)	Total (Percent)
Source of release		
Agricultural channel	3	30%
Fisheries channel	2	20%
Animal husbandry cha	2	20%
Culinary Channel	3	30%
Video comprehensiveness evaluation		
Video with a score of 3	1	10%
Video with a score of 4	2	20%
Video with a score of 5	2	20%
Video with a score of 6	2	20%
Video with a score of 7	3	30%
Evaluation of video quality		
Video with a score of 3	3	30%
Video with a score of 4	3	30%
Video with a score of 5	4	40%
Evaluation of video reliability		
Video with a score of 2	2	20%
Video with a score of 3	3	30%
Video with a score of 4	3	30%
Video with a score of 5	2	20%

Source: Authors based on data characteristics

Based on the evaluation of video quality, it is known that three videos received a score of 3, 3 videos that received a score of 4, and 4 videos that received a score of 5. Based on the evaluation of video reliability, it is known that two videos received a score of 2, 3 videos that received a score of 3, 3 videos that received a score of 4, and 2 videos that received a score of 5.

Table 5. shows the highest number of views from the ten videos that were analyzed was 4,800,000 views, and the least number of views was 110,000 views, with a mean value of 1,657,700 (SD 1866656.015). The highest number of likes was 31,000 likes, and the lowest number was 1,200 likes, with a mean value of 11,020 (SD 10740.246). The highest number of dislikes was 5,700, and the lowest was 7, with a mean value of 1245.80 (SD 2057.678). The longest video duration was 23:05 minutes, and the fastest duration was 08:06 minutes, with a mean value of 14:44 (SD 05:22). For the video reliability evaluation, the highest score was four. The lowest was 2, with a mean score of 2.70 (SD 0.949). In the video quality assessment, the highest score was five, and the lowest was 4, with a mean score of 4.60 (SD 0.516). For the video completeness evaluation, the highest score was seven, and the lowest was 5, with a mean score of 6.30 (SD 0.675)

Table 5. Descriptive statistics data distribution

Feature	Maximum	Minimum	Mean	Std. Deviation
View	4.800.000	110.000	1.657.700	1866656,015
Like	31.000	1.200	11.020	10740,246
Disslike	5.700	7	1245,80	2057,678
Duration	23.05	08.06	14.44	05.22

Source: Authors based on IBM SPSS Statistics 26 application

Table 6. shows the results of the Spearman rank correlation analysis that was conducted, where the analysis results show that there is a significant correlation relationship between the number of likes and views (rho: 0.794, p = 0.006), likes and dislikes (rho: 0.685, p = 0.029), views and video reliability (rho: 0.657, p = 0.039), video comprehension and video reliability (rho: 0.677, p = 0.031). Highly significant correlation relationships were shown by the variables dislike and view (rho: 0.842, p = 0.002), video completeness and video quality (rho: 0.863, p = 0.001), and video reliability and video quality (rho: 0.888, p = 0.001).

Table 6. Result of the Spearman Rank Correlation Analysis

Variables	Rho	p-Value	Conclusion
Like and View	0,794	0,006	Significant
Like and disslike	0,685	0,029	Significant
Disslike and view	0,842	0,002	Highly Significant
View and video reliability	0,657	0,039	Significant
Video completeness and video reliability	0,677	0,031	Significant
Video completeness and video quality	0,863	0,001	Highly Significant
Video reliability and video quality	0,888	0,001	Highly Significant

Source: Authors based on IBM SPSS Statistics 26 application

4. Discussions

YouTube has changed the way we access information, including agribusiness information. YouTube is an entertainment platform and a valuable source of information for farmers, agricultural business owners, and individuals interested in agriculture and all related things. Duffett (2020) argued that there are three effects that influence viewers in accessing videos on YouTube, namely cognitive, affective, and personal integration effects. This argument matches the statement of Akbar (2018) who in his research also argues the same thing, where the

audience accessing videos on YouTube is influenced by cognitive, affective, personal integration, and cheering effects.

In this study, it was found that the majority of viewers interviewed were male with a percentage of 52% and female with 48%. This indicates that YouTube is a platform used equally by both genders in accessing information about agribusiness. In addition, most viewers were in the age range of 16-26 years, and the majority were private sector employees (34%), indicating that agribusiness YouTube shows have a significant appeal to young people with jobs in the private sector. Shoufan and Mohamed (2022) argues that YouTube viewers' interest in YouTube content is not gender-based but is related in terms of skill enhancement, competence, interest, motivation, engagement level, or exam performance. Buf and Ştefãniþã (2020) in their research revealed that there are significant differences between viewers based on their characteristics in accessing videos on YouTube.

Regarding the types of channels subscribed to by viewers, it is known that 30% of viewers subscribe to agricultural channels, 20% subscribe to fishery channels, 20% subscribe to livestock channels, and 30% subscribe to culinary channels. This shows that there is search variation in the content preferences of viewers on YouTube, with agricultural and culinary content being the most popular. Hosseinmardi *et al.* (2021) in their research stated that in choosing content, viewers tend to select those that match their interests. Variations in content preferences on YouTube can be related to the purpose of viewers accessing YouTube, where some viewers seek information and knowledge. In contrast, others seek entertainment, emotional support, or an escape from the daily routine.

Silaban *et al.* (2022) stated that YouTube provides various benefits to its viewers, ranging from education to entertainment that can be accessed at any time. In this study, cognitive effects were identified as the most dominant in influencing audience needs. This is aligned with a study by R. G. Duffett, Edu, and Negricea (2019) in which they found that cognitive effects in the pursuit of information and knowledge are key factors motivating users to access YouTube videos. In addition, affective effects, personal integration effects, and cheering were also found to impact audience needs in watching videos about agribusiness on YouTube. Regarding affective effects, Reif *et al.* (2020) in their study stated that deep emotions play an essential role in audience interaction with video content on YouTube. Zhang, Mishra, and Hirsch (2021) argued that personal integration and cognitive tendencies influence viewers' preferences in selecting and evaluating video content on YouTube. Overall, the results of this study show that YouTube has a strong appeal to audiences of different genders and ages. It also allows content creators to express themselves and meet the various needs of the audience, whether in terms of information, entertainment, or personal fulfillment.

YouTube has become one of the main sources of information in various sectors, including agribusiness. Silveira, Alves, and Raineri (2022) in their research, revealed that viewers use YouTube to access information about agribusiness quickly and easily. Anggraeni *et al.* (2020) stated that video as a medium to obtain knowledge or information has several advantages, including being able to reveal the actual state of a process, can be combined with text or images, has a replay feature that makes it easier for viewers to see images to focus more, is suitable for use as learning media. There is a combination of video and audio so that it can be faster and more effective in disseminating information.

This study analyzes the content of agribusiness videos uploaded on YouTube as a source of information. The results of this study provide an essential overview of the factors that influence the performance and user interaction of agribusiness videos on the YouTube platform and provide significant insights into the key parameters that influence video performance and audience interaction with agribusiness videos on the YouTube platform. Hariyani *et al.* (2023) stated that when using YouTube as a source of information, the content's validity and accuracy significantly impact how viewers make decisions. From the results of this study, it is known that in terms of the number of views, there is a significant variation between the number of views of all videos, with the highest number of views reaching 4,800,000 views, while the lowest number of views is 110,000 views. Irshad (2019) in his research, revealed that videos with a high number of views tend to have certain factors that influence their spread and popularity. This study found similar variations in terms of the number of likes and dislikes, where the highest number of likes reached 31,000 likes. In comparison, the lowest number of likes was 1,200 likes, illustrating the variation in the acceptance of video content by the audience. This funding aligns with research conducted by Baycan *et al.* (2023) where their study found data variations related to the number of likes and dislikes from the content analysis conducted.

The results of the rank-spearman correlation analysis showed some significant relationships between the variables studied. For example, there is a strong positive relationship between the number of likes and views, which can be interpreted as videos with higher likes tend to have a more significant number of views. In addition, there are significant correlations between the variables of likes and dislikes, views and video reliability, video

completeness, and video reliability. This suggests a strong relationship exists between these variables in the context of the videos analyzed. The highly significant correlations between the variables of dislike and view, video completeness and video quality, and video reliability and video quality indicate that these variables tend to influence each other in evaluating agribusiness video content on YouTube. The results of this study align with the results of research from Memioglu and Ozyasar (2022) where in their study, a significant correlation relationship was found between the variables of video completeness and video reliability.

Conclusions

This research shows that cognitive effects most influence viewers who access agribusiness videos on YouTube. They feel curiosity and need for knowledge on agricultural topics, such as the latest farming techniques, how to increase crop yields or solutions to agricultural problems. This indicates that YouTube serves as an essential source of knowledge in agribusiness. The results of the video content analysis show significant variation in user responses to agribusiness videos on YouTube, including the number of views, likes, dislikes, and video duration. Certain factors may influence the popularity and dissemination of such videos. There is a significant correlation between the variables observed in this study, such as the number of likes, dislikes, views, and evaluations of video reliability, quality, and completeness. This reflects the complexity of the interactions between these elements in influencing the performance of agribusiness videos on YouTube.

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Credit Authorship Contribution Statement

Desak Dwi Asthri Cahyani: Methodology, Formal analysis, Writing-original draft, Data curation, Validation.
Gede Mekse Korri Arisena: Conceptualization, Methodology, Funding acquisition.

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Features of Reforming Economic Legislation in the Conditions of Russian Aggression: Theoretical and Legal Aspects

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Abstract: *The aim of the article is to justify the inexpediency of the abolition of the Economic Code of Ukraine during martial law on the basis on the analysis of international legislation on management. Thus, the analysis of international codified acts on the economic sphere regulation shows that the abolition of the Economic Code of Ukraine does not correspond to the Concepts for updating civil and economic legislation as one of the ways of approximation of domestic legislation to international standards. Apart from that, based on the analysis of current Ukrainian and international legal acts, an attempt is made to explore the problems associated with the use of mechanisms for protecting rights to private property and bringing war criminals to justice for its destruction. Furthermore, the authors propose to improve the mechanisms for protecting the right to private property that is destroyed or damaged as a result of war crimes committed by Russian invaders on the territory of Ukraine. Finally, the authors highlight the key problems related to the restoration of the violated right to private property, which was destroyed or damaged as a result of hostilities on the part of Russia and emphasize the need to adopt international experience in order to increase the effectiveness of mechanisms for defending the violated right to property with the assistance of international legal institutions.*

Keywords: economic law; Economic Code of Ukraine; Civil Code of Ukraine; reforms; recodification.

JEL Classification: K00; K40; L40; A12; R11.

Introduction

The full-scale invasion of the Russian Federation into the territory of sovereign Ukraine, which took place on February 24, 2022, made significant and largely unexpected adjustments to the entire system of Ukrainian state-building. All components of a democratic society, including legal institutions, were under the threat of total

destruction. War crimes of Russian aggressors have caused considerable and irreparable damage to the economy of Ukraine. According to experts, the amount of economic damage caused reaches more than $700 billion. Analysing the damage caused by the Russians, Prime Minister of Ukraine Denys Shmyhal said: "According to our estimates, verified by the World Bank, the amount of damage caused to the Ukrainian economy is $350 billion as of June 1. By the end of the year, this amount will obviously double. We understand this as the destruction continues" (Interfax Ukraine 2022).

In the article "How the Ukrainian economy survived 2022", it is reported that according to the EBA survey, due to the hostilities business experienced a change in the working schedules (66%), a decrease in production (40%), and a partial closure of capacities (12%) (Zanuda 2022). Under such conditions, problems related to the regulation of property relations in the economic sphere arose with particular severity because a significant part of business entities were forced to leave the places of entrepreneurial activity and move to safer regions of Ukraine. This means that legislative activity in the economic sphere had to be carried out in such a way as to find the most effective and optimal solutions in response to the new challenges.

It should be considered that the regulation of economic activities did not remain without attention of scientists and practitioners, as evidenced by scholarly publications and draft laws in order to improve the regulatory framework of entrepreneurship. In this regard, it is essential to consider the polar views of representatives of different scientific schools. Thus, some of them believe that economic legislation is a simple combination of civil law and administrative law norms that operate in the field of management. This position is supported by Bratus, Halfina, Matveev, Shevchenko, Dovgert and others. At the same time, Mamutov (2004) and Pobirchenko (2013) express the opposite opinion. According to them, economic law is an independent branch of law.

Based on the provisions of the logical law of sufficient basis, we adhere to the views of scholars who believe that economic law is a complex branch of law that interacts with and is closely connected with other branches of law. Therefore, economic law combines the legal norms of the main branches of law; they have one subject of regulation - economic activity. However, on the day of writing this article, the Economic Code of Ukraine is in force, which regulates all legal relations in the sphere of economic activity. So, it is fundamental to adhere to the fact that the regulation of the sphere of management takes place within the regulatory framework of the Economic Code of Ukraine.

At the same time, we believe that in the new socio-economic conditions, economic legislation should be significantly improved in the areas of unification of certain provisions of contract law, property rights of a business entity (legal entities and citizens-entrepreneurs). In addition, it is necessary to remove from the Civil Code of Ukraine the provisions on the creation and registration of a legal entity (Subsection 2 (Legal entity) Chapter 7 (General provisions on a legal entity) (Civil Code of Ukraine, 2003). We are convinced that the reform of economic legislation should not be carried out by abolishing the Economic Code of Ukraine, but by developing new norms that reflect exclusively economic components, and supplementing it with provisions of other legislative acts, which are purely economic by their legal nature.

1. Materials and Methods

This section should be detailed enough that readers can replicate your research and assess whether the methods justify the conclusions. It's advisable to use the past tense – it's about what you did – and avoid using the first person. Ultimately, you should explain how you studied the problem, identify the procedures you followed, and structure this information as logically as possible to achieve the aim of the research, the authors used the relevant general and special methods. This approach contributes to the logical construction of expressed judgments, justified by the relevant scientific, theoretical, and practical conclusions. During the research, the authors adhere to the main principles of scientific knowledge, which are an active creative approach to the study of the subject of the research, an objective assessment of legal phenomena under study.

The laws of dialectics and logic as the basis of scientific research allow to combine legal science and law enforcement practice as components of the integral process of Ukrainian state-building based on the interaction of general philosophical and dialectical methods. The principle of determinism contributes to the study of the cyclical development of legislation in the economic sphere and helps the authors to generalize on the assessment of the processes of historical development of economic law. The practical aspect of this research consists in promoting the further development of economic law as the only correct form of regulation of legal relations in the field of economy.

Carrying out the selection of effective methodological tools, we determine the most relevant interpretation of this philosophical and legal concept. The method combines subjective and objective aspects of cognition. It is

objective because it allows to reflect reality and its relationships. Consequently, the method is a program of construction and practical application of the theory. At the same time, the method is subjective, since it is an instrument of the researcher's thought and includes its subjective features (Konverskyi, 2010).

The above explanation of the content of the concept of method reveals an unlimited scientific and practical field, which, on the one hand, is framed by normative boundary marks (an objective component), and on the other hand, it contributes to the formation of new logical and legal constructions (a subjective component), which, owing to the possibilities of scientific prediction (a hypothetical method), lead the researcher to new scientific horizons.

Regarding general scientific methods, it should be considered that as a system of principles and techniques, they have a common character for the field of jurisprudence, but do not have a clear regulation and to a greater extent they acquire signs of abstraction. Due to the universal qualities, the use of such methods provides an opportunity to refer to the conclusions of scientists of other fields who directly or indirectly dwelt on the issue under study. To properly describe the results of the study, among a significant variety of general methodological techniques, the methods of observation and comparison were chosen as components of the empirical research, as well as structural elements that form the system of methods of theoretical research (formalization, idealization, convergence from the abstract to the concrete, analysis, synthesis, induction, deduction, etc.).

The application of the method of observation allows to single out and assess certain features of legislative activity in the field of economy, while the method of comparison contributes to making reasonable conclusions about the need not only to preserve the Economic Code of Ukraine, but also to further improve legislation on legal relations in the business sphere. Due to the fact that the theoretical level of research facilitates a comprehensive analysis of the facts, the authors of this article try to obtain reasoned explanations for debatable issues that led to attempts to abolish the Economic Code of Ukraine on the basis of the provisions of the laws of logic and dialectics.

In this regard, the method of formalization contributes to the justification of the need to adopt new norms or to introduce and supplement the current legislation in order to eliminate the possibilities for speculation about the duplication of the legal framework of other branches of law by economic law. The use of the idealization method helps create a scientific conclusion, which, being derived from the current legislation in the economic sphere, indicates new ways and provide reasoned objections to supporters of the abolition of the Economic Code of Ukraine.

The reasoning from abstract to concrete as a general scientific method allows to formulate clearly author's conclusions and generalizations by providing definitions for the phenomena under study, given the socio-economic situation in Ukraine. The use of the analysis permits to distinguish new characteristics of the research subject since the course of the study provides for a comprehensive study of the study object (economic law), considering the special features of the conduct of entrepreneurial (economic) activity during the Russian aggression.

The method of synthesis is used to combine the components of the economic activity in Ukraine, the regulation of this sphere, and the influence of laws and by-laws adopted in the conditions of the Russian invasion in the economic sphere. The application of the inductive method allows to draw conclusions on the regulation of the economic sphere of Ukraine in conditions of war and to suggest measures for the improvement of economic legislation. The deductive reasoning helps present all the qualitative characteristics of the legal sphere of the state as a multiple integral concept on the basis of the theoretical and legal analysis of economic law in the system of law of Ukraine.

When analysing certain aspects of the reform of economic legislation, the special-scientific research methods are used, namely: formal legal, special legal, comparative legal, state legal modelling method, and the method of interpretation of legal norms. Thus, the application of the formal legal method facilitates the study of the relationship between the internal content of legal norms in the field of economy and the external manifestations of the influence of state legal institutions on the entire economic sphere as an integral legal phenomenon. This method also allows us to analyse the sources of law and therefore more fully characterize the legal field that needs to be modernised (reformed). In addition, it also permits to conduct a legal assessment of the activities of the state and legislators in establishing the constitutional foundations of law and order in the economic sphere, as indicated by Article 5 of the Economic Code of Ukraine (Konverskyi 2010).

The special legal method contributes to the establishment of external signs of the latest challenges in the economic sphere, requiring the improvement or change of the regulatory framework, which at this time regulates relations between the participants in the economic sphere. Moreover, the assessment of the level of interaction between the legislative support of relations in the economic sector and state bodies when applying the current

economic legislation deserves particular attention. Furthermore, the comparative legal method is aimed to justify the authors' conclusions on the necessity to resort to international experience in organising the regulation of the economic sphere, paying special attention to the EU experience.

The comparative legal method is applied in two states. At the first stage, it allows to compare individual institutions and legal phenomena related to the economic sphere in Ukraine and the EU countries. The second stage facilitates a new level of understanding of common features and differences in the legal regulation of the economic sphere in different countries. The generalization of the results assesses the legal measures taken to improve the situation in the economic sphere.

In addition, with the help of the method of state legal modelling, the features and changes in the organization of the economic sphere in the conditions of Russian aggression are explored. Besides, this method offers the structural model of the updated Economic Code of Ukraine. Finally, owing to the use of the method of interpretation of legal norms, it is possible to formulate new categories of economic law in order to expand the content of existing norms or suggest definitions of formally undefined concepts and categories of this sphere.

2. Research Results

2.1. Problematic Issues of Regulation of the Economic Sphere in Ukraine during Russia's Aggression

This section should present your findings objectively, explaining them largely in text. It's where you show how your results contribute to the body of scientific knowledge, so be clear and logical. And it's important not to interpret your results – that comes in the Discussions and Conclusions and Further Research sections.

You can base the sequence of this text on the tables, figures and graphs that best present your findings. Emphasize any significant findings clearly. Tables and figures must be numbered separately; figures should have a brief but complete description – a legend – that reveals how the data was produced. The unbiased assessment of the current state of regulation of economic processes, it is possible to affirm that the academic discussion on the role and place of economic law in the legal system of Ukraine has reached a new, war-adjusted level. It is necessary to take into account not only the desire of individual scholars to abolish the Economic Code of Ukraine, but also the objective socio-economic conditions, especially the fact that Ukraine is at war.

As it can be seen from the statistical and legal analysis conducted by the authors, scientists have completely changed their vision of approaches to determining the status of economic law as an independent, artificial or complex branch. The issue is set in a radically different plane: to distinguish or not the economic law, to cancel or to preserve the Economic Code of Ukraine in force. In this regard, it should be noted that the attack on economic law is most emphasized by the drafters of the Concept of modernization of the Civil Code of Ukraine within the framework of the recodification of the civil legislation of Ukraine (Working Group on Recodification (Renewal) of Civil Legislation of Ukraine, 2020). The working group on recodification (renewal) of the civil legislation of Ukraine was approved by the Resolution of the Cabinet of Ministers of Ukraine of 17.07.2019. No. 650 "On the formation of a working group on the recodification (renewal) of civil legislation of Ukraine" (Cabinet of Ministers of Ukraine 2019).

Without resorting to the logical and legal analysis of the scientific views of individual members of the working group, we believe that the position of a member of this group - People's Deputy of Ukraine, Chairman of the Verkhovna Rada of Ukraine, Doctor of Law, Professor Stefanchuk, which he expressed in an interview with Hryshanova, is the most significant one. Justifying the need to update the civil legislation, Stefanchuk notes: "First of all, Book One, which regulates the general provisions of the Civil Code of Ukraine, undergoes serious changes. We proposed to recognize the Economic Code of Ukraine as invalid since it does not meet the parameters of acts regulating entrepreneurial relations, which belong to private law by their nature" (Verkhovna Rada of Ukraine 2021).

We share the opinion of the Chairman of the Verkhovna Rada of Ukraine that the key element of the concept of "entrepreneur" is a private person. However, in the context of legitimate entrepreneurial activity, we are talking about the fact of a citizen's voluntary acquisition of the status of a business entity in accordance with the constitutional rights granted. At the same time, having assumed additional obligations to the state and having entered into an economic environment determined by the norms of law, such a citizen acquires additional characteristics that distinguish him/her from other members of society not engaged in the business sphere. It is these characteristics that do not allow full realization of private law relations since the imperative nature of the relationship "entity – state" excludes the opportunity for the entrepreneur to make his/her own decision, which is covered by the concept of dispositivity. Moreover, a citizen without the status of entrepreneur can dispose of his/her rights at his/her own discretion, observing the norms of legislation.

Hence, the reduction of economic legal relations to the sphere of private law, that is, those regulated by civil law, in our opinion, is not entirely correct because in this way the biding nature of the citizen-entrepreneur's obligations as an accountable and controlled person in connection with the performance of economic functions are levelled. An important circumstance that determines the attitude of scientists and legislators-reformers of civil legislation to the branch of economic law is the preparation of relevant draft laws aimed at abolishing the Commercial Code of Ukraine. First of all, it is necessary to consider the Draft Law of Ukraine No. 6013 of September 9, 2021 "On the peculiarities of regulation of business activities of certain types of legal entities and their associations in the transition period" (2021). It was adopted as a basis on 12th of January 2023, at the plenary session of the Parliament.

Part 4 of the Final and Transitional Provisions of the Draft Law proposes "to recognize the Economic Code of Ukraine as invalid from the date of entry into force of this Law" (Economic Code of Ukraine 2003). Part 3 of this section of the Draft Law provides that Articles 4-19 of this Law "shall expire after seven years from the date of entry into force of this Law" (Economic Code of Ukraine 2003). So, to resolve issues related to the regulation of the economic sphere, the legislator establishes a transitional period of 7 years. However, the legal analysis of the text of the Draft Law conducted by the authors, such a period is not motivated by anything, which raises doubts about this document being based on verified financial and economic calculations.

In paragraph 3 "General characteristics and main provisions of the Draft Law" of the Explanatory Note to this Draft Law, it is noted that the Economic Code of Ukraine is subject to cancellation due to the fact that "its provisions mostly do not have a regulatory effect, are declarative in content, and also contradict other normative legal acts and general principles of civil legislation". However, the authors believe that such arguments for the abolition of a codified legal act cannot be perceived as a sufficient basis. Therefore, the authors of the Draft Law endow the Economic Code with those qualities that make it dependent on civil legislation without providing sufficient convincing arguments. According to the provisions of the Constitution of Ukraine, all normative legal acts are adopted on the basis of the Basic Law and should not contradict it (the authors' interpretation of Article 8 of the Constitution of Ukraine.

Moreover, the Economic and Civil Codes have different subjects of regulation although they interact very closely in the practical implementation of the obligations by the economic entity stipulated by the law. This interrelation of two codified acts in no way implies or establishes the subordination of the Economic Code to the Civil Code. Therefore, it is disturbing that the authors of the Draft Law in the Explanatory Note, among the goals and objectives, define the following: changes envisaged by the Draft Law of Ukraine during the transition period aimed at improving corporate governance in legal entities based on state and communal property; increasing the investment attractiveness of the country; introducing effective mechanisms for controlling the use of state and communal property; and eliminating contradictions between the Civil Code of Ukraine and acts of special legislation.

As seen from the quoted paragraph, the legislator generally does not address issues related to the settlement of legal relations of subjects within private law. At the same time, unreasonable extrapolation of tasks and obligations of legal entities of state and communal forms of ownership to representatives of the private legal part as part of economic legal relations will further introduce confusion in the organization of regulatory activities. Summing up this subsection of the article, it is necessary to point out the most significant drawback of the Drat Law. It lies in the fact that the legislator did not consider the obvious features of the regulation of the economic sphere in connection with the enormous damage caused by military actions to the economy of Ukraine, having passed it in the first reading as a basis (the vote took place on January 12 2023), that is, on the tenth month of the heroic fight of the Ukrainian people with the Russian invaders.

2.2. Analytical and Legal Review of the Ukrainian Legislation on Economic Relations

Developing a professional discussion around the Economic Code of Ukraine, it is necessary, in our opinion, to dissociate ourselves from all scientific schools and focus on the state interest because the priority tasks for any legislative activity is to completely satisfy the demands of society in effective and transparent legal acts that would serve as effective tools in the processes of regulating the relevant spheres of life. Moreover, the provisions of the Constitution of Ukraine recognize a person as the highest social value, and the state is responsible for the results of its activities, according to Article 3 of the Basic Law of the state. This means that when forming, changing or improving legislation, it is necessary to ensure a balance between private and public interest, which is another argument in the discourse on the prevailing importance of civil law. As is known, the state equally protects the right of state, communal, and private property.

At the same time, revealing the content of this part of the article, we turn to the commented Draft Law of Ukraine, which is supposed to recognize the Economic Code of Ukraine as invalid. We refer to the key terms of the document and consider it appropriate to analyze the semantic meaning of individual categories. Defining the task of recodification (renewal) of civil legislation, the authors of the Draft Law use terms that by their semantic meaning lead to conclusions opposite to those laid down in the analyzed document. Supporting "the need for a comprehensive settlement of the problem of the legal status of enterprises, as well as the property basis for ensuring entrepreneurial activity", the authors of the Draft Law provide for the following:

▪ the implementation of the best corporate governance practices in the legislation of Ukraine, in particular in terms of determining the duties of officials of legal entities;

▪ the implementation of effective and market mechanisms for controlling the ownership and management of objects of state and communal property by newly formed organisations and institutions in the civil legislation of Ukraine.

The logical and semantic analysis of the term "implementation" is carrying out international obligations at the domestic level, as well as a specific way of incorporating international legal norms into the national legal system (Lukianiuk 2023). So, based on the semantic meaning of the term "implementation", it is possible to conclude that legislative activity should contain a component of the creation, development and improvement of existing legislation by including certain international legal norms in domestic legislation, that is, not the abolition of existing laws, but their addition to the domestic legal system.

Meanwhile, when formulating the tasks of updating civil legislation, the legislator makes a logical mistake, namely: speaking about the creation, development and improvement of the law, the legislator proposes to recognize that law as invalid (Derevianko 2021). Such approaches are unacceptable from the point of view of law-making techniques. This study would not have been complete if the opposite point of views were not analysed. This concerns ways to improve the economic law of Ukraine, which is summarized in the Concept of modernization of the economic legislation of Ukraine (n.d.). Meanwhile, it is essential to pay attention to the fact that this document, which was developed by business scientists in 2019, has not been widely circulated, and its provisions are covered only in the scholarly works. In order to justify the need to improve economic legislation, the authors of the Concept consider the following main factors:

▪ currently, more than 300 basic laws operate with the terminology from the Civil Code of Ukraine (for example, entity, economic activity, etc.) and contain norms that directly correspond to the provisions of the Civil Code of Ukraine; more than 40 basic laws contain a direct reference to the Civil Code of Ukraine;

▪ there is a positive experience of European countries where economic (commercial, entrepreneurial, trade) codes are adopted;

▪ there is a need to adapt the economic legislation of Ukraine to the EU law and improve national legislation in accordance with the obligations defined by the Association Agreement with the EU;

▪ there is a need to increase Ukraine's position in the World Bank's "Doing Business" rating, among the indicators of which stability and modernization of economic legislation are taken into account, etc.

At the same time, the authors insist on maintaining codification as the most effective form of regulation of legal relations in the economic sphere. Assessing the importance of this document, it should be noted that during the Russian-Ukrainian war, it is especially important to prevent chaos and violation of established norms of economic activity because such a radical change in the systemic foundations of entrepreneurship can demonstrate the opposite effect, which could result in additional damages to the economy. Due to the fact that the proposals of the authors of the Concept to improve the current economic legislation are soft tools for influencing the business environment, the introduction of changes and amendments, taking into account the martial law, will receive a positive response from business entities.

The authors' selective monitoring of the legislative framework of the European Union countries showed that legal relations in the economic (entrepreneurial) sphere are regulated by sectoral codified acts. The list of such countries includes Austria, Belgium, Estonia, Latvia, Spain, Liechtenstein, Luxembourg, Malta, Monaco, the Netherlands, Germany, Portugal, Slovakia, France and the Czech Republic, where commercial or economic codes operate. It should be noted that in Germany, paragraph 11 of Article 74 of the Constitution of the Federal Republic of Germany "Economic law" is attributed to the areas covered by legislative competence. Therefore, it is necessary to state that under the conditions of martial law the liquidation of the Economic Code of Ukraine is inappropriate and will cause harm to the legal system of Ukraine.

3. Discussions

Domestic legal scholars have been working on the problems of improving economic legislation for more than thirty years, participating in the development of the first legislative acts (decrees). They are Dzhabrailov, Malolitneva, and Hudima (2018), Zadykhailo (2012), Poliukhovych (2019), Derevianko (2021), Sakhatskyi (2006), Hryhorchuk (2016), Ustymenko (2021), Mamutov (2004), Pobirchenko, etc. Despite the fact that the researchers held different views on the content, structure and form of the codified act in the field of economy, their contribution to the development of the sphere of regulatory and legal support of economic activity cannot be exaggerated.

However, within the scope of this article, we are guided by the well-known legal positions of scholars of different time periods of Ukraine's independence since there is a wide scope of scientific knowledge. We were forced to distance ourselves from the assessments of scientific and legal work due to the fact that the above information reflects opposite points of view on the situation in the field of regulatory support for economic activity. We will refer to the achievements of some of these researchers in this article as the basis for justifying the authors' conclusions. Therefore, it is advisable to make reasoned arguments that indicate the impossibility of levelling the special status of the participation of a citizen in the entrepreneurial sphere. To this end, we resort to the scientific heritage of well-known Ukrainian legal scholars in the field of economic law.

Thus, Zadykhailo (2012) notes that the chronology of the development of economic law has its historical roots. In such well-known codes of ancient laws as Justinian's Code, "Ruska Pravda", the Lithuanian Statute, there are some provisions concerning the joint conduct of trade affairs, the liability of debtors to creditors, bankruptcy, etc. Hence, it is possible to conclude that economic law, although it arose after the formalization of civil law, has its own genesis, the process of its formation and development is traced. Therefore, the opinion of some scientists that economic law is an artificial branch of law, which duplicates the norms of other laws is erroneous.

We agree with the opinion that economic law has its roots in public law, that is, it uses terms and categories inherent in ancient, codified norms to establish intra-sectoral relations. Such knowledge gives the researcher the right to conclude that economic law is part of general public law. On this basis, an indisputable conclusion can be drawn that the root of economic law is public law (Hryhorchuk 2016). Moreover, in the article "Problems of modernization of economic legislation", Dzhabrailov, Malolitneva, and Hudima (2018) believe that the expediency of amending the Economic Code of Ukraine should be determined not only by the fact of preparing a separate law that will regulate economic relations, but also by the results of a preliminary analysis of its regulatory impact on the sphere of economic relations.

Furthermore, Sakhatskyi (2006) claims that the main sphere of modernization is the system of economic legislation, which should be carried out in the following directions: the adaptation of national legislation to the European law; the stimulation of integration processes; the improvement of state control; the improvement of product quality; the development of technical and technological systems; the wide introduction of innovative technologies; fair trade; the promotion of competition and others.

Poliukhovych (2019), examining the issue of recodification of economic legislation, notes that if we resort to foreign experience, the separation of economic, commercial, entrepreneurial relations from the sphere of civil regulation into a separate branch of regulation has a long history and was implemented both at the theoretical level by substantiating the doctrine of dualism of private law, and in practice by adopting a number of commercial and economic codes in continental countries of Europe.

Apart from that, carrying out a detailed analysis of the scientific and practical situation around the question of the abolition of the Economic Code of Ukraine, the authors consider it appropriate to voice the official position of almost all scientists listed among those who conduct scientific activities in the field of economic law. In this regard, we present certain provisions from the Scientific Expert Opinion to the Concept of Updating the Civil Code of Ukraine (Ustymenko 2021).

Considering the composition of the Coordination Bureau on the legal foundations of entrepreneurial activity, economic and commercial law of the Department of Environmental, Economic and Agrarian Law of the National Academy of Legal Sciences of Ukraine (Ustimenko, Bobkova, Shcherbyna, Vinnik, Zadikhaylo, Podtserkovnyi, Dzhabrailov, Zeldina, Shapovalova and others), it is impossible to disagree with their arguments regarding procedural violations when presenting the Concept. Among the most significant ones are the following:

▪ The Concept has the character of the scientific opinion of individual scientists who have not passed scientific peer review, and the proposals for the abolition of the Civil Code of Ukraine contained in the text of the Concept were not discussed by the Working Group in the prescribed manner, and representatives of ministries and other central executive bodies were not involved in the analysis of the prospects for its implementation;

▪ The concept has not been submitted to the Verkhovna Rada of Ukraine and has not been approved by it, and therefore cannot be considered a conceptual basis for the adoption of any draft laws;

▪ further discussions on the Concept takes place within the framework of the Working Group whose activities are not properly legitimized;

▪ the idea of abolishing the Civil Code of Ukraine, proposed by the Working Group created by order of the Chairman of the Verkhovna Rada of Ukraine of 28.07.2020 No. 260, contradicts paragraph 21 of the Plan of legislative work of the Verkhovna Rada of Ukraine for 2020, which provided only for the transfer of certain provisions of the Economic Code of Ukraine to the Civil Code of Ukraine.

Conclusions

Understanding the social significance of economic law is crucial when it comes to the question of the very existence of the Economic Code of Ukraine. However, given the status of the authors of the Draft Law of Ukraine, which proposes to abolish the Economic Code of Ukraine, this document will still be voted on in the Verkhovna Rada of Ukraine, and therefore this code will expire. It is possible to make legal predictions about the results of such activities, but only history will determine whether such a decision was correct or erroneous.

The material presented in the article demonstrates the real state of affairs in the process of the elimination of economic law of Ukraine as a branch of law. The published scientific positions, having a narrow sectoral character, affect almost all social relations since the sphere of economic activity is part of the general social process. That is why the decision to abolish the Economic Code of Ukraine will be fateful for all participants in the economic sphere, since the Draft Law of Ukraine "On the specifics of regulation of business activities of certain types of legal entities and their associations in the transition period" does not resolve a number of issues that will inevitably arise when applying more than 400 regulatory legal acts that directly or indirectly regulate legal relations of a commercial nature.

At the same time, considering the new socio-economic challenges associated with hostilities, lawyers do not stop working on improving economic legislation. We are convinced that this article will have a double effect. On the one hand, we presented a warning about the inexpediency of radical changes in approaches to organizing legal support of the economic sphere. On the other hand, it is proposed to implement primary measures to prevent chaos in the business environment during the heroic defence of the Ukrainian state from Russian invaders.

The selective logical-right monitoring of international legislation showed that in most European countries the issues of entrepreneurship and the sphere of management as a whole are regulated by separate codified acts. It is for these reasons that we call for a revision of scientific positions in approaches to assessing the role and importance of economic law in the system of law of Ukraine. We believe that the path to reforming economic law in the conditions of Russian aggression, chosen by individual scientists who are not experts in economic law, leads to the destruction of economic law as an area of the Ukrainian law. Such actions can have unpredictable consequences in terms of the impact on the economic situation in Ukraine.

Credit Authorship Contribution Statement

Anatolii Y. Shevchenko: write the contribution of first author choosing the relevant actions, but not limited to: Conceptualization, Investigation, Methodology, Project administration, Software, Formal analysis, Writing – original draft, Supervision, Data curation, Validation, Writing – review and editing, Visualization, Funding acquisition.

Serhiy M. Vykhryst: write the contribution of the second author choosing the relevant actions, but not limited to Conceptualization, Investigation, Methodology, Project administration, Software, Formal analysis, Writing – original draft, Supervision, Data curation, Validation, Writing – review and editing, Visualization, Funding acquisition.

Iuliia Ostapenko: write the contribution of the third author choosing the relevant actions, but not limited to Conceptualization, Investigation, Methodology, Project administration, Software, Formal analysis, Writing – original draft, Supervision, Data curation, Validation, Writing – review and editing, Visualization, Funding acquisition.

Svitlana V. Bobrovnyk: write the contribution of the fourth author choosing the relevant actions, but not limited to Conceptualization, Investigation, Methodology, Project administration, Software, Formal analysis, Writing – original draft, Supervision, Data curation, Validation, Writing – review and editing, Visualization, Funding acquisition.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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An Empirical Study on Developing the Tourism Potentials of Fairs and Festivals in Odisha in India

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Abstract: *Numerous studies on the appeal of tourist sites have been done. However, little study has been conducted on festival attractiveness and its effect on place attachment. This study adopted a mixed-methods strategy to examine the festivals in Odisha. Travel and tourism have become essential economic activities throughout the world in this globalization market. Festivals have recently grown in number, variety, and popularity, making them one of the strongest parts of the tourism industry. During tourism activities, tourists pay close attention to how attractive something is. The festival's appeal is one of the most important things that determines whether or not a tourist will go and take part in activities. Also, the appeal of a festival can makes tourists more likely to come back, which is the key to the success of festival activities. This paper sought to determine the role of tourism as a long-run economic growth mechanism in Odisha. The Government of Odisha promotes tourism, but the focus remains on the golden triangle, which includes Puri, Konark, and Bhubaneswar. Without a doubt, these locations are well-equipped to meet the needs of both domestic and foreign tourists. Other beautiful places in Odisha still are largely unknown to tourists. In this paper, we try to demonstrate the overall importance of various fairs and festivals for the development of tourism and relate the significance of fairs and festivals.*

Introduction

India's services sector has been bolstered by the rise of the country's tourism industry. A wide range of natural beauty sites may be found all over India due to a country with diverse topography and a rich cultural and historical legacy. Our country believes in ideology and is known for lavishly treating all visitors, regardless of origin. Tourists are drawn to visitor-friendly traditions, diverse habits and traditional culture, and vibrantly coloured fairs and festivals. Much more is assumed and recognized about Odisha's heritage, but the majesty of heritage can only be understood by trying to visit the wonderful state. Exotic landmarks, music, dance forms, paintings, cuisines, and soon all contribute to its heritage.

Odisha's rich histories, as well as its cultural and geographical diversity, contribute to the state's broad and diverse tourism appeal. Odisha tourism is unique and fascinating, but it is still undiscovered by tourists. It is filled with magnificent temples and exceptional monuments are home to several renowned skilled artisans and have beaches, wildlife sanctuaries, and beautiful environments of dazzling beauty. Odisha's entire districts dotted with many places of religious and secular interest and avast wilderness of serene beauty, spiritual panoramic view,

and spectacular, peaceful, and precious contemplation. It's a great place for nature enthusiasts and is also reasonably priced. Winter is a great time to visit his location.

Globalization has given marketing tourist attractions a whole new definition, as countries, regions, and independent attractions compete for investment and visitors. A destination is a town, city, or location that has one or more tourism products or attractions. These products or attractions can be fascinating, scenery, heritage, recreational activities, shopping, rebates, food, or excursions. As a result, festivals and events can be seen as key economic developer tools in the framework of tourism destinations. To improve the state's tourism industry, we need to review and adjust multifaceted tactics while businesses gradually reopen. Tourism-based fairs and festivals are coming back to the foreground, which will speed up the processing time and have a greater impact.

1. Literature Review

The literature is replete with explanations of the relationship between tourism expansion and a country's real economic growth Jamel (2020), Rasool *et al.* (2021), Ullah *et al.* (2023). Over the years, many studies have described Odisha as the heart of Incredible India and is widely regarded as a cultural or heritage tourism destination. It is a state that has almost every type of attraction to keep a tourist entertained Panigrahi (2005), Mohapatra (2011), Sahu (2013) and Chaudhury *et al.* (2022) examines the growth and performance of the Odisha tourism sector. It is a comparison of the number of tourists who visited Odisha. To investigate the concept and development of rural tourism in Odisha, Mohanty, (2014) and Mohanty *et al.* (2019) summarized the impact while describing the challenges and difficulties and focused on the development of a strategic marketing plan for rural tourism Mohanty (2016). It also shed light on the government's rural tourism development project and policies.

Parida S.K., (2015) and Mohanty and Samal (2023) emphasized the image of the destination and its financial advantages to the tourism industry, with particular reference to Odisha. Mishra *et al.* (2016) explore the effect of tourism on Odisha's development. Favorable tourism contributes to Odisha's economic sector and suggested that the Odisha government develop more policies and plans to promote tourism for sustainable growth. Mohanty, (2017) conducted a tourism study in the Koraput district of Odisha and discovered that despite having rich natural resources and scenic beauty, it has not been able to capture the attention of tourists Pasayat (2012). However, the relationship between tourism expansion, governance quality, and economic growth has been few and far between.

The empirical literature provides sample support for the tourism-led growth hypothesis in both developing the potential of tourism. Suhel and Bashir (2018), and Khan *et al.* (2020) provide empirical evidence in support of tourism expansion's positive impact on a nation's real economic growth. Festival Tourism, a type of festival activity with tourism value and tourist industry advantages, can bring substantial economic, cultural, and social benefits in a short amount of time if run successfully. Among these advantages, the cultural and economic functions are enormous. Culture is the festival's soul, and the economy is its life blood Zhang (2022) and Rasoolimanesh and Lu (2023). These two elements are inextricably linked. Festival tourism is an important part of today's tourism activities. The majority of people will travel to attend a festival. As a result, festival tourism activities can be planned promptly, assisting the area in becoming one of the top destinations. To attract tourists to the local culture, festival tourism has played a major role in improving urban functions and shaping the image of the city. If the event caters to visitors from other generating zones, as well as the opportunity for grants and sponsorships, either directly or indirectly, it can produce a considerable quantity of immigration, according to Getz (1997). A kaleidoscope of planned cultural, sporting, political, and business occasions: from mega-events like the Olympics and world fairs to community festivals; from programmes of events in parks and attractions by dignitaries and intergovernmental assemblies from small meetings and parties to huge conventions and competitions, according to Goldblatt (2002). For Bachleitner and Zins (1992), festival tourism boosts resident's educational attainment, develops a sense of communal pride, and aids in the formation of many medium-sized or small-scale family enterprises. Many different types of festivals are held throughout the year, but Falassi (1987) says that a cultural festival is one in which everyone in the community... participates directly or indirectly and to different degrees. In the words of Hall (1992), important events are regarded to be capable of attracting economic advantages. Economic analysis of events provides an aspect of why events are held and the impact they have on an origin. The societal effects, on the other hand, may not be as readily apparent as their economic counterparts. Communities employ these events to enhance tourism during the low or off-season, while others focus on weekends to attract leisure travellers, says Lugosi (2007). Host destinations pride themselves on presenting their culture. The needs of the guest, the location, and the host community must all be taken into consideration when planning a trip Usakli, and Seyhmus (2011), Obradović and Tešin (2023).

2. Fair and Festivals in Odisha

Fair and Festival in Odisha has increased dramatically in recent years as a result of the state's various attractions. Lord Jagannath is the most revered deity in the state, and he is the subject of numerous festivals. The most notable of these is the annual Rath Yatra (Chariot Festival), which attracts tens of thousands of visitors to the Puri Dham to witness the deities' blissful procession. Festivals play an important role in Indian culture and tradition. The same is true for Odisha. While many people believe that Odisha is only about Rath yatra, the state celebrates a lot more than that. It is best if we know what kinds of things are done during those festivals. We must ensure that they are significant and have an impact on the culture and traditions of the people involved. We define here some of the festivals in Odisha to help a better understanding and knowledge.

The Chhau festival is an important and well-known festival in Odisha. Kalinga Mahotsav isyet another popular festival celebrated by the people of Odisha. The Sitalsasthi Carnival, despite its unusual name, is a very popular festival that is celebrated in the form of a carnival. Dance is a very important cultural form of art in Odisha, which is why the Konark Dance Festival is so important. While it is commonly known as Raksha Bandhan throughout the country, it is known as Gamha Purnima in Odisha. Makar Sankranti is another well-known festival observed throughout Odisha. Each region around it celebrates it in their unique way. Another popular festival in Odisha is the Chandan Yatra, which is celebrated with greatenthusiasm and joy. Ganesh Chaturthi is a well-known festival celebrated throughout the state of Odisha. According to the Odia calendar, the new year is celebrated as Maha Bisuva Sankranti. It is also referred to as Pana Sankranti. The Hingula yatra is another popular festival in Odisha that is celebrated throughout the state. The festival honours and worships Shakti and is performed as a Shiva puja. The Rajoparba is observed for four days in a row. The festival's main goal is to focus on agricultural festivals while allowing the Goddess to rest. Apart from these lot more festivals are celebrated in Odisha.

3. Methodology and Constructed Hypothesis

These theoretical constructions must first be operationalized to empirically test the theoretical models hypothesized in this study. As a result, a set of elements is required to measure the conceptual model's structures. Tourist satisfaction with facilities, organisers, comfort amenities, information availability, convenience, and programmes should be specifically chosen or developed to tap the conceptual field of theoretical constructions as thoroughly as possible. The following sections describe how these structures can be used.

Figure 1. Conceptual Frame Work of the Study
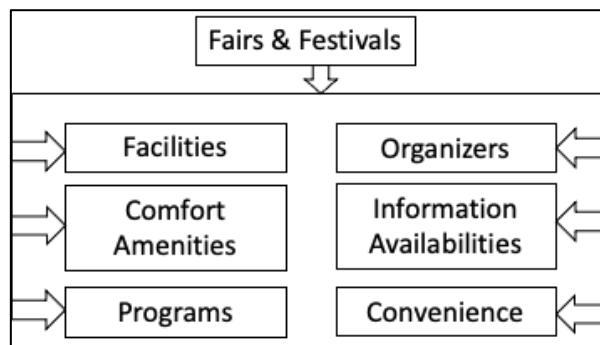
The said model is constructed for Fairs and Festivals for developing Tourism Potential. In this model, we have constructed a questionnaire with six major categories. Each category has a different number of appropriate questions. The categories are i) Facilities with the number of questions ix, ii) Organizers with the number of questions ix. iii) Comfort Amenities with the number of questions four, iv) Information availability with the number of questions three, v) Convenience with the number of questions five, vi) Programs with the number of questions four. In this model, we want to demonstrate the overall and individual parameter-wise satisfaction based on the demographic profiles of tourists. We also explore the relation of each parameter of the model.

Figure 2. The Empirical model of the Study
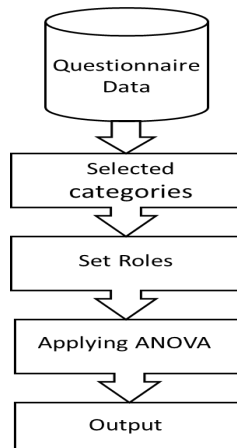
The above model is constructed for empirical analysis of collected data through our questionnaire. Here we did a total of five steps first, we took the collected data and then we selected major categories, that define in the conceptual model. After that, we selected the dependent and independent variables for applying one-way ANOVA for our analysis to prove our hypotheses.

4. The Objective of the Study

▪ To identify the contribution of fairs and festivals to culture and tourism.

▪ To explore the history of the fairs and festivals organized/celebrated in the stated region of the state and record their uniqueness as well as attractiveness amongst the visitors.

▪ To explore the facilities available for tourists and to study the satisfaction of visitors.

▪ To demonstrate the importance of various fairs and festivals for the development of tourism and relate the significance of fairs and festivals to the development of tourism potential.

5. Hypothesis Constructed

H1o: There are no significant differences between the opinions of tourists for overall satisfaction based on their demographic profiles.

H1a: There are significant differences between the opinions of tourists for overall satisfaction based on their demographic profiles.

H2o: There is no significant impact on the facilities, organizers, comfort amenities, information availability, convenience, and programs of tourists for overall satisfaction based upon their demographic profiles.

H2a: There is a significant impact on the facilities, organizers, comfort amenities, information availability, convenience, and programs of tourists for overall satisfaction based upon their demographic profiles.

Figure 3. Flow Diagram of Hypothesis
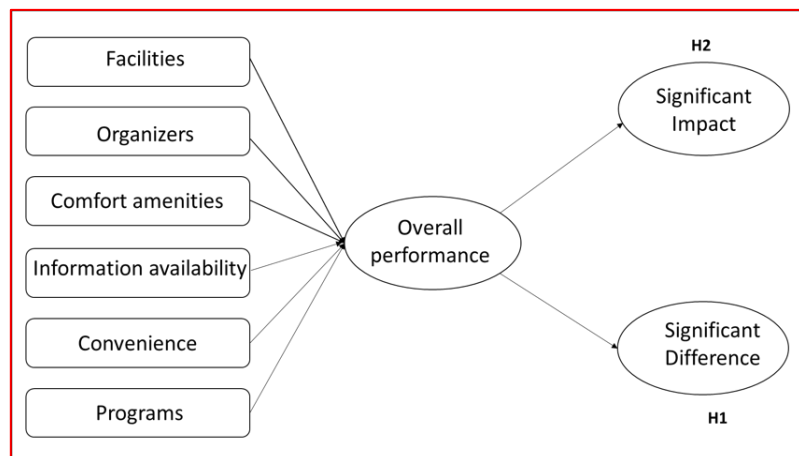
We have taken six major categories for constructed hypotheses and each category bears multiple questions, which have been discussed in the previous section. We designed our hypothesis in two parts, first overall performance combined with all six categories then it measures the significant difference with a hypothesis (H1). Secondly, we have designed a hypothesis (H2) with all criteria and tried to find out their impact.

6. Data Collection

This study involves the collection of primary data through our survey and interviews. We surveyed with our designed questionnaire the organizers of the Fairs and Festivals, tourists, and other local people of mostly Bhubaneswar and other places of Odisha. Our questionnaire is designed with six major parameters and each parameter has several questions on seven-point Likert Scales. We have collected sample data of 878 as per random sampling.

7. Data Analysis and Demonstrated Hypotheses

This empirical study explained the data analysis and proved the hypothesis in statistical analysis using PCA and ANOVA.

8. Statistical Analysis Method

The Mathematical formulas, models, and techniques used in the statistical analysis of raw study data are statistical methods. The use of statistical methods derives information from surveys and various interviews to the assessment of the robustness of the results. In this process first, we did the factor analysis to calculate the weightage of the selected factors then calculated the pilot test and the sample size to collect the data through our questionnaire. After that, we used ANOVA to measure the differences between tourists' opinions for overall satisfaction based on their demographic profiles and the impact of all factors on the opinions of tourists for overall satisfaction.

9. Demonstrated Hypothesis

Here we prepared two steps for proving the hypothesis. In the first step, we did Principal Component Analysis (PCA), and in the second step, we did an ANOVA test. As per the following table PCA Table-1, the factors, that we used as per our questionnaire i)"Q1: Facilities", ii)"Q2: Organizers", iii)"Q3: Comfort Amenities", iv)"Q4: Information availability", v)"Q5: Convenience", and vi)"Q6: Programs".

After Principal Component Analysis (PCA) we got all factor's eigen values are quite good and all are greater than 0.7 of significant value than the following Scree Plot (Figure3) is also quite good. So, we can consider all factors for our further ANOVA test to demonstrate our hypothesis. The hypothesis (H1) has demonstrated in the 5.2.2 subheading.

10. Demonstrated Hypothesis

After PCA we can observe the data reliability of statistics and statistics scale. In the reliability of statistics, Cronbach's Alfa is 0.833, which indicates a very good level of data reliability. In the Statistics scale mean is 24.05, and the standard deviation is 4.976, also good for all six criteria of the questions.

Table 1. Correlation Matrix

SI.	Eigen value	Difference	Proportion	Cumulative
Eigen values of the Correlation Matrix				
1	2.37686435	1.26486114	0.3961	0.3961
2	1.11200321	0.18203263	0.1853	0.5815
3	0.92997058	0.24691389	0.1550	0.7365
4	0.88305669	0.19394844	0.1138	0.8503
5	0.98910825	0.08011134	0.0815	0.9318
6	1.40899692	0.26203263	0.0682	0.4821

Figure 4. Scree plot of PCA
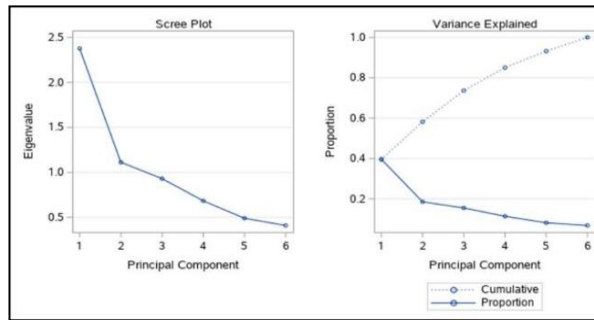
In the above Table (Table 1) we can observe the reliability of the Eigen value, which is very important for data validation. Here we can see all six criteria's eigen values are greater than 0.7, which is significant in reliability. So, we can say our data is very good reliability in Cronbach's Alfa and eigen values for analysis. The Scree plot of PCA and Component Scores Matrix is also shown very well in figure 4 and figure 5.

Figure 5. Component Scores Matrix of PCA
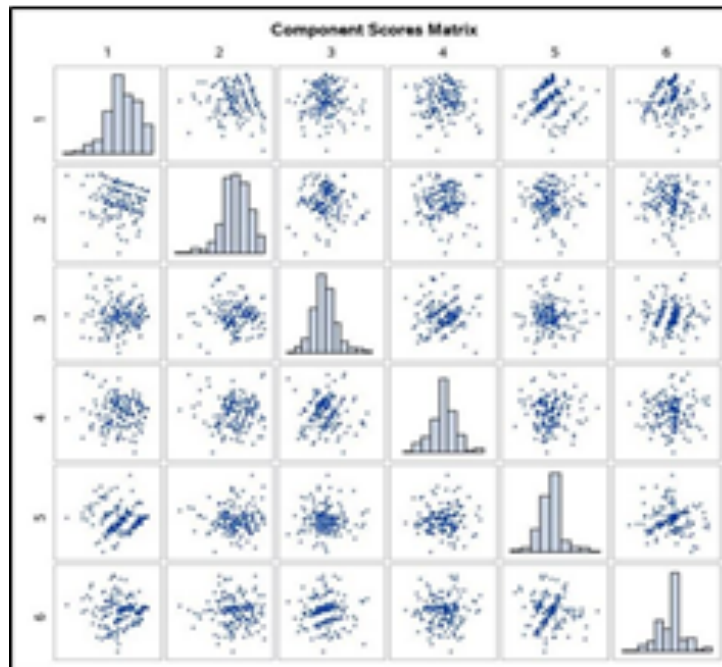
10.1 Hypothesis H1

Table 2. ANOVA table of Hypothesis H1

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	61.498832	12.299766	15.23	**<.0001**
Error	1254	1012.928946	0.807758		
Corrected Total	1259	1074.427778			

In the above ANOVA table (Table 2) we can observe the p-value is less than 0.0001 is significant, the following fit diagnostic of hypothesis (Figure 5), and the box plot of hypothesis also quite well. So, we can say our model is good, which is very important for said analysis.

Figure 6. Fit Diagnostics of hypothesis H1
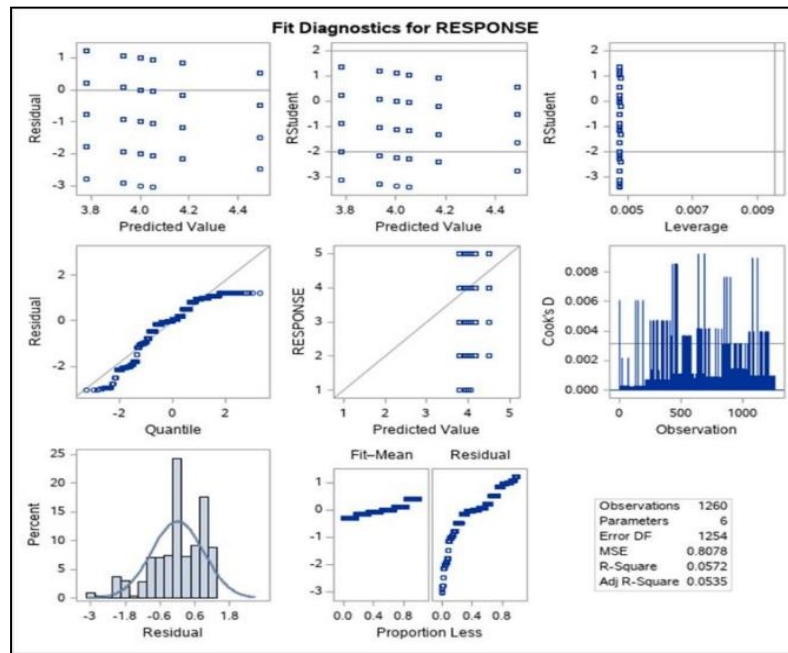
As per the above ANOVA Table 2, the "F" value is 15.23, which is quite good and the "P" value is less than 0.0001, which is also less than 0.05 significance. The fit diagnostic (Figure 6) shows the Mean Square Error (MSE) is 0.8078, R-Square is 0.0572, and the Adjusted R-Square is 0.0535 these values are also pretty good and acceptable. So, we can prove our hypothesis. The null hypothesis "**H1o: There are no significant differences between the opinions of tourists for overall satisfaction based upon their demographic profiles**" is rejected, whereas the alternative hypothes is "**H1a: There are significant differences between the opinions of tourists for overall satisfaction based upon their demographic profiles**" is accepted. It is inferred that there is a significant impact, and it also means that there is a sign of the overall satisfaction of visitors / tourists based on their demographic profiles for Fairs and Festivals in Odisha.

10.2 Hypothesis H2

Table 3. ANOVA table of Hypothesis H2

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	22	264813.7361	12036.9880	4.44	**<.0001**
Error	187	506918.7639	2710.7955		
Corrected Total	209	771732.5000			

In the above ANOVA table (Table 3) we can observe the p-value is less than 0.0001 is significant, and the following fit diagnostic of the hypothesis (Figure 7), is also quite well. So, we can say our model is good, which is very important for said analysis.

Figure 7. Fit Diagnostics of hypothesis H2
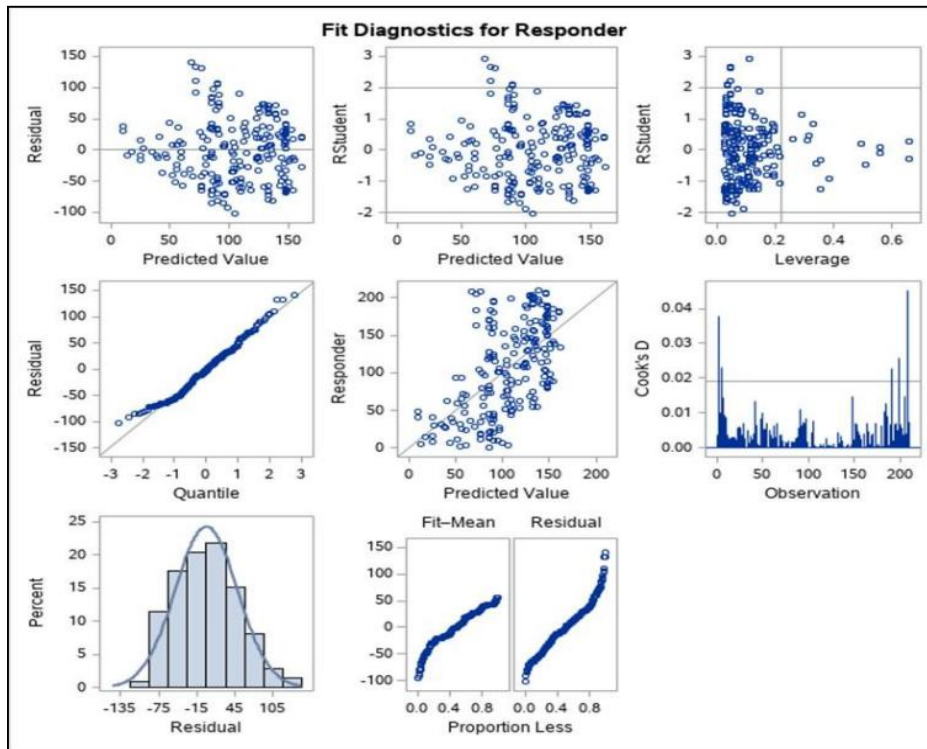
As per the above ANOVA Table 3, the "F" value is 4.44, which is quite good and the "P" value is less than 0.0001, which is also less than 0.05 significance. which is significant. The fit diagnostics are also quite good. So, we can prove our hypothesis.

The null hypothesis "**H2o: There is no significant impact on the facilities, organizers, comfort amenities, information availability, the convenience and programs of tourists for overall satisfaction based upon their demographic profiles**" is rejected, whereas the alternative hypothesis "**H2a: There is a significant impact on the facilities, organizers, comfort amenities, information availability, of tourists for overall satisfaction based upon their demographic profiles**" is accepted.

It is inferred that there is a significant impact on overall satisfaction is there, but individual parameters are different as per Table 4. There is a significant impact on

Conclusion

The potential for festival tourism in the state of Odisha are immense in nature as it boasts beautiful places, peaceful communities, and sublime people with different cultures. The Government of Odisha promotes tourism, but the main focus remains on the golden triangle, which includes Puri, Konark, and Bhubaneswar. As this research work shows, the cultural and historical value of Odisha's traditional festivals has made the state's heritage manifestations famous and made Odisha a tourism brand champion. The government and tourism stakeholders in Odisha should show the world a proper marketing strategy that maps out the potential of the state's festivals. Odisha's cultural and heritage places, as well as those from other parts of India and the world, should work together to promote festivals that will bring more tourists to the state. As this paper is based on empirical research to learn more about festival tourism, destination management, and marketing, it possess adequate potentials for important insights regarding the development of Odisha as a lucrative alternative. The tourism business relies heavily on fairs and festivals as it encourages cultural exchanges between tourists and locals by bringing them to local community activities. Local businesses benefit directly and indirectly from the spending of event tourists on local goods and services, which in turn has a ripple effect across the community. However, it is important that both the hosts and the visitors must gain from the arrangements. While the festival contributes greatly to the local community's socio-cultural and economic well-being, it is imperative that efforts are made to increase festival tourism in order to better exhibit the local culture to tourists. To improve tourism in Odisha and enhance its image as a cultural tourist destination, the study has identified some of the key weaknesses of this festival and recommended some suitable arrangements, if adopted. This paper will help to improve the tourism potential of Odisha and enhance its image as a cultural tourist attraction.

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The Relationship between Environmental, Social, Governance, and Export Performance in Manufacturing Companies: A Literature Review

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Abstract: *The swiftness with which environmental, social, and governance (ESG) has progressed and taken root in the manufacturing industry has had an immense impact on performance. The impact of ESG on the environment in the manufacturing context, however, remains ambiguous. This investigation endeavors to present a review of the recent literature on the relationship between ESG and export performance, while simultaneously providing a roadmap for future inquiries. Employing content analysis techniques and the VOS viewer tool, this analysis scrutinizes salient research components such as journals, countries, regions, plausible links between ESG and corporate performance, and trends, with particular emphasis on the environmental pillar. Subsequently, a research agenda for ESG implementation is proposed that encompasses both conceptual and empirical perspectives, which includes: (i) identifying the optimum ESG level and its effects on export performance; (ii) exploring the inherent inverse causality within the ESG-export performance nexus; (iii) conducting international comparisons; and (iv) presenting various arguments that support an indirect link between ESG and export performance.*

Keywords: ESG; manufacturing; export performance; environmental; social.

JEL Classification: Q56; M11; L25; L50; L53; A13.

Introduction

Since the 1990s, a global green revolution has made a profound impact on various aspects of human life, exerting significant influence on the world economy, politics, and behavior. One crucial concept that has emerged from this revolution is Environmental, Social, and Governance (ESG). This concept emphasizes the integration of social and environmental considerations into corporate decision-making and operations, becoming critical in the context of the global economy.

The financial implications of ESG have been extensively explored in academic studies, particularly regarding the relationship between ESG, firm performance, and profitability. This relationship holds significant implications for managers, policymakers, and shareholders. Despite the extensive discussion on this topic, the direct link between ESG and export performance remains ambiguous.

Recent studies have sought to deepen our comprehension of this link by investigating how ESG influences innovation pathways and exploring the impacts of individual ESG components on innovation across various industry contexts. While some studies have demonstrated that companies focusing on ESG tend to be viewed as more responsible and sustainable (Li and Li, 2023; Alcaraz *et al.* 2022; Bıçakcıoğlu *et al.* 2019), Tatoglu *et al.* 2019), leading to increased investments, enhanced financial performance, and greater innovation, conflicting

perspectives exist. Researchers like Mijatovic *et al.* (2019), Chakraborty and Mukherjee (2013), and Birkin *et al.* (2009) propose a negative or negligible correlation between these variables. These conflicting findings can be attributed to differences in ESG and firm performance measurements, study periods, model specifications, and control variables used (Benlemlih 2017). Hence, understanding the potential positive and negative impacts of ESG on manufacturing companies is imperative.

This study aims to provide a comprehensive analysis of the influence of ESG practices on export performance, with a specific emphasis on the environmental pillar. While existing research has explored the relationship between ESG and financial performance, limited attention has been paid to the impact of ESG on export performance—an integral aspect of corporate strategy for numerous manufacturing companies. Furthermore, this study contributes to the literature by offering a fresh perspective on the connection between ESG and export performance. By employing qualitative literature review methods and synthesizing recent study findings, this research elucidates the intricate links between ESG practices and export performance. Moreover, it provides insights into potential strategies for implementing ESG practices within manufacturing companies. In conclusion, this study holds significance for both management researchers and practitioners as it offers a deeper understanding of how ESG practices impact corporate performance and provides practical recommendations for companies aiming to enhance their export performance through sustainable practices.

1. Literature Review

The worldwide awareness of environmental concerns has placed increased pressure on businesses, leading to greater scrutiny from various stakeholders. In response, companies have begun incorporating natural concerns into their strategic planning, as evidenced by research conducted by Aragon-Correa and Sharma (2003) and Buysse and Verbeke (2003). Elkington's "triple bottom line" (TBL) approach, which prioritizes people, profit, and the environment, has gained significant attention (Norman and MacDonald, 2004). According to this approach, corporations must evaluate their social and environmental impact, in addition to the economic value they create, whether it be positive or negative. Manufacturing companies can consider the environmental, social, and economic dimensions of their business models. Some authors, such as Carroll (1991) and Pawłowski (2008), take the multidimensional approach even further, including economic, legal, ethical, philanthropic, moral, and technical dimensions.

Manufacturing is a reflection of humanity's rational drive for continuous progress and expansion (Li and Li 2023; Malshe *et al.* 2015). In order to ensure environmental sustainability, there must be a balance between production activities and their effect on the environment. More and more, the connections between manufacturing and nature are being recognized (Rosen and Kishawy 2012), which has spurred manufacturers to prioritize environmental sustainability in their operations.

As we move further into the digital age, manufacturing companies are facing tougher competition because of the advancements in technology that allow for higher quality products, lower costs, and faster delivery times (Sartal 2020). To stay ahead of the curve, many companies are starting to implement eco-friendly strategies into their manufacturing processes to reduce their impact on the environment (Li 2022; Joung 2013). This shift in focus has allowed companies to exceed the basic standards of efficiency-based management philosophies and better meet the needs of a changing landscape.

The authors of this paper acknowledge the need to emphasize environmental sustainability more strongly, which the author defines as a strategic management method in which an organization is devoted to the environmental sustainability principles in its operations across sub-businesses, aims to employ renewable resources, and attempts to reduce the negative environmental impact of its activities. We operationalize environmental sustainability integration into the core business as the level of environmental sustainability, and consider various indicators to assess this level, such as environmental performance and eco-effectiveness, resource-/eco-efficiency (Wood 1991), and the intensity of integrating overarching principles related to corporate sustainability (*e.g.*, Life-Cycle Management, Circular Economy, Lean Manufacturing, innovation).

Export performance refers to a company's ability to meet performance targets in foreign markets, as noted by Cavusgil and Zou (1994) and Li (2022). Scholars have defined this term as both the outcome of a company's marketing initiatives and other business operations in overseas countries (Katsikeas *et al.* 2000; Shoham 1996), and the degree to which a company intends to achieve by transporting a product to a foreign market (Cavusgil and Zou 1994). As such, it serves as a vital indicator for management teams when making decisions regarding foreign operations, as it supports and promotes the development of long-term corporate sustainability (Sinkovics *et al.* 2018).

At the core of a company's strategic legislation process lies the attainment of successful export performance, as emphasized by Beleska-Spasova (2014). Tatoglu *et al.* (2020) contend that companies must adopt a product differentiation strategy to compete in the global market. This approach stresses the importance of setting a product apart from other similar competitor products (Porter 1985). Companies operating in export markets use ESG-based product differentiation to promote their brand image as socially and ecologically sustainable commodity producers (Fombrun and Shanley 1990). This approach satisfies consumer desires for environmentally friendly characteristics, which raises the value of a product in their eyes (Fandos-Roig *et al.* 2021) and leads to an increase in export sales (Li and Li 2023; Giallonardo and Mulino 2012; Boehe and Cruz, 2010). Therefore, this strategy boosts overall client satisfaction and engagement, resulting in an overall improvement in export performance.

This study was based on two different theories: the resource-based view and stakeholder theory, due to their importance and relevance to ESG. Stakeholder theory, as put forward by Freeman (1984), states that companies must not only consider the interests of stockholders, but also of a range of other stakeholders, such as employees, customers, suppliers, and local community organizations. This theory suggests that without engaging in certain ESG activities that benefit the social and environmental aspects of company procedures, they are at risk of losing the support of these stakeholder groups. Therefore, stakeholder theory has become the most commonly used theoretical approach to examine ESG, as it is the major motivation for corporations to go beyond legislative obligations (Cantrell, Kyriazis, and Noble 2015; Perrini 2006).

The social impact hypothesis, which derives from stakeholder theory (Freeman 1984), is the most effective way to explain the positive influence of ESG on financial performance. This hypothesis states that when companies satisfy the demands and expectations of various stakeholders, their financial performance is improved (Perrini *et al.* 2011). ESG is also seen as a strategic approach to earning financial gains, as it can yield competitive advantages on the market (Porter and Kramer 2002), bolster a company's reputation (Fombrun and Shanley 1990), strengthen its brand image (Murray and Montanari 1986), and enhance its legitimacy (Hart and Christensen 2002).

Resource-based view (RBV) is a key theory to understanding the importance of ESG in corporate performance. Developed by Wernerfelt (1984), and further expanded by Barney (1991), RBV views the use of valuable, scarce, unique, and non-substitutable resources and competencies as a source of sustainable competitive advantage. According to Castelo and Lima (2006), this theory suggests that businesses should aim to equip themselves with either tangible or intangible resources that rivals cannot readily replicate or acquire (Cho and Pucik, 2005).

Therefore, corporate engagement in ESG can be used as a control mechanism to accommodate the interests of different stakeholders (Li 2022; Mason and Simmons 2014). When stakeholders are satisfied, the company's reputation could lead to improved export performance. Conversely, if stakeholders are disgruntled, the export performance of the company might suffer. This concept is at the core of strategic management, requiring firms to consider the impacts of their operations on both stakeholders and the environment (Donaldson and Preston 1995).

The purpose of this paper was to conduct an analysis of the latest empirical literature concerning the impact of ESG on the export performance of manufacturing companies. Our primary objective was to gain a comprehensive understanding of the most recent studies and discern how ESG factors influence firms' performance. We have presented an overview of the current state of research, having the potential to enrich the existing discourse and provide potential research avenues that could be beneficial for both scholars and practitioners.

Undoubtedly, the manufacturing industry plays a significant role in driving the growth of the global economy. Through the development of innovative materials, it offers a plethora of options that cater to people's daily needs and thus serves as a crucial engine for societal progress (Li and Li 2023; Guang *et al.* 2012). It is a fundamental pillar of the national economy, particularly in emerging countries. Moreover, the export business plays a substantial role in the operations of manufacturing companies.

With the implementation of eco-friendly trade policies, such as environmental certification requirements, by industrialized nations to safeguard the environment and ensure the well-being of humanity, the study of ESG and its impact on the export performance of manufacturing companies has become even more crucial. Therefore, it is imperative to conduct research in this area to understand the correlation between ESG practices and the export performance of manufacturing firms.

The present paper is thoughtfully structured to provide a comprehensive understanding of the correlation between ESG and export performance. To achieve this aim, it has been divided into five well-defined sections

that allow for a clear and coherent presentation of the research. Section 1 is dedicated to laying out the theoretical foundations of ESG and export performance and extensively examines the existing literature on the topic. It provides the necessary context for understanding the significance of the study. Moving forward, Section 2 sheds light on the methodology adopted for conducting the literature review, which is essential for understanding the credibility and reliability of the findings. Section 3 delves into the intricate links between ESG and export performance and highlights the significant impact that ESG practices have on the export performance of companies. Section 4 presents the crux of the study, where the authors thoroughly analyze the empirical results of the research and draw insightful conclusions that are likely to contribute to the existing literature. Finally, in Section 5, the authors outline the contribution and limitations of the study, providing a comprehensive overview of the research's strengths and weaknesses. The five-section structure is designed to ensure that the reader gains a deep understanding of the intricate relationship between ESG and export performance, making it an essential contribution to the academic discourse on the subject.

2. Materials and Methods

The present investigation employs a qualitative research methodology and formulates a comprehensive search strategy to pinpoint primary studies relevant to the research topic. A novel perspective is introduced to scrutinize the outcomes and furnish the groundwork for researchers and practitioners to utilize. The methodological practices adopted in this study are exploratory and theory-building, as recommended by Karlsson (2016). To comprehend the intricate interplay between the subject of inquiry and other allied fields, a process of literature review is employed. As elucidated by Hart (2018), this process entails handpicking, evaluating, scrutinizing, arranging, and articulating information from diverse sources concerning a specific topic to accomplish a particular goal. In line with Hart's instructions, the review comprises three essential stages: literature selection and evaluation, content analysis, and results delineation.

The search query was crafted with meticulous attention, utilizing the "OR" operator to sift through three distinct sets, namely A (ESG), B (export performance), and C (manufacturing). The combination of keywords was deftly achieved by employing the "AND" operator between these sets, weaving a sophisticated web of interconnected terms to refine the search. To ensure the search's robustness, the study harnessed the power of two renowned scientific databases, Scopus and Web of Science, with Scopus being the primary source of information, and Web of Science playing the supplementary role. In the pursuit of precision, every possible avenue was explored, and therefore, the search terms spanned across the title of the article, the abstract, and the author keywords.

Table 1. Keywords for search query

Search query: set A AND set B AND set C		
Set A	Set B	Set C
environmental, social, governance OR ESG OR corporate social responsibility OR CSR OR environmental sustainability	export performance	manufacturing

In the first phase of our investigation, we conducted a meticulous search using various keywords such as environmental, social, governance, ESG, corporate social responsibility, CSR, and environmental sustainability, which resulted in a bounty of over 3,290 articles. Subsequently, we ventured into exploring the realm of export performance, and our search yielded a satisfactory amount of 127 outcomes. Lastly, we directed our efforts towards investigating the manufacturing industry, and our query fetched us a modest sum of 76 articles.

After this initial round of exploration, we carefully filtered our findings based on specific parameters such as language (English), the type of publication (peer-reviewed academic journals), and the fields of business economics, behavioral sciences, operations research, and management science, resulting in a reduced set of 31 articles for in-depth analysis. To ensure thoroughness and eliminate the possibility of duplication, we repeated the same search query on the Web of Science database, resulting in 168 articles. We then subjected these outcomes to the same rigorous standards as before, resulting in a further reduction to a meager 24 articles.

After subjecting these 24 articles to thorough content analysis and removing duplicate and irrelevant papers, we were left with a final set of 28 articles, which were then meticulously analyzed. Table 2 presents a summary of the relevant findings of these articles, which specifically focus on the themes of ESG, export performance, and other pertinent conclusions.

Table 2. An overview of the recent research on the relationship between ESG and export performance discussed in this paper

Authors	Country	ESG measure	Export performance measure	Result	
					Mediator/ moderator
Conceição *et al.* (2006)	Portugal	Level of RandD; Objectives and hampering factors of innovation; Sources used	Exports share	+	
Birkin *et al.* (2009)	China	Reducing waste and emissions, investing in renewable energy sources; Engaging in corporate social responsibility initiatives.	Export growth	0	
Urban and Govender (2012)	South Africa	Environmental Policy; Environmental Auditing; Environmental Training; Environmental Monitoring	Export intensity; Export growth	+	
Chakraborty and Mukherjee (2013)	Developing countries	Environmental Performance Index (EPI) score	Growth rate of exports	-	
Perry and Towers (2013)	Sri Lanka	Philanthropic/charitable activity; Monitoring and auditing of code of conduct; Waste generation	Production cost	+	
Hofman and Newman (2014)	China	Philanthropy; Environmental sustainability; Ethical labor practices	Employee's emotional attachment, loyalty, and identification	0	Cultural values
Palma, et al (2014)	Brazil	Environmental management; Social responsibility; Economic prosperity	Export profitability; Market share; Export growth	+	
Tsai and Liao （2017）	Taiwan	Prevention of pollution; Reduction of waste.	Questionnaire	0	Market pulls; Environmental policy
Al-Amin *et al.* (2018)	Malaysia	Sustainable business climate; Promotion of best practice	Ability to sustain competitiveness	+	
Joo *et al.* (2018)	Korea	Firm's ability to generate and implement new environmentally-friendly products, processes or practices;	Exports growth rate; Export profit; Market share	+	Environmental and technological innovation capabilities
Mendoza-Fong *et al.* (2018)	Different countries	Green product design; Green purchasing; Green manufacturing; Green distribution; Green marketing	Cost reduction; Environmental sustainability; Brand image enhancement; Income increase	+	Updating of ICT; Implementation of the GSC
Bıçakcıoğlu *et al.* (2019)	Turkey	Environmentally-friendly product design; Environmentally-friendly manufacturing; Environmentally-friendly strategic planning	Export profit; Export sales	+	Internal resources; Product positioning
Mijatovic *et al.* (2019)	Serbia	Eco-friendly product design; Eco-friendly manufacturing; Eco-friendly strategic planning	Questionnaire	0	
Tatoglu *et al.* (2019)	Turkey	Eco-efficiency in production; Eco-friendly manufacturing;	ROA	+	
Chen and Hamilton	China	CSR reporting evaluation system	ROE; ROA	+	

Authors	Country	ESG measure	Export performance	Result	
(2020)					
Sardana *et al.* (2020)	India	Water usage; Energy usage; Environmental targets	ROA; Market share	+	Plant capability
Galbreath (2021)	Taiwan	Materials, energy, carbon emissions and other pollution reduction; Recycling	Volume of foreign sales	+	Government subsidies; Consumer demand; PCES; Absorptive capacity
Hu *et al.* (2021)	China	The macrocosm dimension; The content dimension; The technique dimension	ROE	+ –	Value appropriation
Ullah *et al.* (2021)	United States	CGVS score (Thom- son Reuters Asset4)	Foreign sales to total sales ratio	+	
Alcaraz *et al.* (2022)	Mexico	Inbound sustainability; Internal sustainability; Outbound sustainability	Average return on sales and investment, profits growth, and market share	+	Supplier integration; Customer integration;
Nguyen *et al.* (2022)	10 different countries	Usage of vendor certification; Direct green investment and environmental col- laboration	Market share, revenue, and profit	+	Process innovation; Export oriented manufacturing
Padilla-Lozano and Collazzo (2022)	Ecuador	Formal CSR tools; Environment-related CSR; Workplace-related CSR; Community-related CSR; Marketplace-related CSR	Market performance; Intangible performance	+	Green innovation
Teplova *et al.* (2022)	Emerging market companies	Environmental indicators; Social indicators; Governance indicators	Share of direct export in revenue	+	
Nguyen *et al.* (2023)	Multiple countries	Environmental impact; Environmental targets	Market share Profitability Total sales	+	Green reputation pressures
Silva et al (2023)	Portugal	Product; Price; Distribution; Promotion programs	Profits; Sales; Market share; Sales intensity	+	
Uddin, Razzak and Abd Rahman (2023)	Bangladesh	Reduction of environmental impacts; Improvement of working conditions; Increased collaboration with stakeholders	Enhanced brand reputation; Improved financial performance; Enhanced customer satisfaction	+	
Yang and Han (2023)	Korea	KCGS Evaluation Data (Score)	ROA; ROE; Export amount	+	

"+" is positive; "-" is negative; "0" is not providing a definitive answer.

VOS viewer is a free, widely used software in bibliometric research that enables users to construct maps of journals, authors, citation data, and keywords. The term "VOS," which stands for "visualization of similarities," emphasizes the graphical representation of bibliometric maps. These maps are designed to be comprehensible and interpretable to the viewer (Van Eck and Waltman 2010). This study utilized visual network images to facilitate analysis of cited sources, regions, bibliographical relations and more.

3. Research Results

In recent times, scholars have taken a keener interest in the domain of ESG, which is a facet of sustainability rooted in scientific principles. The phrase "ESG" was initially introduced in the United Nations' report titled Who Cares Wins, in the year 2004. Since then, the field has witnessed an unprecedented surge in interest, marked by the publication of Conceição *et al.* in 2006, which serves as a testament to this fact. Moreover, the frequency of publications pertaining to ESG has increased each year since 2018. This surge in interest can be attributed to the implementation of environmentally friendly trading protocols by industrialized nations, which include the incorporation of environmental certification prerequisites. The objective of these protocols is to safeguard the environment and ensure the well-being of humanity. The Green Trade Barrier (GTB), a non-tariff commercial hindrance employed in international trade, is employed to enforce such regulations (Li and Bang 2020). The graph displayed in Figure 1 highlights the rapid proliferation of publications related to ESG and exports. In addition, 35% were mainly published in three journals, including Sustainability (14%), Business Strategy and the Environment (14%) Journal of Cleaner Production (7%). The distribution of published journals is shown in Fig2.

Figure 1. Timeline of publications
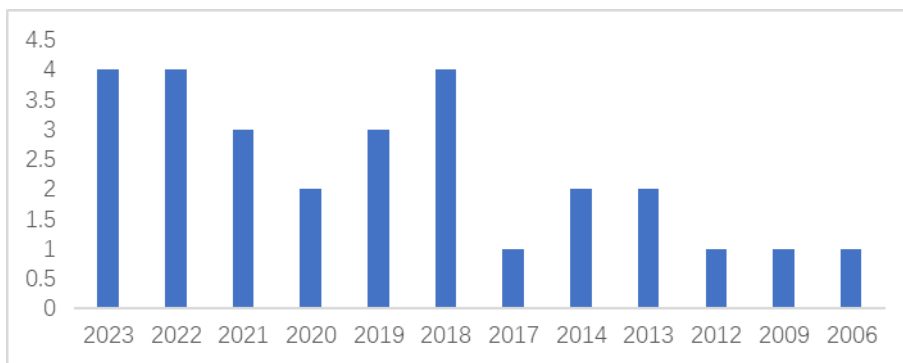
Figure 2. Contributions of the journals
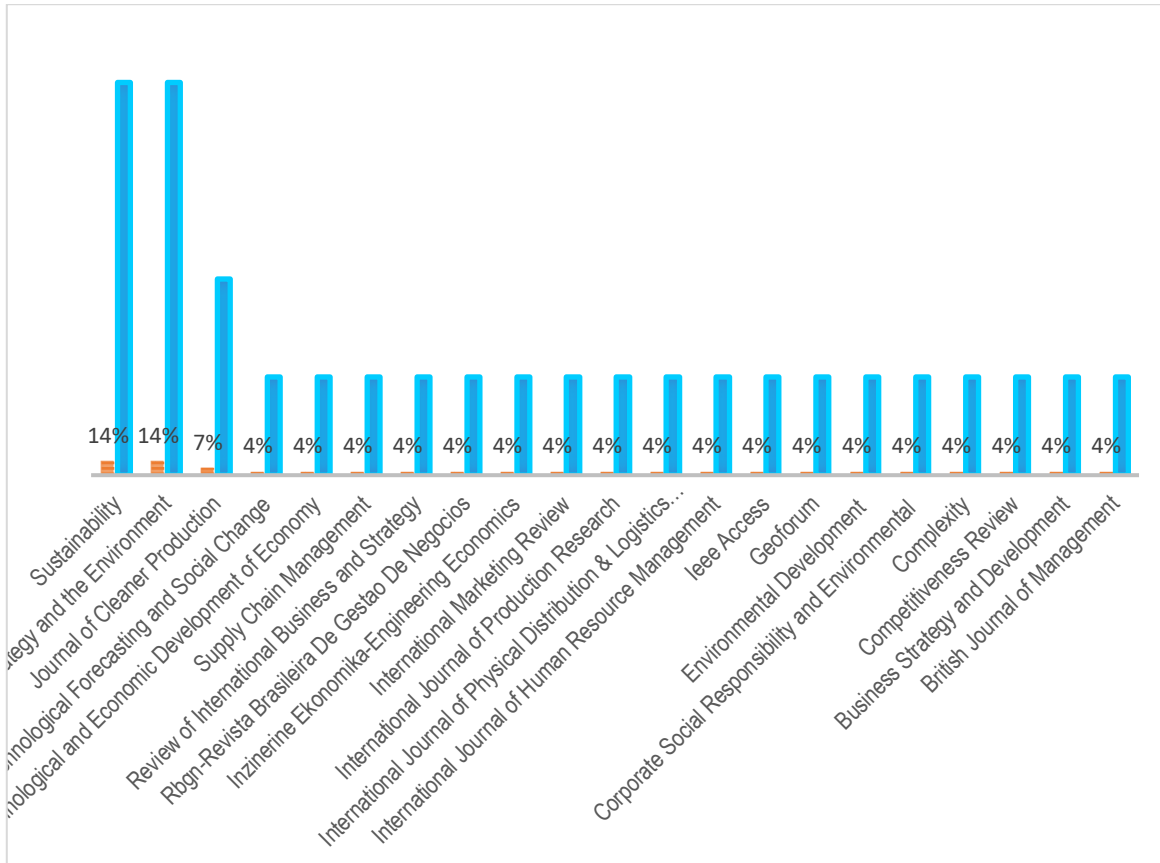
Figure 3. Collected papers considering country

■ Number
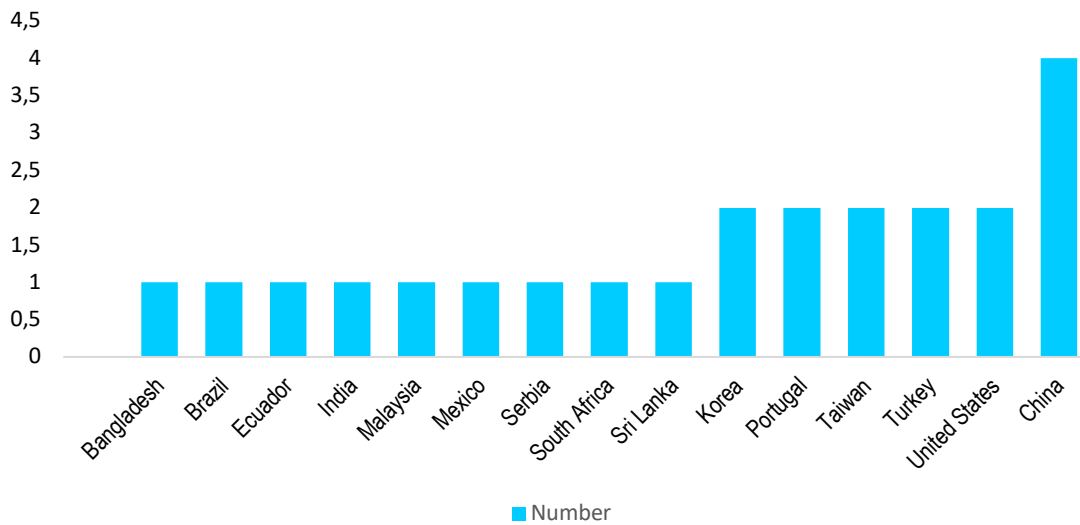
Figure 3 reveals that China is the most researched country with four articles devoted to it. Korea, Taiwan, Portugal and the United States follow, each with two articles; the remaining regions are represented by single articles.

Figure 4. Analysis of the bibliographical relations based on density
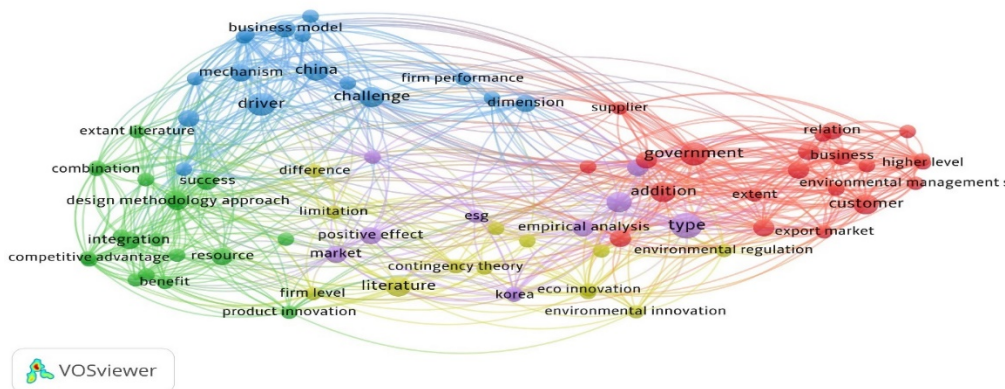
Figure 4 illustrates the most frequently mentioned terms in the articles, as well as the relationship between them. 'Integration', 'business model', 'government', 'customer', 'environmental regulation' and 'China' had the highest density. This result suggests that a majority of the articles examined some of the elements that impact ESG implementation. Additionally, the analysis suggests that China is one of the most studied countries in this context. However, it is important to note that this analysis was limited to the presence of such terms in the articles and thus, it is impossible to make a generalized assessment without considering the context in which the terms are utilized.

Conclusions

The present study offers a comprehensive review of recent literature concerning the intricate nexus between ESG and export performance. It is revealed that investigations in this domain have progressed significantly, covering a broad spectrum of topics such as the nuanced impacts of distinct ESG components on export performance, differentiating between strengths and concerns in the analysis, and scrutinizing the mediators and moderators of the relationship. Despite the growing body of literature on this subject, several queries still linger. Primarily, given the inconclusive findings regarding the link between ESG and export performance, it would be intriguing to ascertain the optimal ESG level and its impact on export performance. Such an optimal level would serve as a threshold, indicating that investing below or above it could adversely affect financial outcomes.

A further avenue of intriguing inquiry beckons, one which explores the inverse causality inherent within the ESG-export performance nexus. According to Tatoglu *et al.* (2019), a notable shift towards a customer-centric business model, coupled with a heightened emphasis on differentiation strategy and a greater awareness of the significance of stakeholder orientation, can prompt corporations to implement ESG measures to a greater degree. Astonishingly, research on the effects of export performance on ESG implementation remains woefully scarce.

As a few companies are presently embarking upon the implementation of Environmental Management System (EMS) practices at their manufacturing and operational levels, reaping the rewards of waste minimization and cost reduction through their unwavering commitment to continuous improvement techniques, there are others who are yet to follow suit. Therefore, it would be intriguing to delve deeper into the subject matter, utilizing a meta-analysis research approach to establish an international comparison between firms from various countries. This would enable us to undertake a thorough analysis of different industries, discerning the dependence of the relationship between the EMS practices and their impact on the contextual landscape, along with the inherent characteristics of such a correlation.

Ultimately, the fundamental mechanisms by which ESG influences export performance remain shrouded in mystery. Within the author's comprehensive literature review, various studies presumed that the correlation between ESG and export performance is not overt, and therefore sought to identify the conduits by which ESG impacts a firm's performance. It is worth noting that the majority of moderators and mediators, such as a company's capacity, environmental orientation, and innovation performance, are abstract and elusive in nature. Thus, it can be inferred that this association has captivated a significant amount of research and will continue to do so in the foreseeable future.

Contribution and Further Research

Our research, while theoretically grounded in the decision to limit our review to the manufacturing industry, has two significant drawbacks. Firstly, this choice, motivated by the desire to move beyond a general overview of ESG to a more targeted analysis of industrial ESG practices, inevitably excludes a considerable portion of the ESG phenomenon - that which is exclusively related to the tertiary sector. Secondly, our approach did not rely on quantitative methodologies, thereby precluding any immediate examination of correlations or potential causal relationships. Nonetheless, this limitation provides an opening for a future meta-analysis of the papers, a promising avenue for exploring such associations.

Our research has made a noteworthy addition to the ESG literature, having the potential to enrich the existing discourse and provide valuable insights for policymakers, academics, and practitioners alike. There exist a limited number of publications on ESG practices in the manufacturing industry that scrutinize the performance of exports. Most of these studies primarily delve into financial performance, but there is no doubt that the manufacturing sector plays a pivotal role in propelling global economic growth. Through pioneering the development of innovative materials, this industry proffers a diverse range of solutions to meet the daily requirements of people, and thereby functions as a vital driving force for societal advancement (Guang *et al.* 2012). It stands as a fundamental cornerstone of the national economy, especially in emerging nations. Additionally, the export sector assumes a significant role in the manufacturing operations.

With the increasing adoption of eco-friendly trade policies such as environmental certification requirements by developed nations to preserve the environment and promote human welfare, researching the influence of ESG practices on the export performance of manufacturing firms has become even more imperative. Hence, it is essential to conduct studies in this realm to comprehend the correlation between ESG practices and export performance of manufacturing companies. Furthermore, this article expounds on potential avenues for future research.

Credit Authorship Contribution Statement

Yan Li contributed to the Conceptualization, Investigation, Methodology, Project administration, Software, Formal analysis, Writing – original draft, Supervision, Data curation, Validation, Writing – review and editing, Visualization.

Jilian Li contributed to Conceptualization, Investigation, Methodology, Project administration, Software, Formal analysis, Writing – original draft, Supervision, Data curation, Validation, Writing – review and editing, Visualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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COVID-19 Pandemic and Foreign Trade Behavior in the Democratic Republic of Congo: A Non-Parametric Test Approach by Comparison of Means

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Abstract: *This paper analyzes the behavior of foreign trade indicators, specifically exports and imports in the Democratic Republic of Congo (DRC) during the COVID-19 pandemic. This health crisis was labelled a "pandemic" by the World Health Organization because it affected all mankind to varying degrees. It also examines the evolution of international reserves during the same period, while taking stock of some macroeconomic indicators for the DRC.*

Non-parametric tests reveal differences in the means between the period of the COVID-19 surge and the period of the COVID-19 decline, to verify the significance of the negative or positive influence of imports and exports in the DRC.

It was fandhat during the year most affected by the pandemic, 2020 compared to the previous year, 2019, both exports and imports fell on average annually, respectively (in millions of USD) by 1,078.6 versus 1,098.6 and by 988.8 versus 1,149.1. This can be justified by the various measures taken by the government to contain the COVID-19 pandemic. Subsequently, these same indicators (in millions of USD) will increase between 2021 and 2022, respectively from 1,742.5 to 2,368.4 for exports and from 1,520.4 to 1,920.1 for imports. This increase is

the result of the urgent stimulus measures taken by the government to enable the economy to cope with the multiple economic consequences of the COVID-19 pandemic. These observations were also verified by statistical tests: these show differences for independent and matched samples at the 0.05 threshold. There is a considerable difference in exports in millions of USD between those during the absence of COVID-19 and those during the presence of COVID-19.

These observations were also verified by statistical tests: these provide differences for independent and matched samples at the 0.05 level. There is a considerable difference in exports (in millions of USD) between those made in the period before and those made during the COVID-19 pandemic.

Keywords: non-parametric tests; COVID-19 pandemic; imports; exports; international reserves; comparison of means.

JEL classification: C12; C14.

Introduction

Keynesians consider the economy to be unstable in the sense that the information transmitted by prices is generally not in line with reality. Most often the economy is confronted with crisis situations (underemployment of factors, involuntary unemployment). These are known as supply or demand shocks, which lead to fluctuations in consumption, production, employment and inflation, exports, and imports in various directions. Thus, a crisis occurs and economic activity stops growing.

Foreign trade includes all activities related to imports and exports of a country. We can include the different stages of import-export operations: country studies, prospecting, negotiation, sales, logistics, transport, etc. However, in the face of economic fluctuations, it generally behaves according to a bullish or bearish dynamic.

The recent COVID-19 pandemic has had consequences far beyond the health sphere. It has profoundly disrupted the global economy, sometimes with unprecedented devastating consequences for the well-being of nations, particularly for their international trade.

As in the rest of the world, the Congolese authorities have taken several measures to limit and contain COVID-19 pandemic on the well-being of the population and the national economy. Among these measures, the "containment" which appeared as the most emblematic of this crisis since it was set up as the ultimate bulwark for the preservation of humanity. It has come at the cost of an unprecedented recession: it is often referred to as a "boondoggle" whose effects have reduced the factors of accumulation of production and accelerated what Pinshi refers to as "a self-inflicted recession" (Pinshi 2020).

In addition to these sectoral effects, there has also been a deterioration in consumer and business confidence, which has been forced to rely on weaker demand and thus reduce spending and investment. This has led to business closures and job losses (Gopinath 2020). Problems in production and supply chains and in both domestic and international trade were also mentioned.

The DRC is a country with an economy that is still outward looking, disjointed and disintegrating. As a result, it is highly exposed to the ups and downs of international trade and has not been spared the horrors of the crisis caused by the COVID-19 pandemic, which has compromised its macroeconomic stability and growth. Indeed, the crisis has worsened the fiscal and foreign trade balances as in several other countries. Given that public debt has risen (to 83% of global GDP), as the IMF argues in its report on the effects of the COVID-19 pandemic (2020), it is seriously affecting the country's finances.

According to available data, for the period 2019-2020, exports and imports will decrease from 1,078.6 to 1,098.6 and from 988.8 to 1,149.1, respectively, as an annual average and in USD millions. Thereafter, between 2021 and 2022, these same indicators rise from 1,742.5 to 2,368.4 for exports and from 1,520.4 to 1,920.1 for imports in million USD, in DRC.

In addition to exports and imports, other macroeconomic aggregates also evolved differently and recorded fluctuations: GDP grew by 4.3 percent, CPI was 5.5 percent, government revenue and grants amounted to 10.8 percent of GDP, of which 9.5 percent was tax and non-tax revenue, and 1.3 percent was grants. Government expenditure amounted to 10.9 percent of GDP, of which capital expenditure was 2.1 percent. Two deficits were also recorded during the same period, respectively the budget balance of -0.2 percent and the current account balance of -3.5 percent. However, the DRC recorded an increase of 3.7 percent of GDP in net official reserves and 13.3 percent in public external debt.

Compared to 2019, fluctuations in 2020 are down for some indicators identified in 2019. Gross domestic production declined from 4.3% in 2019 to 3.9% in 2020. There was a slight decline in CPI of 5.0% and government revenue of 10.6% overall, including 9.1% in tax and non-tax revenue, including a slight increase of 1.5% in grants to 1.3% in 2019. Public expenditure decreased overall to 10.8%; a very slight increase in capital

expenditure following government interventions in the health sector to counter the health crisis. (Uhttp //: wto.org/COVID-19-fhtm).

1. The Problem

Since late 2019 and early 2020, the world has been dealing with the COVID-19 health crisis that started in Wuhan, People's Republic of China, and eventually reached almost every country in the world. Beyond its public health effects, COVID-19 pandemic has had a significant impact on global economy. In fact, the pandemic rapid spread across continents by the end of the first quarter of 2020 caused severe disruptions in global economic activity. Almost every country in the world has been affected (Mujani 2020).

The observation of economic life over a long period highlights a succession of phases during which economic activity is either growing or decreasing, this succession is caused by endogenous or exogenous multisectoral shocks, for the specific case: COVID-19 pandemic.

DRC being open to foreign trade is also experiencing a slowdown in its economic activity and is affected by global supply and demand imbalance. To this end, it is important to conduct a conjunctural analysis of the foreign trade macroeconomic aggregates to identify these different effects.

The objective of this study is to compare the DRC's means of foreign trade variables during the period before, during and after COVID-19 pandemic.

The study examines COVID-19 pandemic effects on the DRC's foreign trade. It hypothesizes that COVID-19 pandemic caused a slowdown in the pace of DRC's foreign trade, which it is still struggling to fully recover[3].

2. Methodological Approach

The present study uses the analytical method, accompanied by the documentary technique and statistical analysis to establish the comparison of annual averages of imports, exports and international reserves before the COVID-19 pandemic and during the COVID-19 pandemic, periods during which several public measures were stopped.

The empirical analysis involved independent and paired Student's t-test sampling. It compares the period of presence and absence of the COVID-19 pandemic respectively, which declines an evolution of imports, exports as well as international reserves[1].

In the latter, we have measurements of the values of X in two independent samples E_1 and E_2 of sizes n_1 and n_2 respectively. We also want to compare the two experimental means, *i.e.* test the null hypothesis $(H_0): \mathcal{U}_1 = \mathcal{U}_2$

First, the values obtained in the sample pool are sorted in ascending order. For each value x_i from E_1 the number of values from and after E_2 in the ordered list is counted (those equal to x_i only count for 1 / 2). We note U_1 the sum of the numbers thus associated with the different values coming from E_1. The same is done by swapping the roles of the two samples, which gives the sum U_2. And U_1, the smaller of the two sums obtained.

$$\mathcal{U} = \min\{\mathcal{U}_1; \mathcal{U}_2\}$$

The associated random variable is denoted U.

- For any n_1 and n_2 we read from the Mann and Whitney test tables the number M_a such that, under (H_o), $P(U \le m_a) = \alpha$. (H_0) is rejected at the risk of error α if $u \le m_a$. Otherwise, (H_0) is accepted.

If n_1 and n_2 are large enough (≥ 20 in general), under (H_0), U approximately follows the normal distribution $N(\mu;\sigma)$ with :

$$\mu = \frac{n_1 n_2}{2} \text{ et } \sigma = \frac{\sqrt{n_1 n_2 (n_1 + n_2 + 1)}}{12}$$

We read U_a in the normal distribution reduced deviation table such that $P(|N| \ge U_a) = \alpha$, calculate $\varepsilon = \frac{u - \mu}{\sigma}$, and reject (H_0) at risk of error α if $\varepsilon \notin]- U_a; Ua[$. Otherwise, (H_0) is accepted.

We have measurements of the values of X in k independent samples, $E_1, \dots, E_k$, of respective sizes $[\![n]\!]$ $1,\dots,n_k$. We wish to compare the k experimental means, *i.e.* test the null hypothesis (H_0): "$\mu_1 = \dots = \mu_k$.

The comparisons of means[2] for an independent sample, concern: (i) the normally distributed series, including the Z Test for a sample "n" greater than or equal to 30 observations (n≥30) and the T Test (Student) for

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[1]URL/https://help.xlstat.com/fr/6759-quelle-est-la-difference-entre-tests-pour-echantillons. Nonparametric tests. The difference between independent and paired sample tests, 2023.

[2] Comparisons of these means, for an independent sample, concern: (i) the normally distributed series including the Z-test for a sample "n" greater than or equal to 30 observations (n≥30) and the T-test (Student) for a sample "n" less than 30

a sample "n" less than 30 observations (n<30), and also (ii) the series in relation to the absence of normality, including the Test of (***Mann-Whitney, Kruskal-Wallis, Wald-Wolfowitz and Kolmogorov***), which make it possible to test the significance of the variables

3. Analysis Results

The graph below shows the monthly evolution of imports and exports in the DRC between January 2019 and December 2022. Considering this period, we observe a decline in imports and exports for the year 2020, after an upward trend in 2019. For the period 2021-2022, foreign trade remains on an upward trend.

Graph 1. Monthly evolution of exports, imports (in millions of USD).
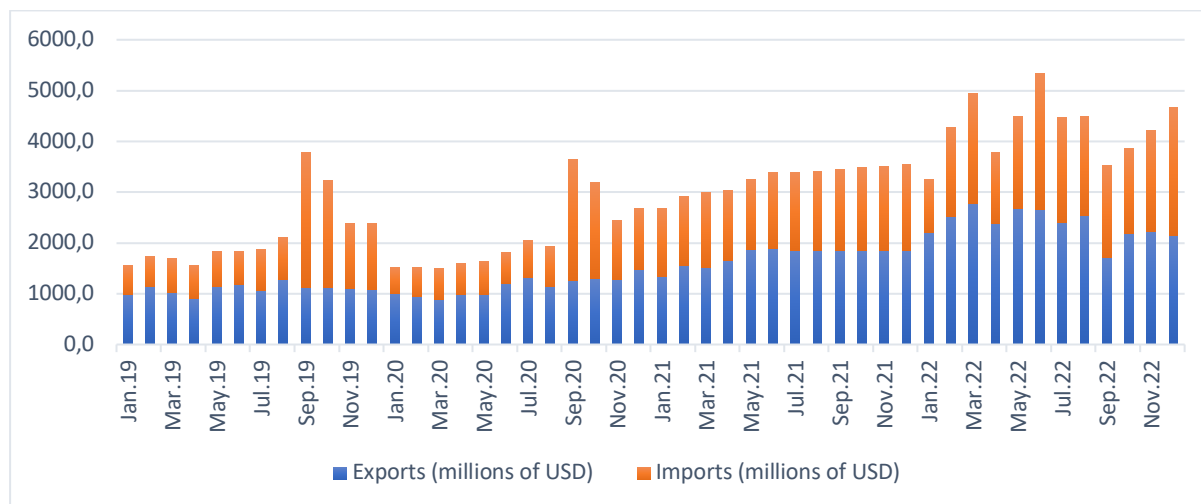
Source: Compiled by the authors, based on BCC data

The following graph shows that international reserves during the COVID-19 surge keep a fluctuating trend, and during the decline we observe an increase.

Graph 2. Monthly evolution of international reserves (in millions of USD).
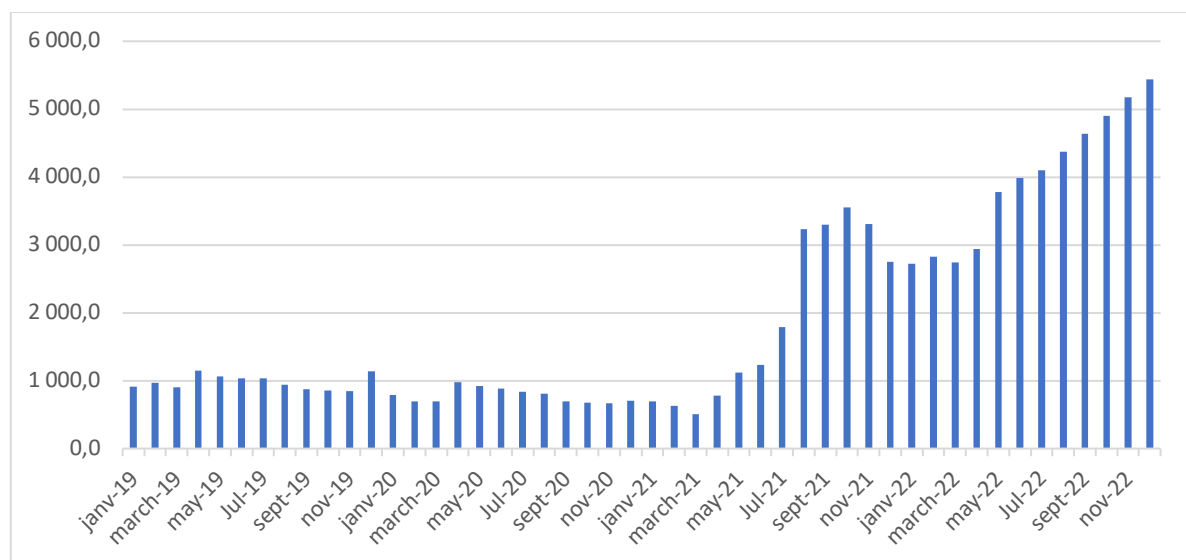
Source: Compiled by the authors, based on BCC statistical data

This is justified by support from partners, rapid credit facilities, extended credit facilities from the IMF between 2021 and 2022 (in millions of USD), various aid received from the World Bank, ADB, the Kuwaiti Sovereign Wealth Fund, etc., as well as a new SDR allocation in 2021 for the DRC equivalent to 1.5 billion USD.

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observations (n<30), and also (ii) the series in relation to the absence of normality, including the W-test (Wilson's test or rank test) which allows to test the significance of the variables

The figure above shows that international reserves during the convid-19 surge keep a more or less fluctuating trend, and during the downturn an increase is observed. This is justified by the support of partners, rapid credit facilities, extended credit facilities of the IMF in millions of USD between 2021 and 2022, various aids from the World Bank, ADB, Kuwait Sovereign Wealth Fund, etc.), new SDR allocation in billion USD in 2021.

The table below provides information on the effectiveness of the effects of COVID-19 pandemic on exports, imports and foreign exchange reserves during the period of COVID-19 presence and absence.

Table 1. Comparison tests for comparison of means

Null hypothesis	Wald Wolf witz		Mann and Whitney		Kolmogorov		Kruskal Wallis	
	Prob.	Decision	Prob.	Decision	Prob.	Decision	Prob.	Decision
G and S export is identical during the presence or absence of COVID-19.	0,000	RH_0	0,000	RH_0	0,000	RH_0	0,000	RH_0
Import of G and S in million USD is identical during the presence or absence of COVID-19	0,062	AH_0	0,003	RH_0	0,000	RH_0	0,003	RH_0
International reserve in millions of USD is the same during the presence or absence of COVID-19	0,071	AH_0	0,501	AH_0	0,36	RH_0	0,488	AH_0

Source: Estimates made by the authors on the basis of statistical data from the BCC

The result of these analyses (Table 1), according to the non-parametric tests, is that there is a significant difference between exports during the period in the absence of COVID-19 and exports during the period in the presence of COVID-19, in the sense of a decrease in millions of USD.

Also, for imports, there is also a significant difference during the period of COVID-19 pandemic presence, namely a decrease compared to the periods of absence or decrease of COVID-19.

As for international reserves, they did not decrease significantly during the COVID-19 pandemic presence and absence periods. They have maintained a more or less constant trend, sometimes even showing a slight increase following support from the DRC's traditional partners, which has been effective through rapid credit facilities (*i.e.* USD 730 million between 2019 and 2020), extended credit facilities (*i.e.* around USD 600 million between 2021 and 2022), various aid measures from the World Bank, the ADB, the Kuwaiti Sovereign Wealth Fund, and a new SDR allocation (*i.e.* USD 1.5 billion in August 2021).

Between 2021 and 2022, the Congo Central Bank's interventions on FOREX market (*i.e.* around USD 200 million) have also contributed to increase the DRC's international reserves[3]. This was already observed during previous interventions in 2009, which resulted in the DRC's international reserves crossing USD 1 billion threshold (with SDR allocations of around USD 620 million - in August 2009 - in addition to IMF's USD 200 million Exogenous Shocks Facility - in March 2009 - and USD 200 million World Bank support in response to 2008 financial crisis).

Conclusion

At the end of this reflection on the COVID-19 pandemic and DRC's foreign trade behavior according to a non-parametric approach and the comparison of means, it should be noted that the DRC remains open to foreign trade. As such, it has faced a slowdown in economic activity and an imbalance in global supply and demand throughout the crisis.

Based on the observations of the monthly evolution of exports and imports between 2019 and 2022, there is a decline in exports and imports during 2020, after a certain upward trend in 2019. For the period from 2021 to 2022, the DRC's foreign trade has maintained a growing trend, as have its international reserves, despite the health crisis that marked the study period.

For the year 2020, compared to 2019, the decline in exports and imports in million USD is noted, respectively falling to 1078.6 against 1098.6 and 988.8 against 1,149.1 in annual average. This can be explained by the various restrictive measures taken by the government to contain the health crisis in COVID-19, including containment, teleworking, reduction of work shifts, limitation of working days, closure of borders, etc.

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[3] Interview with experts (Monetary Policy and Foreign Trade) of the Central Bank of Congo, in Kinshasa, DR. Congo, March 2nd 2023.

Subsequently, these same indicators were also reported to rise between 2021 and 2022, from 1,742.5 to 2,368.4 for exports and from 1,520.4 to 1,920.1 for imports from the DRC.

According to non-parametric tests of differences between independent and matched samples, at the 0.05 level, there is a significant difference between exports during the period of absence of COVID-19 and those during the period of presence of COVID-19. Indeed, we note that exports in millions of USD fall considerably and that the same is true for imports. Thus, these results show that the COVID-19 pandemic has significantly influenced foreign trade, considering the variables exports and imports, and that international reserves have not significantly decreased because of the various interventions (Aid and support from traditional partners).

The scientific relevance of this study, from a theoretical point of view, is to present the profile of the economy of the DR Congo's economy as a country open to international trade on the one hand, and also to measure the cyclical effects of this COVID-19 health crisis on this economy through the aggregates of foreign trade, and possibly to propose contingency mechanisms and resilience to health crises.

Therefore, it is suggested that the Government should work more towards diversification of the economy and the intensification of international trade, in order to better finance and maintain the balance of international reserves in a context of exogenous shocks. This is the best way to effectively contribute to a more resilient economy, which is structurally dependent on bilateral and multilateral donors. The COVID-19 pandemic has had a strong impact on world trade and has revived arguments around the debate on a better localization for countries' economic activities. In fact, the decision to reterritorialize a country's economic activities would undoubtedly lead to the renunciation of benefitting the great international specialization advocated at the turn of the century without any certainty, as to a better resilience of the international value chains that are at the core of economic progress.

Credit Authorship Contribution Statement

Yannick Lubongo Mbilu: Conceptualization, Investigation, Methodology, Project administration, Supervision, Validation.
Logas Lowenga Koyamodja: Data curation, Methodology, Formal analysis.
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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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List of acronyms

- AH_0 : Null hypothesis accepted
- APD [ODA] : Official Development Assistance
- G et S : Goods and Services
- ADB : African Development Bank
- BCC : Central Bank of Congo (DRC)
- CDF : Congolese francs
- COVID-19 : Coronavirus 2019 (full name)
- CR : Research Unit
- DGDA : DRC Customs and Excise Utility
- DGI : DRC Tax Utility
- DGRAD : DRC administrative and state revenue Utility
- SDR : Special Drawing Rights
- FASEG : Faculty of Economics and Management
- FMI [IMF] : International Monetary Fund
- H_0 : Null hypothesis
- H_1 : Alternative hypothesis
- Import-Export : Importation and Exportation
- IRES : Economic and Social Research Institute
- OMC [WTO] : World Trade Organisation
- PED : Developing countries
- PGAI : Aid and Investment Management Platform
- PIB [GDP] : Gross Domestic Product
- PMUAIC-19 : Multisectoral emergency mitigation programme for COVID-19
- Prob. : Probability
- DRC : Democratic Republic of Congo
- RH_0 : Null Hypothesis rejected
- UNIKIN : Université of Kinshasa
- USD : US Dollar

Inflation Persistence and Implications for the Euro Area

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Abstract: *The deceleration of consolidation trends subsequent to the previous financial crisis has had a mitigating effect on price dynamics. Furthermore, the expansionary fiscal and monetary measures implemented to stimulate the recuperation of crisis-affected economies did not yield substantial inflationary consequences. The disruptions in supply chains caused by the pandemic, the increased use of expansionary fiscal and monetary policies in response to the outbreak, and the influence of geopolitical factors such as energy prices have recently rekindled the capacity of price level dynamics to react. When the underlying economic factors deteriorate, it leads to an increase in vulnerability and a decrease in the ability of the euro area to withstand adverse events. During periods of economic prosperity, the monetary policy implemented by the European Central Bank (ECB) has the tendency to enhance the convergence of countries within the euro area and bolster its resilience against adverse economic disturbances. The findings of the article provide support for arguments emphasizing the need to adjust the institutional framework of the euro area, hence reinforcing the rationale for the concept of a two-speed euro area.*

Introduction

The existing body of empirical research lacks sufficient theoretical and empirical understanding of the progression of price level dynamics, its underlying characteristics, its relationship with broader macroeconomic trends, and the resulting causal effects on monetary policy. The forecasts presented are grounded in empirical evidence, which highlights the significant impact of endogenous and external shocks, as well as the actions undertaken by monetary and fiscal authorities, on the overall growth of advanced Western economies.

Following the current financial and following economic and debt crises, there has been a notable impact on price developments due to considerable consolidation patterns. On the other hand, the implementation of expansive fiscal and monetary measures, notwithstanding deflationary and disinflationary conditions, has played a supportive role in facilitating the recovery of economies afflicted by the crisis. In recent times, however, there has been a restoration of the capacity for price adjustments to respond. The observed phenomenon can be attributed to the intensification of expansionist components within fiscal and monetary policies following the onset of the COVID-19 pandemic, with the interruptions seen in production chains due to the epidemic. Additionally, the influence of geopolitical issues, particularly energy prices, has contributed to this outcome.

There exists substantial theoretical and empirical backing for the examination of inflation characteristics, including the duration of inflationary periods. This assertion holds particular validity within the framework of the New Keynesian Model (NCP), which serves as a robust and comprehensive approach for integrating macroeconomic and microeconomic underpinnings within the realm of economic modeling. At the microeconomic level, the estimation of price adjustment costs in monopolistic market structures serves to elucidate the attributes of inflation. Conversely, at the macroeconomic level, the analysis of inflation characteristics is predominantly

driven by approaches that examine the efficacy of transmission mechanisms, the bias between rules and discretion, inertia, trends in inflation as opposed to cyclical macroeconomic fluctuations, and other related factors.

The formation of inflation expectations is influenced by the response of inflation to various macroeconomic, microeconomic, and monetary policy factors. The effectiveness and efficacy of the transmission mechanism for monetary policy have experienced significant decline within an environment characterized by persistently low interest rates approaching zero (often referred to as the near-zero lower bound), notwithstanding the utilization of unconventional measures in the implementation of monetary policy. Consequently, the price level dynamics were influenced by microeconomic factors, as opposed to being solely determined by monetary macroeconomic fundamentals. The efficacy of the monetary policy transmission mechanism in terms of retail segment cash accessibility may have diminished. However, it can be argued that quantitative easing is beneficial in this regard, as its fundamental objective is to guarantee the availability of liquidity to economic entities, including commercial banks. In contrast to the conventional macroeconomic environment characterized by predictable macroeconomic fundamentals, the expansion of the monetary base by central banks, driven by fiscal stimulus measures in response to the pandemic, has exhibited an accelerated trajectory. Initially, this acceleration took place covertly through the increase in financial asset prices, such as stock markets, and the growth of house prices. However, more recently, it has become overt, manifesting in the dynamics of price levels and the associated characteristics of inflation.

The ECB faces challenges in managing the effects of external shocks on the euro area's diverse Member States. While there is some alignment in economic cycles, differences in macroeconomic and microeconomic factors, as well as price levels, contribute to asymmetric economic outcomes. These disparities also impact real interest rates. Empirical evidence serves to bolster the proposition of a viable two-speed euro area concept and lends credence to the arguments emphasizing the imperative need for modifications in the institutional framework of the euro area. During periods of economic prosperity, the single monetary policy implemented by the ECB has the tendency to enhance economic convergence, leading to a convergence in price levels. Additionally, it serves to reinforce the symmetry of economic cycles and enhance the euro area's resilience to both internal and external shocks. The adoption of a common monetary policy benefits countries in favorable economic conditions. Nevertheless, when confronted with deteriorating macroeconomic fundamentals, it becomes apparent that the euro area's ability to withstand challenges is underscored, while simultaneously exposing some vulnerabilities stemming from enduring structural and performance disparities among its constituent nations. This, in turn, leads to observable disparities in real interest rates.

The main objective of the article is to provide a comprehensive understanding of the theoretical and empirical basis for examining and explaining the characteristics of inflation, as well as the macroeconomic consequences that influence central banks' decision-making regarding monetary policy. This paper aims to provide a comprehensive overview of the evolutionary trajectory of inflation and its associated characteristics during the past two decades. Special attention will be given to the transformative developments observed in recent years, particularly those influenced by the global pandemic and energy crises. This study aims to elucidate the implications of empirical experience for economic policy.

1. Literature Review on Persistence in Inflation

The phenomenon of inflation gradually returning to its equilibrium level after a shock, such as one caused by monetary policy, is referred to as inflation persistence. This concept is being utilized more frequently as a measure of the effectiveness of monetary policy (Meller and Nautz 2012). According to Willis (2003) and Marques (2004), the persistence of inflation is influenced by the magnitude of its response to a shock. When the rate of inflation's response is low, inflation tends to be more persistent. Conversely, when the rate of response is high, inflation exhibits lower levels of persistence. According to Roache (2014), the effectiveness of monetary policy in addressing temporary price shocks is diminished when inflation exhibits a high level of persistence. Conversely, the efficacy of monetary policy implementation by the central bank is enhanced as inflation persistence diminishes. In Milani's (2005) seminal work, a theoretical framework was put forth to explain the phenomenon of inflation persistence. This model posits that economic actors adjust their expectations of future inflation based on previous economic performance. According to his research findings, inertia, sometimes referred to as "learning behavior," emerges as the predominant factor contributing to the persistence of inflation. In addition, Cogley and Sbordone (2008) propose in their study that modifications in monetary policy play a predominant role in driving alterations in the long-term inflation trend component, hence contributing to the persistence of inflation.

Empirical research utilizes a variety of methodologies to measure the degree of inflation persistence. Two empirical studies have been conducted to estimate autoregressive models with a time-varying parameter. These

studies are Pivetta and Reis (2007) and Benati (2002). In their study, Levin and Piger (2004) employed autoregressive models that incorporated the possibility of a structural break occurring at any given point. They utilized both traditional and Bayesian econometric methodologies to carry out their analysis. Cuestas and Harrison (2010) conducted a study in which they employed unit root tests that account for nonlinearity to examine the stationarity of inflation in a majority of the Central and Eastern European (CEE) countries. Davig and Doh (2014) conducted an estimation of the mark-switching New Keynesian model for the United States, employing Bayesian approaches to account for potential fluctuations in the coefficients that capture monetary policy reactions. Wolters and Tillmann (2015) conducted a study to examine the impact of structural fracture on the persistence rate of inflation using quantile autoregressive models. Canarella and Miller (2017) conducted an empirical investigation to examine the global durability of inflation by employing cointegration methodologies.

Amisano and Tristani (2010) contend that the inclusion of structural breaks in the model results in a notable reduction in the degree of persistence observed in inflation. Moreover, it is argued that econometric assessments validating substantial levels of inflation persistence are typically observed in research that solely examine average inflation. Amisano and Tristani (2010) have documented a considerable body of research that has consistently revealed the existence of structural cracks and their consequential effect on the reduction of inflation persistence. Levin and Piger (2004), Bilke (2005), and Corvoisier and Mojon (2005) have together identified structural breaks in inflation in France across a significant number of OECD countries. In their study on the persistence of inflation, Ewing and Malik (2010) incorporated structural breaks into the GARCH model and found that oil shocks exerted a significant initial effect which diminished rapidly over time.

The study conducted by Meller and Nautz (2012) examined the degree of inflation persistence prior to and after to the establishment of the Economic and Monetary Union (EMU). The panel data model employed in their study demonstrated that, notwithstanding variations in inflation dynamics among member nations, there has been a notable decline and convergence in the level of inflation persistence since 1999. Canarella and Miller (2017) conducted a study on the persistence of inflation in a sample of industrialized and emerging economies who implemented inflation targeting. The results indicate that inflation exhibits co-integration, stationarity, and persistence in Germany, the United States, as well as three developed economies, namely Sweden, Canada, and the United Kingdom. Nevertheless, there is a lack of convergence between the three emerging economies (Mexico, Israel, and Chile) and Germany or the United States in terms of inflation persistence. Additionally, Canarella and Miller (2017) observe that there is a decreasing trend in inflation persistence among industrial economies on a worldwide scale. Kanellopoulos and Koutroulis (2016) employed non-linear panel data models to investigate the existence of heterogeneity and analyze the persistence of inflation across 11 member states within the euro area. The results of the study indicate a positive correlation between higher inflation rates and increased inflation persistence. This relationship has important implications for the implementation of monetary policy across different contexts. According to the study conducted by Franta, Saxa, and Šmídková (2010), there were notable disparities in the level of inflation persistence between the member nations of the euro area and those that were not part of it. Rodriguez-Fuentes, Olivera-Herrera, and Padrón-Marrero (2004) highlight a consistent decline in inflation rates across EU member states over an extended period. However, they argue that the ECB's singular monetary policy, designed to target inflation for the entire euro area, may exacerbate the persistence of inflation in countries with divergent business cycles. This is due to the ECB's uniform interest rate policy, which may not adequately account for the specific needs of individual nations. Additionally, the authors suggest that nations aspiring to join the euro area may also experience an increase in inflation persistence as they strive to align with the core member states of the euro region.

2. Inflationary Trends

The COVID-19 epidemic has had a profound influence on the political and economic functionality of the global economy. In numerous European countries, governmental authorities have implemented restrictions on commercial operations, while individuals have voluntarily restricted their mobility due to apprehensions around the transmission of diseases. Private consumption experienced a significant decline as a consequence. Countries that saw a more pronounced impact from the crisis subsequently witnessed higher rates of economic growth due to the diverse nature of economic activity and development. The recession exhibited distinctive characteristics in terms of its magnitude and attributes, wherein several sectors experienced significantly more adverse effects compared to others, particularly those reliant on face-to-face interactions such as travel, entertainment, dining, and accommodation.

The conflict in Ukraine has had a profound effect on the global economy, particularly in relation to the food and energy sectors. There has been a significant decrease in supply and a remarkable increase in prices. The

euro area has a higher degree of vulnerability to the economic ramifications arising from Russia's invasion of Ukraine compared to other economic zones. The predominant factor contributing to this phenomenon is the substantial dependence of the euro area on energy imports, which constituted over 50% of the region's energy consumption in the year 2020. Moreover, it is worth noting that Russia held a prominent position as a major energy provider to the euro area prior to the onset of the conflict. Before the commencement of armed conflict in Ukraine, both Russia and Ukraine had significant roles as importers of food and fertilizer inside the euro area. The euro area is widely recognized as an economically integrated region that is particularly vulnerable to disruptions in global manufacturing chains and global markets.

The ongoing conflict in Ukraine has exacerbated the pre-existing inflationary pressures that were already on the increase across the euro area during the period of economic recovery following the epidemic. Consequently, there has been a significant increase in consumer costs, namely in the sectors of food and energy. The primary factor behind the heightened inflation in 2022 was the escalation of energy costs. However, since the commencement of 2023, the predominant driver of inflation has been the surge in food prices. The escalation in food prices can be attributed, in part, to the indirect and delayed consequences of elevated energy prices, as food production necessitates a substantial amount of energy. The energy policy mechanism of the European Union (EU) has exerted a notable influence on the escalation of energy prices, specifically in connection to electricity and its cost relative to gas prices. The prices of food commodities, such as oilseeds and wheat, which were significantly dependent on imports from Russia and Ukraine before the onset of the war, had a considerably higher rate of growth compared to the overall average rise in food costs. The economies of the member nations of the euro area are currently experiencing significant adverse effects from elevated levels of inflation, mostly driven by escalating energy and food costs. This phenomenon is particularly evident in homes with limited financial resources, as a significant proportion of their total consumption is allocated towards energy and food expenses.

The substantial rise in imported energy costs leads to a considerable and unavoidable decline in actual revenue as a consequence of the deterioration of trade circumstances and genuine demands to enhance competitiveness. The reason for this is that the euro area has a limited level of energy source diversity and, consequently, relies heavily on energy imports, predominantly from Russia prior to the commencement of the conflict in Ukraine. In light of these conditions, enterprises are incentivized to mitigate their share of the burden by transferring the escalation in input costs to their clientele through price increases for their products. Moreover, employees are motivated to mitigate their share of the workload by engaging in salary negotiations with employers in order to completely compensate for the decrease in purchasing power resulting from rising inflation. The interplay between higher profit margins, increasing nominal incomes, and rising prices mutually reinforce one another, hence intensifying the likelihood of an inflationary cycle and elevating inflation expectations. Consequently, this dynamic has the potential to solidify persistently high levels of inflation. Therefore, in line with the mandate of the ECB, the Governing Council of the ECB initiated the process of normalizing monetary policy in December 2021 and made a commitment to swiftly restore inflation to the medium-term target of 2%.

Based on the projected sequence of events, there are discernible signs in the initial and subsequent quarters of 2023 that suggest a diminishing influence of the Ukrainian conflict on global energy and food market dynamics. This phenomenon is expected to result in a gradual and moderate decrease in inflation rates, both within the euro area as a whole and within its constituent member nations. The expenditure associated with energy holds significant importance within this particular setting. In the year 2022, the EU experienced a notable reduction of over 20% in its consumption of natural gas. This decline played a significant role in enabling the EU to manage the consequences of decreased imports of Russian gas, which can be attributed, in part, to the imposition of sanctions by the EU. The precipitous decrease in natural gas prices observed subsequent to the peak levels reached in autumn 2022 can be ascribed to endeavors aimed at curbing energy use and fostering energy source variety. Moreover, the present market forward prices suggest a downward trend in gas prices, so leading to a potential decrease in energy expenses for consumers.

The primary determinant of consumer inflation inside the euro area currently pertains to the fluctuating nature of escalating food expenses. Nevertheless, starting from mid-2022, several significant indicators, such as farm-gate prices and food commodity prices within the euro area, have experienced a substantial decline. This observation substantiates the forecast that there will be a deceleration in the increase of food costs in the forthcoming months. Despite these promising advancements, it is crucial to underscore that there is a significant potential for the conflict in Ukraine to exert adverse effects on economic expansion, potentially leading to general price increases, notably in the realms of food and energy.

The euro area economy is projected to see moderate yet positive short-term growth, as a result of fiscal measures aimed at mitigating the effects of high inflation on real earnings, with a particular focus on low-income populations. Additionally, the decrease in energy expenses contributes to this economic prognosis. The labor markets within the member nations of the euro area continue to exhibit positive developmental trends. The strong performance of the labor market indicates significant potential for future growth in the economy of the euro area. Additionally, it might potentially encourage the emergence of novel employment prospects, thereby efficiently integrating a substantial number of Ukrainian refugees into the labor markets of member nations within the euro area.

3. Is Inflation a Threat for the Euro Area?

Following the occurrence of the global financial and economic crisis, as well as the ensuing debt crisis commonly referred to as the euro crisis, a period of economic recuperation ensued. Over the past decade or longer, the ECB has consistently underestimated its inflation target. However, it is noteworthy that inflation rates constantly maintained below the threshold of 2% throughout this period. In response to these occurrences, the ECB has opted to enact monetary stimulus measures at unprecedented magnitudes, commonly referred to as "quantitative easing," with the aim of elevating inflation levels in alignment with its desired target. The ECB introduced the pandemic emergency purchase program (PEPP) as a supplementary measure to its monetary policy framework in response to the onset of the global pandemic. This decision was motivated by the ECB's apprehension regarding the potential exacerbation of deflationary pressures resulting from the implementation of pandemic-related restrictions on economic activity. The aforementioned action clearly indicated the organization's commitment to maintaining an accommodating monetary policy throughout the duration of the pandemic, as seen by the wider population.

However, the conclusion of the pandemic and the energy crisis associated with the conflict in Ukraine have raised significant considerations on the potential need for the ECB to adjust its monetary policy earlier than originally projected. The reopening of sectors of the economy that experienced prolonged closures in 2020 can be attributed to the effective management of the epidemic by advanced economies. Furthermore, the global recovery in 2021 exhibited a relatively robust pace. Furthermore, some anomalous occurrences resulting from the epidemic facilitated a swifter-than-expected restoration of inflation in the year 2021. Furthermore, alongside the recuperation of energy prices, there have been price escalations observed in several other commodities as a result of disruptions in supply and alterations in demand patterns.

In 2021, the ECB conducted a review of its monetary policy strategy. Following the completion of this assessment, the ECB may have made the decision to allow inflation to surpass its designated target, even if only for a limited period, considering the substantial cumulative underestimation of its inflation objective in the years leading up to the global health crisis. Given the ECB's decision to refrain from adopting an average inflation target policy, it becomes imperative for the ECB to take prompt measures in response to any sustained inflation exceeding the 2% threshold in the long run. The ECB would have significant challenges if it were to abruptly transition to a more conservative monetary policy. Such a shift might potentially result in a likely recession or pose concerns regarding financial stability. Given the prevailing macroeconomic and monetary policy trends in the second half of 2021, the ECB had little reason to be apprehensive about the possibility of inflation persistently exceeding its target level and so requiring a substantial modification to its monetary policy. During the latter part of 2021, the ECB, the FED, and other central banks in advanced market countries acknowledged the temporary nature of heightened inflation following the initial phase of the pandemic, as pandemic restrictions were being eased. The relevance of considering the potential alleviation of inflationary pressures observed in 2021 for the year 2022 seemed significant, despite the presence of several distinctive factors and attributes inherent to post-pandemic countries, which further complicated the process of economic forecasting during that period.

The conflict in Ukraine has exacerbated the inflationary pressures that were already on the increase across the euro area amid the post-pandemic economic recovery of individual nations. Consequently, there has been a significant increase in consumer prices, namely in relation to food and energy. The large increase in headline inflation in 2022 may be attributed to the upward trend in the prices of food and energy, which accounted for more than two-thirds of this surge. The primary factor behind the heightened inflation in 2022 was the escalation of energy costs, whilst the predominant contributor since the commencement of 2023 has been the upward trajectory of food prices. In May 2023, there was a notable surge of 10.5% in food costs compared to the corresponding month in the previous year. It is worth mentioning that this increase follows a larger annual rise of 15.3%, which reached its peak in March 2023. The escalation in food prices can be attributed, in part, to the indirect and delayed consequences of elevated energy prices, as food production necessitates a substantial

amount of energy. The energy policy mechanism of the EU has exerted a notable influence on the escalation of energy prices, specifically in the context of electricity and its cost relative to gas prices. The prices of food commodities, such as oilseeds and wheat, which were significantly dependent on imports from Russia and Ukraine prior to the war, had a considerably higher rate of growth compared to the average escalation observed in food costs. The economies of the member nations of the euro area are experiencing significant adverse effects from elevated levels of inflation, mostly driven by escalating energy and food costs. This phenomenon is particularly true for households with low income, as a significant proportion of their total consumption is allocated to expenses related to energy and food.

The substantial rise in imported energy costs leads to a considerable and unavoidable decline in actual revenue as a consequence of the deterioration of trade circumstances and genuine demands to enhance competitiveness. The reason for this is that the euro area has a limited level of energy source diversity and, consequently, relies heavily on energy imports, predominantly from Russia prior to the commencement of the conflict in Ukraine. Considering these conditions, enterprises are incentivized to mitigate their share of the burden by transferring the escalation in input expenses to their clientele through price increases on their products. Moreover, employees are motivated to reduce their share of the workload by engaging in negotiations with employers to get compensation modifications that completely counterbalance the decrease in real income resulting from heightened inflation. The interplay between higher profit margins, increasing nominal incomes, and rising prices contributes to the potential emergence of an inflationary cycle, subsequently elevating inflation expectations and potentially solidifying a persistent state of high inflation. Therefore, in line with the ECB's prescribed objectives, the Governing Council of the ECB initiated the course of action to restore monetary policy to its standard state in December 2021. Additionally, they made a commitment to expeditiously bring inflation back to the desired medium-term target of 2%.

3.1 The Euro Area's Inflation and Inflationary Pressures

Before the implementation of pandemic-related restrictions, the Harmonized Index of Consumer Prices (HICP) reflected an estimated inflation rate of approximately 1%. The pandemic-induced restrictions imposed in 2020 had a negative impact on pricing dynamics, particularly during the latter half of the year. However, a reversal in this trend occurred in early 2021, leading to a subsequent increase in the inflation rate.

As can be seen from Figure 1, the main drivers of the rise in HICP inflation in 2021 and 2022 were non-core inflation components. Core inflation can be said to fluctuate over a much narrower range than headline HICP inflation, broadly since the inception of the euro area.

Figure 1. Harmonized Index of Consumer Prices (HICP and core HICP in the euro area) (2007-2023) (in percent)
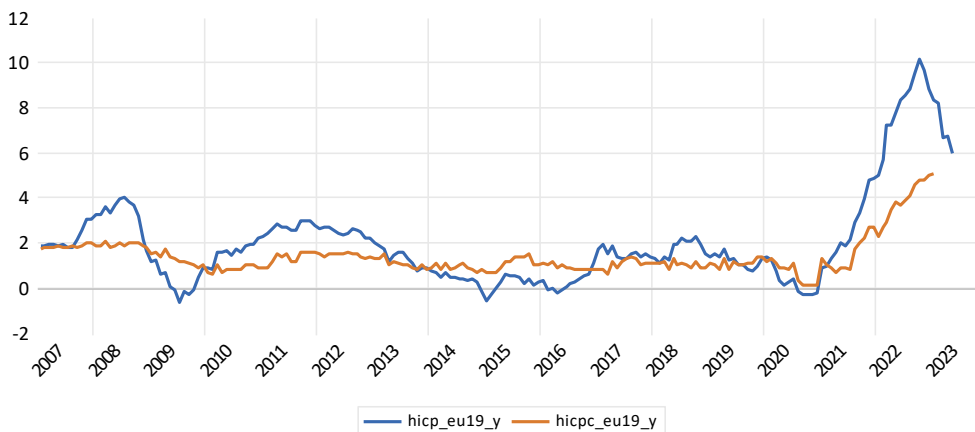
Source: The author's calculations using data from Eurostat

What implications does this have for the monetary policy of the ECB? The ECB frequently exhibits a preference for a broader range of "fundamental" indicators of price fluctuations, which may not be directly tied to the only monitoring of core HICP inflation. However, while analyzing the projected trajectory of inflation, it is prudent to focus on the concept of core inflation, as depicted in the graph. In contrast, core inflation has a greater degree of stability, especially during periods that are perceived as economically fortunate. Furthermore, it is evident from both plots that the euro area exhibits more pronounced disparities between core and basal inflation when compared to the United States.

The disparity between core and basal inflation in the euro region can be predominantly attributed to the notable escalation in energy prices. Figure 2 illustrates a notable decrease in energy prices during the initial phase of the epidemic era, followed by a significant rebound towards the conclusion of 2022. The swift transformation might be attributed to apprehensions of the possibility of an economic downturn resulting from the impact of increasing key interest rates implemented by the ECB on the euro area's economy.

Figure 2. HICP and HICP energy price index (2007-2023) (in percent)
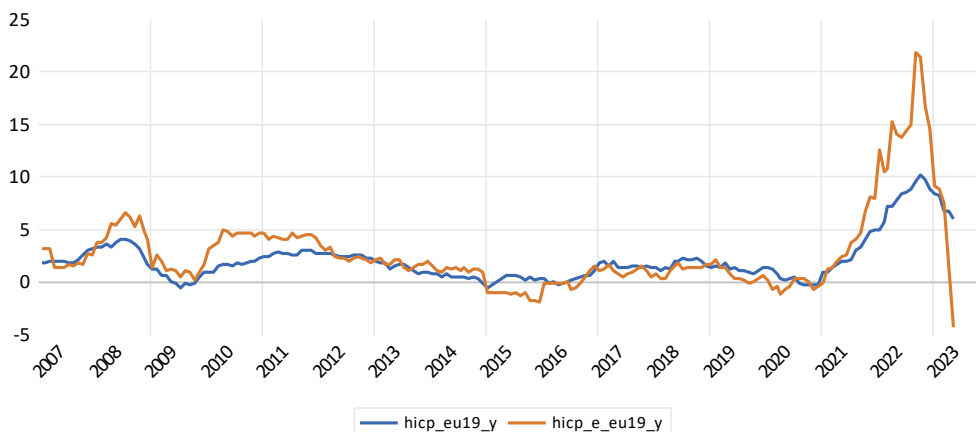
Source: The author's calculations using data from Eurostat

An in-depth analysis of macroeconomic indicators suggests that the current persistence of inflation, as measured by the HICP and targeted by the ECB, is likely to be temporary in character. It is not feasible to anticipate a continued upward trajectory of core HICP inflation in the forthcoming months. However, several additional factors are considered in addition to the immediate term.

Furthermore, it is of utmost importance to ascertain the extent to which heightened inflationary pressures translate into increased inflation expectations and subsequently contribute to elevated wage demands. This critical information aids in assessing the transitory nature of a reported inflationary upsurge. Currently, it does not seem that continually increased inflation rates have a detrimental effect on the upward trajectory of inflation expectations. Based on available statistics, it can be observed that the economy saw a resurgence subsequent to the removal of pandemic-related limitations. Consequently, this led to a gradual upturn in the HICP inflation over the course of 2021. The onset of the energy crisis in the EU in early 2022, accompanied by early indications, and the following eruption of the conflict in Ukraine, led to a significant surge in the HICP inflation. This upward trajectory reached its highest point prior to the conclusion of 2022.

The recent surge in inflation poses a potential threat to the medium-term economic growth of the euro area. Despite the observed peak towards the close of the preceding year, the probability of a forthcoming reduction in interest rates may be significantly reduced due to the prolonged persistence of inflation rates over the ECB's inflation objective. Countries that have been impacted by the pandemic and oil crisis may have challenges in their efforts to expedite economic growth if they continue to face elevated interest rates. Higher interest rates on debt payments might hinder the efforts of governments, firms, and individuals to consolidate their financial obligations.

Orphanides and Wilcox (1997) advocated that central banks could capitalize on short-term supply shocks that yield favorable effects on inflation as a means to mitigate inflationary pressures. These shocks are expected to enable central banks to maintain low inflation rates without the need to raise unemployment rates, hence avoiding hindrances to the nation's economic advancement. The reputation of central banks, such as the ECB, has been adversely affected due to their inability to attain the required levels of inflation in recent years, despite their implementation of a policy involving the utilization of cheap money, quantitative easing, and the maintenance of key interest rates at near-zero levels. If the current upward trend in inflation has any impact on inflation expectations, it could perhaps help to uphold the ECB's target rate as the primary reference point for inflation expectations. Furthermore, the potential of "opportunistic higher inflation" extends beyond aiding the ECB in achieving its inflation target. It might also potentially support a systematic and organized exit strategy from the ECB's ongoing unorthodox monetary policies.

4. Causes behind the Current Rise in Inflation

Throughout the year 2020, the period of the pandemic exerted a significant influence on worldwide economic patterns. The sudden decrease in aggregate demand resulted in a substantial decrease in the pricing of several commodities and services. Following the commencement of economic recovery, it became evident and anticipated that a substantial increase in prices would occur as a result of these transformations. The variation in the trajectory of this process across different nations and industries was to be expected, and it had a significant impact on the pricing of particular goods and services.

Budianto *et al.* (2021) express concerns on the potential conclusion of the recent phase of low inflation, attributing it to the enhancement in headline output growth and the persistent limitations imposed on specific sectors. The primary factors contributing to the surge in inflation are the underlying consequences of the pandemic, the escalation in prices for specific items impacted by the pandemic, and the rise in energy expenses. All these reasons share a common characteristic: they had a temporary impact on inflation. In order to achieve a sustained rise in inflation, it would be imperative to witness a significant surge in labor expenses alongside a decrease in inflation expectations. Nevertheless, in the aftermath of the pandemic, there was limited evidence of inflation expectations from forecasters and financial markets effectively stabilizing in the medium term. Additionally, while wage growth is subdued, it is worth noting that it is quite elevated. Therefore, these modifications appeared to align with a medium-term inflation projection that was approaching the targets established by central banks.

Figure 4. Dynamics of the HICP main components in the euro area (2020-2023) (in percent)
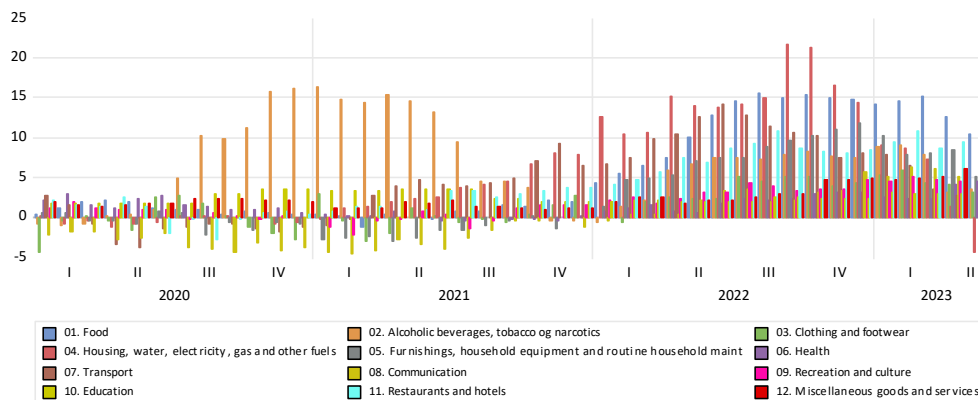
Source: The author's calculations using data from Eurostat

The preceding section discussed the significant impact of base effects on oil and other energy prices. The aforementioned observation aligns with the historical precedent of significant volatility, pronounced seasonal variations, and heightened vulnerability to sudden external disturbances in the context of food and energy prices (see Figure 4). Due to this rationale, analysts and central bankers primarily direct their attention towards core inflation as a means to gauge underlying inflation patterns and forecast inflation in order to establish the essential frameworks for guiding monetary policy. Core inflation, in this context, excludes the influence of food and energy prices when computing the consumer price index (CPI) and assessing inflation levels.

The euro area has experienced significant input cost pressure, notably starting from the latter half of 2021. This may be attributed to the escalation of commodity prices, substantial increases in transportation costs, as well as shortages in certain raw materials and intermediary products. Within the manufacturing and distribution chain, there exists a phenomenon of pricing pressure originating from external factors, leading to a rise in the costs associated with inputs. However, it was not until a subsequent phase in the production and distribution process that the effects of pricing pressures were evident. In contrast to intermediate products, the escalation in prices of domestic non-food consumer items remained rather moderate across the specified timeframe, despite the fact that prices within this category were already much higher than their historical mean. Moreover, the alterations in import prices were disadvantageous, particularly for non-food consumer goods, predominantly due to the appreciation of the euro compared to its value one year ago.

The escalation of consumer costs, namely for food and energy, has been observed as a consequence of the energy crisis resulting from the conflict in Ukraine. Consequently, by October 2022, the median annual inflation rate in the euro region as a collective entity surged to an unprecedented level of 10.16%. As of the commencement of 2021, the inflation rate inside the euro area remained below 1%. The predictability of the euro

area economy's recovery, the labor market conditions in each member state, and the possible risks linked to a potential escalation of the crisis in Ukraine causing further increases in food and energy prices are all highly uncertain. If there is a persistent increase in food and energy prices, the ECB might delay the reduction of key interest rates, relaxation of monetary policy guidelines, and the cessation or reduction of the current quantitative tightening. This would be done to align inflation in the euro area with its desired target.

4.1 Should We Anticipate a Steadier Increase in Inflation?

As the current situation stands, there is a possibility of prolonged high inflation if the inflationary shocks experienced in 2021 (stemming from the global economy rebounding after the relaxation of pandemic restrictions) and 2022 (due to the energy crisis resulting from the conflict in Ukraine) trigger a series of subsequent events that give rise to a price-wage inflationary spiral. Consequently, this could lead to sustained wage growth surpassing labor productivity growth, specifically in terms of continuous increases in unit labor costs. Additionally, there is a risk of ecological contamination.

According to Lane (2021), robust labor markets are generally associated with enduring inflation. Numerous economies have successfully navigated the pandemic period, seeing few adverse impacts on the labor market and unemployment trends, primarily due to substantial budgetary assistance. Consequently, numerous countries are projected to experience unemployment rates post-2021 that are similar to the historically low levels observed in the preceding decades. It is worth mentioning that the compensation per employee (CPE) in several euro area nations has not yet returned to the levels observed prior to the pandemic, a trend that persists into 2021 and even extends into 2022 (as indicated in Figure 5).

Figure 5. Increasing trend in labor compensation per employee (2000-2022) (in EUR per hour)
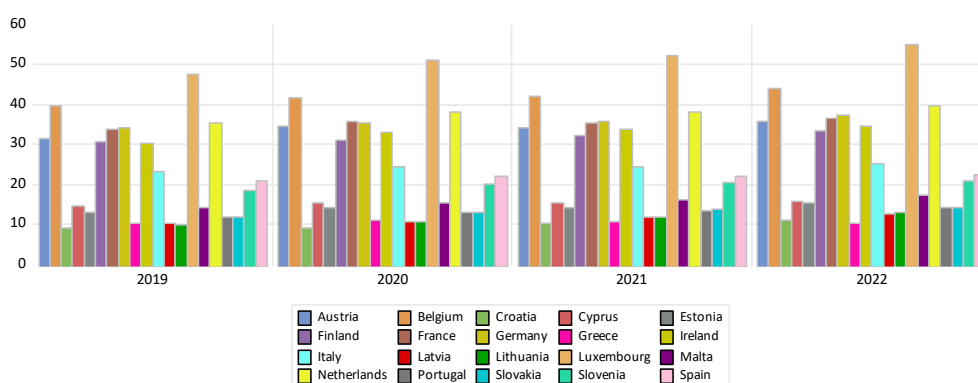
Note: Compensation of employees per hour worked in EUR
Source: The author's calculations using data from Eurostat

In the context of the euro area, it is apparent that the utilization of fiscal stimulus to sustain employment throughout the pandemic period has implications for many indicators that monitor the progression of the labor market. The CPE growth remained below 2% until the conclusion of 2021 due to a confluence of factors, including a deceleration in the rate of pay per employee per hour and an upsurge in working hours attributable to a decline in the utilization of short-term employment programs. This level of growth aligns with the long-term average observed since 1999. However, it is noteworthy that during the entirety of 2022, the increase of CPI exceeded the long-term average of 2% by a little margin. This observation suggests the potential emergence of a price-wage spiral, which has inherent risks. This offers another rationale for the ECB's implementation of a more restrictive monetary policy approach, which entails gradually increasing key interest rates and implementing measures to reduce the quantity of money in circulation.

Nevertheless, it can be postulated that workers whose actual wages were affected during the pandemic, characterized by a decrease or lack of growth in nominal wages alongside a decline in the purchasing power of their real incomes due to rising inflation, may endeavor to address this predicament by advocating for increased wages from their employers or by pursuing opportunities in alternative industries that offer greater potential for wage advancement. Current labor market concerns, such as skill mismatches among workers in various industries, considerable regional disparities in income and employment prospects, and limited territorial mobility of employees within the EU, have the potential to undermine and exacerbate the fragility of local labor markets. The demand for proficient personnel in rapidly recovering industries and regional economies may be increasing, perhaps resulting in heightened competition within labor markets. The convergence of inflationary forces resulting from the economic recovery following the pandemic and the escalating costs associated with the EU's energy

challenge may potentially lead to a situation of stagflation in specific countries inside the eurozone, should this scenario materialize.

Based on the prevailing conditions in the euro area, it is plausible to posit that the phenomenon of stagflation will not solely impact a limited subset of states characterized by pronounced challenges but will progressively extend its detrimental effects to encompass a substantial proportion of the region's economies. To mitigate the risk of a debt crisis, central banks possess the capacity to engage in the monetization of substantial fiscal deficits. This is attributable to the notable escalation of private and governmental debt within the global economy throughout the pandemic era, as well as persistent structural patterns (Roubini 2021). Economic actors find themselves ensnared in a cycle of indebtedness as a consequence of the simultaneous escalation of both public and private debt. In the forthcoming years, central banks will be confronted with the challenge of addressing the escalation of inflation. There is a potential for initiating a significant debt crisis and profound economic downturn if policymakers opt to gradually transition away from implementing unconventional measures and maintain higher interest rates over extended durations within nations, with the aim of addressing inflationary pressures. Nevertheless, there is a potential danger of seeing double-digit inflation and severe stagflation if the authorities decide to prematurely relax monetary policy once again.

4.2 How Did We Get There?

The implementation of quantitative easing by the ECB over a period of more than ten years resulted in a substantial increase in its balance sheet, as depicted in Figure 6. The initial catalyst for the events may be traced back to shifts in the macroeconomic landscape, encompassing both market fundamentals and sentiment. These changes were then compounded by the consequences of the sovereign debt crisis within the euro region. Given that the main policy rate had already been reduced to negative levels in 2014 and was nearing the effective lower bound, the ECB initiated the implementation of "unconventional" monetary policy measures.

Shortly after the onset of the COVID-19 epidemic, there was a notable increase in the balance sheet of the ECB. The introduction of an additional government bond purchase program has further augmented the balance sheet of the ECB with the objective of averting financial crises and economic downturns. During its peak in 2022, the balance sheet of the ECB accounted for over 50% of the GDP of the euro area.

Simultaneously, it is noteworthy that a substantial augmentation in the ECB's balance did not exhibit any discernible indications of potential inflationary pressures. Throughout the majority of the post-economic and financial crisis era, commencing in 2008, the euro region saw a notable presence of disinflationary forces that posed a significant risk to its delicate economic expansion.

The ECB observed the initial indications of inflationary pressures shortly after the onset of the COVID-19 pandemic problem. This was a consequence of the significant distortions it caused in the economies of not only the euro area, which became evident towards the end of 2021. The gradual reduction of asset purchasing programs, coupled with the implementation of quantitative tightening in March 2023, played a role in the gradual decline of the ECB's balance sheet.

Figure 6. Consolidated balance sheet (assets) of the ECB (1999-2022)
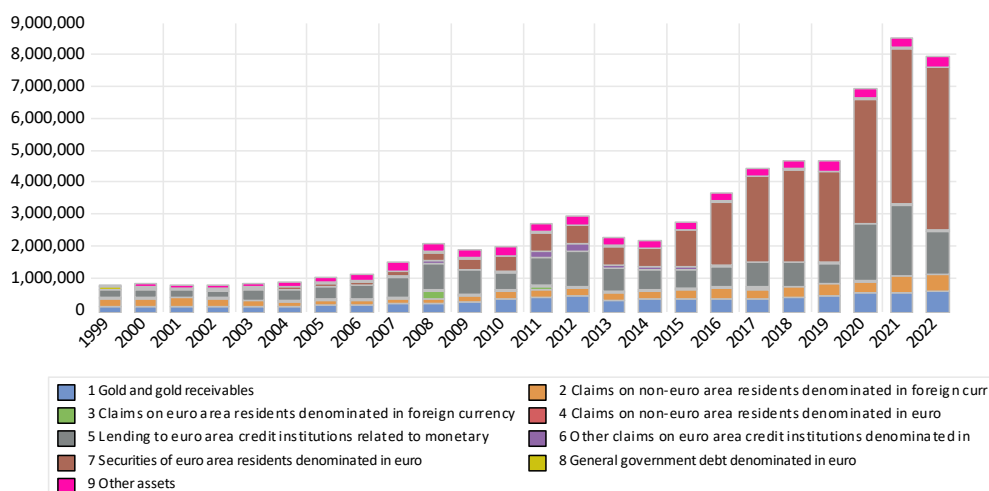
Source: The author's calculations using data from Eurostat

The process of reducing the size of the ECB's balance sheet appears to be progressing slowly but is of great significance in mitigating inflationary pressures within the euro area. This reduction aims to lessen the excessive amount of money in circulation, so contributing to the overall objective of price stability. Nevertheless, it is evident that the implementation of the new monetary policy strategy by the ECB has shown certain constraints within a span of less than a year. The ECB's swift escalation of key interest rates, coupled with a corresponding decline in government bond prices, has resulted in challenging liquidity limitations for the government budgets of euro area member countries. This situation is further exacerbated by a substantial accumulation of sovereign debt within the region (as depicted in Figure 7), leading to a notable surge in interest payments on government debt.

Figure 7. Government debt (consolidated) (as % of GDP)
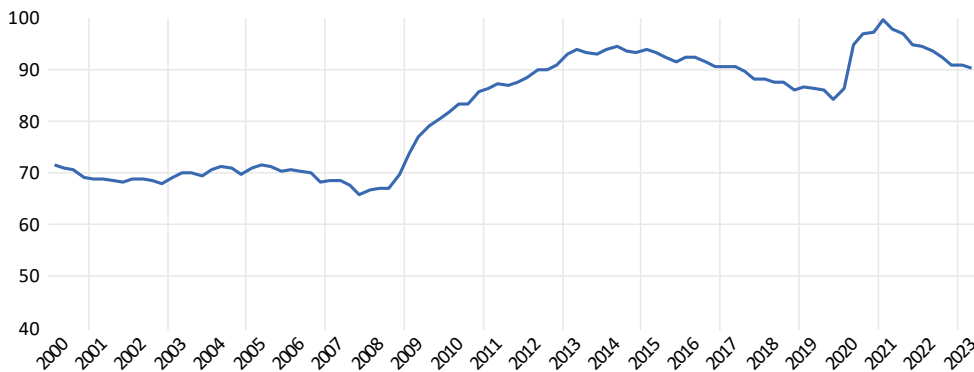
Source: The author's calculations using data from Eurostat

One notable consequence arising from heightened uncertainty during the post-economic and financial crisis period, which began in 2008, is a substantial rise in the spread of 10-year government bonds among individual member nations of the euro area (as depicted in Figure 8). The presence of heterogeneity across member countries in the euro area is often seen as a favorable characteristic of the shared currency region. This heterogeneity enhances the advantages derived from diversity, leading to increased intertemporal cross-country trade and capital allocation. Nevertheless, the fundamental foundations of the euro region, particularly the shared framework for monetary policy, paradoxically exacerbate this divergence despite efforts to mitigate it. Consequently, the distorting impacts of the prevailing monetary policy exacerbate pre-existing disparities among member nations of the euro area and contribute to the overall decline in its competitiveness.

Figure 8. 10-Year Government Bond Yields (in % p.a.)
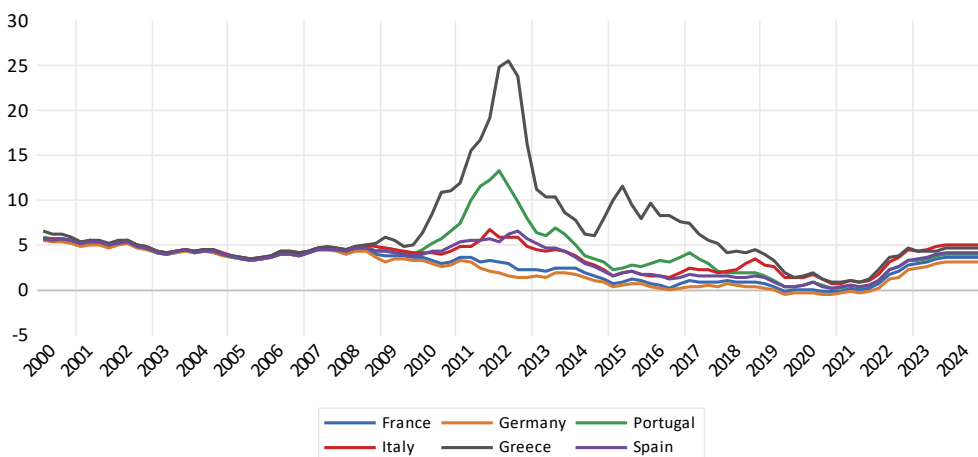
Source: The author's calculations using data from Eurostat

4.3 Inflation and Policy Challenges for ECB

The stance towards the ECB is relatively more complex as compared to that of the FED. During the initial decade, growth shocks emerged as the predominant determinant affecting inflation dynamics inside the euro area. Over the course of the previous decade, there has been a notable transition towards disinflationary shocks in the aftermath of the global financial crisis. In a scenario where a significant minimum threshold indicates that

disinflationary shocks cannot be easily counteracted through interest rate measures, various cyclical elements, notably the disinflationary consequences of both the 2009 twin recessions (economic and financial crisis) and the 2012 debt crisis, interact with persistent structural patterns such as globalization, digitalization, and demographic factors. The diminished anticipation of inflation (as depicted in Figure 9) could be attributed to the ECB's inflation objective being less firmly established, possibly due to the prolonged presence of low inflation (ECB, 2021).

The utilization of unconventional monetary policy measures has played a significant role in addressing disinflationary pressures, alleviating apprehensions regarding deflation, and averting a more pronounced decline in inflationary expectations, particularly starting from 2014. This analysis critically examined the unconventional monetary instruments employed by the ECB and reached the determination that each of these tools effectively contributes to the enhancement of economic output, employment levels, and inflation rates. The aforementioned tools encompass longer-term refinancing operations, asset purchases, negative interest rates, and forward guidance. The Governing Council deemed these actions justifiable considering their potential spillover consequences, such as impacts on socioeconomic inequalities and the banking sector. The close proximity of interest rates to the effective lower bound, along with the limited understanding of the effectiveness and potential adverse consequences of alternative tools, contributed to the maintenance of inflation rates below the targeted level. Additionally, these variables-imposed constraints on the extent and swiftness with which monetary policy could address disinflationary events. The potential lack of adequate anchoring of inflation expectations slightly below, yet proximate to, the 2% threshold within the ECB's dual-objective framework may have engendered ambiguity over the precise level of the inflation target. Moreover, the perception of differential treatment in relation to the target's applicability for various stakeholders could have contributed to the prolonged persistence of low inflation. In light of concerns over the sustainability of debt, fiscal policies impeded both economic growth and inflation subsequent to the financial crisis (ECB, 2021).

The primary objective of the ECB's strategy review in July 2021 was to ensure the credibility of its inflation target. The objective behind the recalibration of forward-looking interest rate guidance and the transition from a "below, but close to, 2% inflation target" to a symmetrical inflation target of 2% was twofold: firstly, to avoid premature monetary tightening, a mistake that the ECB has made previously, and secondly, to establish a more distinct reference point for longer-term inflation expectations.

Figure 9. Market-based inflation expectations in the euro area and USA (2007-2024) (in percent)
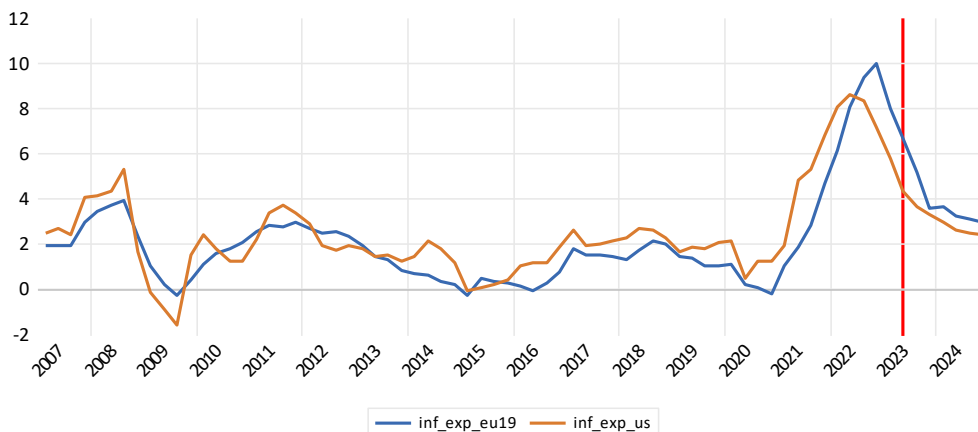
Note: The vertical line indicates the start of the projection horizon.
Source: The author's calculations using data from FRED Economic Data, Federal Reserve Bank of St. Louis.

The ECB faces a notable credibility challenge in the event that demand, and supply shocks continue to be influenced by structural factors that affect the economies of the euro area, even after the conclusion of the pandemic and energy crises. This scenario could result in a sustained and substantial increase in medium-term inflation within the euro area, surpassing the ECB's inflation target of 2%. In contrast to the FED, which possesses a greater degree of autonomy in adjusting its monetary policy tool without significant concerns of disturbance within its authority, the ECB is expected to encounter more challenges under comparable conditions. Within the context of the euro area comprising sovereign nations, certain member states face the potential of a sovereign debt crisis. Consequently, the central bank's choices regarding the timing, magnitude, and necessity of reducing government bond acquisitions, as well as increasing interest rates to mitigate inflationary pressures, are bound to generate controversy and carry significant political implications. In the context of inflationary pressures, it becomes challenging for the ECB to strike a harmonious equilibrium between varying national interests and

divergent views towards inflation, particularly in a situation where nations burdened with substantial public debt experience slower economic growth compared to those with lower public debt levels.

Concluding Remarks

In the aftermath of the recent financial and following economic and debt crises, there has been a discernible deceleration in price fluctuations as a result of the prevailing inclination towards consolidation. Nevertheless, the emergence of expansionist components in fiscal and monetary measures following the onset of the COVID-19 pandemic, coupled with the disruptions in production chains caused by the same, alongside the influence of geopolitical dynamics such as energy prices, have recently reinstated the capacity for price fluctuations. The presence of deflationary and disinflationary trends did not amplify the inflationary impacts of loose fiscal and monetary policies aimed at stimulating the recovery of crisis-affected economies.

From a certain perspective, quantitative easing can be regarded as advantageous as its primary objective is to guarantee the availability of liquid assets for economic entities, such as commercial banks. This is true even though the effectiveness of the monetary policy transmission mechanism, specifically in terms of retail segment access to liquidity, may be compromised. In the context of the economic effects of pandemic measures, the expansion of central banks' monetary base has been observed. This expansion has been driven by fiscal stimulus measures aimed at mitigating the impact of the pandemic. Initially, this expansion occurred in a covert manner, leading to increases in financial asset prices such as stock markets and growth in house prices. However, more recently, this expansion has become more overt, affecting price levels, and altering the dynamics of inflation. These developments deviate from the typical macroeconomic environment characterized by predictable macroeconomic fundamentals, highlighting the potential risks associated with such measures.

Conclusion

The macroeconomic features of euro area Member States exhibit heterogeneity, even though there is a growing similarity in cyclical trends in economic developments. This heterogeneity reinforces divergent tendencies and asymmetric economic manifestations. These differences are observed not only in macroeconomic and microeconomic fundamentals but also in price level dynamics. As a result, there are divergent distorting effects on real interest rate developments. These disparities arise in response to idiosyncratic and exogenous structural shocks, within the framework of the common monetary policy implemented by the ECB. The empirical findings provide support for the arguments emphasizing the necessity of making modifications to the institutional structure of the euro area. Additionally, these results lend credibility to the arguments advocating for the implementation of a feasible idea of a two-speed euro region. The single monetary policy implemented by the ECB has the potential to enhance economic convergence among countries, promote synchronization of economic cycles, and improve the euro area's ability to withstand internal and external shocks during favorable economic conditions. However, in the presence of declining macroeconomic fundamentals, certain vulnerabilities and reduced resilience within the euro area become more pronounced. This is primarily due to persistent structural and performance disparities among member countries, which consequently lead to divergences in real interest rates.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Using Markunsen's Typology as a Starting Point to Examine the Case of the Center for Defense Space and Security Cluster: The State-Anchor Type of Cluster

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Abstract: *Defense is a strategic sector that is closely tied to national security and sovereignty. As such, governments tend to have a strong interest in supporting and developing the defense industry in their countries. This paper aims to investigate and identify to which of the four types of industrial clusters described by Markusen, the Danish Defence Space and Security (CenSec) cluster belongs to. Our initial argument is that CenSec has the characteristics of a state-anchor cluster, because in the defense cluster, the role of government is typically decisive due to the nature of the industry. The analysis will also explore the implications of the type of cluster for policymakers and industry stakeholders in terms of promoting innovation, competitiveness, and economic growth in a broader correlation with the European business and institutional ecosystem.*

Introduction. Clusters as Ambiguous, Multidimensional Phenomena. Main Theoretical Approaches

It is common practice to preface any discussion or study of economic clusters with a disclaimer that there is no universally accepted definition of the phenomenon, as definitions and analytical frameworks can conflict. Martin and Sunley (2003) note that constructing a thorough and critical review of clusters is challenging due to the numerous varieties and types of clusters, and the persistent feeling that there must be more to the concept than what is currently understood. This creates a perception of a disordered or ambiguous concept.

Indeed, cluster definitions can vary depending on the discipline or perspective from which they are being viewed. For example, the Preliminary Report "Industry Clusters - An Economic Development Strategy for Minnesota", identify "Industry Clusters" as *geographic concentrations of competing, complementary, or interdependent firms and industries that do business with each other and/or have common needs for talent, technology, and infrastructure. The firms included in the cluster may be both competitive and cooperative* (Munnich *et al.* 1999).

Several scholars have also developed and refined the cluster concept, including Michael Porter, Paul Krugman, Philip Cooke, and others. Porter (1990), in his influential book "The Competitive Advantage of Nations", argued that clusters provide a source of competitive advantage for firms by increasing their productivity, innovation, and competitiveness. He identified several key factors that contribute to the success of clusters, including the presence of specialized suppliers, a skilled labor force, and local institutions that support innovation and entrepreneurship. On the other hand, Krugman, in his paper "Increasing Returns and Economic Geography" (1991), provided a theoretical framework for understanding the emergence and persistence of clusters. Krugman argues that clusters result from economies of scale and increasing returns to specialization, which lead to a

concentration of economic activity in specific regions. In their book "Regional Innovation Systems: The Role of Governances in a Globalized World", Hans-Joachim *et al.* (1998), emphasized the importance of local institutions and governance structures in fostering the development of clusters. Cooke argues that in order to promote innovation and economic growth, it is crucial to establish effective collaboration between firms, universities, and other institutions. In their paper "Clusters, Networks, and Innovation in Small and Medium-Sized Enterprises", Breschi and Malerba (2000), examined the role of clusters in promoting innovation in small and medium-sized enterprises (SMEs). They found that SMEs in clusters were more innovative and successful than those outside of clusters, due to the benefits of knowledge spillovers, access to specialized inputs, and opportunities for collaboration. Finally, Gordon and McCann (2000), Guerrieri and Pietrobelli (2000), and Markusen (1996) all contributed to the understanding of clusters by exploring the relationship between clusters and globalization, industrial restructuring, and economic development.

As exemplified above, different scholars and experts have developed various definitions and analytical frameworks, each highlighting other aspects of the cluster phenomenon. The lack of a universally accepted definition reflects the complexity and diversity of clusters and the different contexts in which they emerge (Martin and Sunley 2003). Nevertheless, industrial clusters are characterized by a set of distinct features such as shared use of local resources, similar technologies, and the formation of linkages and alliances among companies. These linkages can take various forms, including buyer-supplier relationships, shared human resources, machinery, infrastructure, joint marketing, training, research initiatives, associations, and lobbying (Porter 1998). Businesses and institutions engage with one another at various levels within the ecosystem of a cluster, which allows individual companies to increase their competitive advantage (Karaev *et al.* 2007; and Singh *et al.* 2008; and Singh *et al.* 2010) by creating synergies (Jankowska *et al.* 2017) and pooling resources, knowledge, and innovation (Keeble and Wilkinson 1999; Cumbers *et al.* 2003). Industrial clusters can be seen as an initiative to organize participating members in a coordinated manner, utilizing local competition creatively to generate innovation and increase competitiveness through co-operation between companies, RandD agencies/institutions, and local, regional, and/or national government (Morgan and Hunt 1994).

Deviating from this traditional approach, other scholars provide a new perspective on clusters, that considers various factors, including spatial contexts and geographical factors, in analyzing economic and technological changes. For example, Kudrina, Klius, and Ivchenko, (2023) sourcing their case studies from Ukraine, they emphasize the importance of considering the spatial contexts within which economic evolution occurs, including processes such as path creation, innovation, adaptation, and resilience, as well as integration with the rest of the world. Last but not least new papers assess the effect of the digital economy on manufacturing agglomeration and explore the mechanisms through which this effect occurs. They discuss factors such as reducing transaction costs, increasing market potential, enhancing knowledge spillover, and the role of globalization, localization, and human capital in moderating these processes, emphasizing that the spatial layout of economic activities has gradually shifted from "transportation cost + labor force" to "information + technology" (Wang, Zhang, Chen, Yu, 2023).

In this paper, we will dive deeply into the theoretical approaches described above and try to revisit the definition of a cluster by expanding beyond the conventional understanding of a cluster as a geographically concentrated group of firms and institutions. The definition of a cluster is not restricted to the mere physical co-location of firms and institutions but also encompasses the quality and degree of their interactions and relationships and the unique characteristics of their industry. As such, this definition expands beyond the conventional understanding of a cluster as a geographically concentrated group of firms and institutions. While physical proximity is an essential factor, this study will also try to emphasize the significance of the nature and intensity of firms' interactions and relationships in driving the cluster's growth and competitiveness and will delineate the state's role in the "business ecosystem" created by the cluster. Moreover, the article will try to understand the role and importance of E.U. policies and initiatives in promoting the development of industrial clusters and innovation ecosystems.

As a result, this definition presents a complex and multi-faceted concept. It considers not only the quality and degree of interactions and relationships between firms and institutions but also the distinctive features of the defense industry, as well as the institutional and policy framework provided by the E.U. to promote and shape their development. This multi-dimensional understanding of a cluster enables a more thorough examination of the factors that enhance the success and competitiveness of industrial clusters. It gives policymakers and industry leaders a more nuanced perspective on the strategies and policies required to facilitate their growth and innovation.

The scope of this paper is to investigate and identify to which of the four types of industrial clusters described by Markusen (1996), the Danish Defence Space and Security (CenSec) cluster belongs to. Our initial argument is that in the defense cluster, the role of government is typically decisive due to the nature of the industry. Defense is a strategic sector that is closely tied to national security and sovereignty. As such, governments tend to have a strong interest in supporting and developing the defense industry in their countries (Eliassen and Sitter 2006). The analysis will also explore the implications of the type of cluster for policymakers and industry stakeholders in terms of promoting innovation, competitiveness, and economic growth in a broader correlation with the European business and institutional ecosystem.

The study's novelty lies in its holistic approach. It encompasses diverse theoretical perspectives, expanding the definition of clusters, and emphasizing how EU policies facilitate and shapes the enhancement of knowledge between clusters. Last but not least, the study provides practical implications as it delivers a potential roadmap for policy makers for fostering innovation, competitiveness, and economic growth within industrial clusters.

By bridging theoretical insights with practical applications, the study contributes significantly to the understanding of industrial clusters, making it a valuable addition to the existing body of knowledge in this field. It moves beyond the traditional understanding of clusters as geographically concentrated entities, emphasizing the multifaceted nature of clusters, stressing the quality and intensity of interactions and relationships among firms and institutions. This expanded definition provides a more nuanced understanding of how clusters function and grow. Given this novel approach this article goes beyond the traditional definitions of clusters highlighting that clusters are dynamic ecosystems where the quality and intensity of interactions among firms and institutions play a pivotal role and are not "confined" by traditional factors and dynamics. Finally, the paper has a distinctive EU "flavor" that analyses and elaborates on the integration of national clusters into a larger European context. This integration aligns with the EU's initiatives, indicating a harmonious collaboration between local clusters and pan-European strategies.

1. Using Markusen's Cluster Categorization as a Starting Point and a Methodological Tool

Markusen differentiates industrial clusters on the role of large firms, the state (Clark, Huang, and Walsh 2009) and different inter-organizational patterns and arrangements (Bell *et al.* 2009). Markusen identifies four distinct types of clusters:

Marshallian clusters, also known as localized clusters or industrial districts, were first identified by the economist Alfred Marshall in the late 19th century. These clusters are named after him because he was the first economist to identify the positive externalities that arise when firms are in close proximity to one another (Belussi and Caldari 2009). Marshallian clusters are typically characterized by a concentration of small and medium-sized enterprises (SMEs) that are often family-owned and operated (Markusen 1996; Bell *et al.* 2009). These firms are typically specialized in a specific industry or product and are deeply embedded in the local community. They often have close relationships with suppliers, customers, and competitors, creating a network of interdependent firms that cooperate and compete with one another (Clark *et al.* 2009).

One of the critical features of Marshallian clusters is the presence of what Marshall called an "industrial atmosphere" (Markusen 1996). This refers to the intangible benefits that firms receive from being in close proximity to one another. These benefits include access to skilled labor, specialized suppliers, and a culture of innovation and entrepreneurship. Firms in Marshallian clusters often engage in knowledge-sharing and collaborative activities, which can create new products and processes (Hervas-Oliver *et al.* 2019). In Marshallian clusters the member companies become part of a "technological circle" the success of which is further reinforced by the interpersonal relationships developed between the innovation/RandD managers of the cluster's companies. These good interpersonal relationships and face-to-face interactions facilitate the circulation of "tacit knowledge" (Seeley 2007; Seeley 2011; Pietrobelli 2002), in other words knowledge which is difficult to circulate, mainly due to the nature of the message it conveys. In contrast to "explicit" knowledge that can be easily transmitted, thereafter perceived, and re-used, "tacit" knowledge usually requires an in-depth explanation of "how something is done". Knowledge transfer is both intended and unintended and is often the result of proximity and employee's mobility between companies (Ferreira *et al.* 2009). Marshallian clusters are often found in regions with well-developed infrastructure and high levels of human capital. Examples of Marshallian clusters include the clusters of the Italian area usually known as "Third Italy" (Boschma 2000; Bianchini 1991).

Overall, Marshallian clusters are seen as a model of economic development that promotes local economic growth, innovation, and entrepreneurship. They provide an environment where firms can benefit from close

proximity to other firms in their industry, creating a network of interdependent firms that cooperate and compete with one another to create economic value.

Hub-and-spoke clusters are characterized by a central hub, typically a large, dominant firm or institution, and a number of smaller, specialized firms or suppliers connected to the hub (Gray *et al.* 1996). In a hub-and-spoke cluster, the hub serves as the anchor that attracts and supports the smaller firms in the cluster, creating a hierarchical cluster structure (Lan and Kai 2009; Randelli and Lombardi 2014; Carbonara 2002). The hub often has a significant market share and the resources to invest in research and development, marketing, and other activities that benefit the entire cluster (Malipiero *et al.* 2005). The smaller firms in the cluster often specialize in providing goods or services to the hub, such as specialized components or support services.

Hub-and-spoke clusters can be found in a variety of industries, including aerospace, software, and automotive. A well-known example of a district with hub-and-spoke clusters is Seattle, in where Boeing acts as the hub for the aerospace industry, Microsoft for the software industry, while the Fred Hutchinson Cancer Center and the University of Washington "shaped" the faith and structure of the local biotechnology industry (Gray *et al.* 1996). Another example of a hub-and-spoke cluster is that of the East Midlands Aerospace cluster in the U.K. The cluster's hub firm is the British engine manufacturer Rolls-Royce, and the spokes are its many second and third-tier suppliers and other SMEs (Smith and Ibrahim 2006). One of the benefits of hub-and-spoke clusters is that they provide opportunities for smaller firms to benefit from the resources and expertise of the larger hub firm. The hub firm can provide mentoring, access to capital, and other forms of support that can help the smaller firms grow and become more competitive, playing the role of "gatekeepers" (Randelli and Lombardi 2014) for the clusters, enabling them to connect with global networks and affecting their sustainability. In addition, the close relationships between the hub and the spokes can lead to knowledge sharing and innovation, which can benefit the entire cluster. However, hub-and-spoke clusters also have some potential drawbacks. The dominance of the hub firm can limit competition and innovation in the cluster (Ferreira *et al.* 2009), and smaller firms may become too dependent on the hub for their survival. In addition, if the hub firm were to leave the cluster, it could have a significant impact on the smaller firms that rely on it.

Satellite platform clusters are characterized by a number of smaller firms or institutions connected to a larger platform firm or institution, rather than a central hub (He and Fallah 2011; Boja 2011). In a satellite platform cluster, the platform firm or institution provides a range of services and resources that support the smaller firms in the cluster. These services may include access to markets, expertise in marketing and branding, and support for research and development. The smaller firms in the cluster may specialize in a particular aspect of the platform's operations, such as manufacturing components or providing support services (Rugman and Verbeke 2003).

When it comes to innovation, the multi-national "parent" companies are simultaneously a knowledge generator and a knowledge seeker, as Rugman and Verbeke (2003) conclude, also playing the role of "global pipelines" diffusing knowledge (Morrison *et al.* 2012). Such pipelines are beneficial for the accumulation of knowledge only if the "local aspects/ firms" of the cluster are either characterised by a "high-quality local buzz" or are weakly endowed in terms of knowledge as Morrison *et al.* (2012) concluded.

One of the benefits of satellite platform clusters is that they provide opportunities for smaller firms to access resources and expertise that would otherwise be unavailable to them. The platform firm or institution can provide access to markets and customers, as well as expertise in areas such as marketing, branding, and research and development. In addition, the close relationships between the platform and the satellites can lead to knowledge sharing and innovation, which can benefit the entire cluster. One of the satellite platform clusters that is frequently mentioned in the literature is that of the aerospace clusters in Baja California, Mexico (Gomis and Carrillo 2016; Romero 2011). However, satellite platform clusters also have some potential drawbacks. The platform firm or institution may have a significant amount of control over the smaller firms in the cluster, which could limit their independence and ability to innovate (He and Fallah 2011). In addition, if the platform were to leave the cluster or change its operations, it could have a significant impact on the smaller firms that rely on it.

State anchored clusters are characterized by the state or government's vital and supportive role in supporting and developing the cluster (Markusen 1996). In a state-anchored cluster, the state or government provides a range of services and resources that support the firms in the cluster (Ghent 2004). These services may include infrastructure development, financial incentives, workforce training, and support for research and development (Zhong and Tang 2018; Barbieri *et al.* 2010; Ahedo 2003). The cluster's firms may be from various industries, but they all share a common reliance on the state or government for support (Markusen 1996).

State-anchored clusters can be found in various industries, including aerospace, biotechnology, and renewable energy. Examples of state anchored clusters include the biotechnology cluster in Massachusetts, which is supported by state-funded research institutions like Harvard and MIT (Nelsen 2005), and the aerospace

cluster in Washington state, which is supported by state funding for infrastructure and workforce development (McKenzie *et al.* 2017).

One of the benefits of state-anchored clusters is that they can provide a stable and supportive environment for firms to grow and develop. The state or government can provide financial incentives and support for research and development, which can help firms become more competitive and innovative. In addition, the close relationships between the state or government and the firms in the cluster can lead to knowledge sharing and innovation, which can benefit the entire cluster.

We should not fail to notice that governmental help is provided to all types of clusters. The difference in the state-anchored cluster is, as Markusen and Park (1993) concluded in their research on the case of Changwon cluster, South Korea, the state's role as the lead agent, a factor that lessens the importance of traditional locational aspects. In the case of Changwon, the cluster was built due to the commitment of the state to build a military supply sector. In the state-anchored clusters, innovation is centrally coordinated, putting any activity in line with public objectives (the objectives of the anchor institution) (Jankowiak 2012), while the members of the cluster are relatively unimportant to the creation of innovation (Ferreira *et al.* 2009) as well as in the development of the cluster. Another limitation is that state-anchored clusters can lack responsiveness to market demands Lundvall and Sørensen (2004). More particularly Markusen's typology of clusters is presented on Table 1.

Table 1. Markusen's typology of clusters: A synopsis

Markusen's typology of clusters: A synopsis				
	Marshallian	**Hub-and-Spoke**	**Satellite Platform**	**State anchored**
Characteristics of the Cluster's Members	Locally owned SMEs	One, or a few, Hub firm/s – surrounded by multiple smaller suppliers	Assemblage/ concertation of branch facilities of externally based multi-national firms	A government-owned or supported entity surrounded by related suppliers (cluster members)
Innovation	Members of the cluster create and share innovation	Hub firms "regulating" and shaping the innovation process of the cluster, having the rule of knowledge "gatekeepers"	Multi-national "parent" companies are simultaneously a knowledge generator and a knowledge seeker / "global pipelines" and "agents" of knowledge diffusion	Innovation is centrally coordinated, putting any activity in line with the objectives of the "anchor" institution
Governmental Institutions	Government-sponsored industry organisations	Hub companies have stronger ties to national trade associations than local	Local and/or national government provide infrastructure, tax breaks, and other generic business inducements	Anchor institution/state is the lead agent
Co-operation with companies and/ or other entities not part of the cluster	Low degrees of linkage with firms external to the district / high level of "embeddedness" to the district, unique local cultural identity	Defined by the Hub firm/s	Defined by the "parent" multi-national firm/s	Extended with the institution, the cluster is "anchored" to

Source: Author's estimations and evaluation

The analytical framework mentioned above is limited in that it only provides a static snapshot of a cluster, according to Belussi (2015). Therefore, a cluster may transition from one type to another over time. For example, Markusen (1996) uses Detroit as an illustration of a cluster that was transformed from a Marshallian district to a hub-and-spoke district. In reality, clusters may have characteristics of different types as identified by Markusen. In Italy, for instance, Marshallian clusters are changing as a result of the consolidation of several leading firms, leading to a modification in their configuration and structure to a hub-and-spoke district (Carbonara 2002; Belussi 2015).

To investigate our propositions, we will use Markusen's distinction of industrial districts as a framework for analysis following the lead of numerous other studies on industrial clusters' dynamics. We will proceed with studying the Danish Center for Defence Space and Security (CenSec). Case study analysis can be an effective way of analyzing academic subjects, particularly when it comes to examining complex or context-dependent phenomena. One of the strengths of case study analysis is that it allows researchers to investigate complex, multifaceted phenomena that may be difficult to study using other research methods. By examining a single case in detail, researchers can gain a rich and nuanced understanding of the factors that influenced the phenomenon under study (Yin 2013; Stake 1995). Case study analysis has been widely used in the study of industrial clusters, particularly in the fields of economic geography and regional development. One example is the study by Cooke and Morgan (1998) of the automotive components cluster in the West Midlands region of the U.K. Through a combination of interviews and statistical analysis, Cooke and Morgan identified a range of factors that influenced the competitiveness of the cluster, including the availability of skilled labor, the presence of research and development capabilities, and the existence of strong networks between firms. More recently, a study by Duranton and Puga (2004) used case study analysis to investigate the factors contributing to industrial clusters' formation and evolution. Through a review of the literature and the examination of case studies from a range of industries and locations, Duranton and Puga (2004) identified several key factors, including the importance of agglomeration economies, the role of knowledge spillovers, and the influence of institutional factors such as government policies.

One limitation of case study analysis is that it can be time-consuming and resource-intensive, as researchers must collect and analyze detailed data from a single case. Additionally, it can be difficult to generalize findings from a single case to a larger population or to other contexts.

As already mentioned this paper main scope is to investigate and identify to which of the four types of industrial clusters described by Markusen (1996), the Danish Defence Space and Security (CenSec) cluster belongs to. Our initial argument is that CenSec will have the characteristics of a state-anchor clustrer, because the defense cluster, the role of government is typically decisive due to the nature of the industry. Defense is a strategic sector that is closely tied to national security and sovereignty. The analysis will also explore the implications of the type of cluster for policymakers and industry stakeholders in terms of promoting innovation, competitiveness, and economic growth in a broader correlation with the European business and institutional ecosystem.

Even though as part of her findings, Markusen provides in-depth analysis of her proposed typology, for this paper, only a summary of the aspects is described/ used, and they can be summarised as follows:

1. the number and size of companies participating in the cluster as well as their structure and configuration,
2. the internal or external orientation or integration of the companies within the geographical / institutional entity of the cluster, as well as the intraregional and interregional linkages they have developed,
3. The management of innovation created by the cluster,
4. The existence (or not) of a public entity around which the cluster is "anchored".

Markusen's (1996) methodology/typology was selected because there is a concrete connection between a cluster and the role a government and/or a governmental institution could play in forming and managing the cluster.

2. The Role of the State in the Triangle: Defense Industry, Economic Patriotism, and E.U. Institutions

It has been more than 30 years since Andrew Moravcsik challenged what many considered common sense, arguing that large Western European countries will prefer to procure defense equipment from local firms. In his article "Arms and Autarky in European History," he argues that throughout history, states have pursued autarkic policies (*i.e.*, policies aimed at achieving self-sufficiency) to enhance their military power and strategic position. Moravcsik (1991) concludes that while a solid historical link exists between arms production and autarkic policies, the relationship between military power and economic self-sufficiency is not always straightforward. He argues that economic interdependence and co-operation can often enhance military power and strategic position.

On the other hand, several academics believe that the defense industry is "shaped" by what Clift and Woll (2012) call "Economic patriotism." Clift and Woll argue that economic patriotism is a response to globalization and the perceived loss of control over domestic financial affairs. They define economic patriotism as the desire to protect and promote a country's economic interests. The authors argue that economic patriotism is not necessarily incompatible with open markets but rather is a way to maintain some control over financial affairs in a globalized world. Other academics (Keohane and Valasek 2008) argue that E.U. countries opt to buy defense equipment from foreign companies if domestic companies cannot produce the equipment under procurement.

The truth is that European governments have shown a preference (regardless of how big or conditional it is) for their national defense industries when procuring defense equipment, a fact that is directly linked to the state's role as the main actor in the international system (Krause 1992). This is primarily correlated to Waltz's (1979) structural realist theory of international politics that emphasizes the importance of the international system, rather than individual states or leaders, in shaping global outcomes. Waltz argues that the international system is characterized by anarchy, meaning no overarching authority exists to govern and prevent conflict. In this context, states are driven by the need to ensure their survival, often leading to competition and conflict.

Thus, a close relationship exists between developing a national defense industry and a government's ability to ensure security. The government, as a customer, sponsor, and regulator (Heidenkamp *et al.* 2013), plays a critical role in shaping the industry, as it is the primary source of funding and sets the rules and regulations that "shapes" the industry. As a customer, the government's primary goal, is to ensure that it gets the best value for money and that the equipment meets its operational requirements. As a sponsor, the government is responsible for investing in research and development and providing long-term funding to support the industry. Finally, as a regulator, the government sets the rules and regulations that govern the industry, including procurement and export controls.

The complex relationship between the government and the defense industry creates obstacles to activating foreign capital (Belin and Guille 2008, Belin *et al.* 2017). As a result, while other industries in the E.U. have been liberalized and opened up to the competition as part of the E.U.'s broader push towards a single market, the defense sector has remained largely protected from international competition. This has implications for the broader E.U. project, as it creates tensions between the push for greater economic integration and the desire of individual member states to maintain control over their defense industries (Eliassen and Sitter 2006).

However, globalization creates and/or accelerates the emergence of international defense markets and corporate structures, creating a new status quo. The globalization of defense industries is being driven by a combination of factors, including changes in the global security environment, technological advances, and the desire of defense firms to expand their markets (Hayward 2001). Acknowledging this trend, E.U. institutions are trying to use several "tools" to promote international business co-operation among European defense industries, and clusters can be a powerful tool for European countries to enhance their competitiveness and promote economic growth (Müller *et al.* 2012).

This trend is not only a E.U. phenomenon. A paper provided by Balakrishnan and Johar (2023) studies the level of defense industrial innovation success in Malaysia providing valuable insights into the challenges and solutions related to defense industrial innovation, offering relevant perspectives for understanding the dynamics of industrial clusters, particularly those in the defense sector. The collaborative approaches discussed in the paper can be applied and adapted to the context of industrial clusters, contributing to the overall discourse on cluster development and innovation ecosystems, exemplifying that the E.U. ecosystem under discussion is not a unique phenomenon.

3. Case Study: CenSec Denmark

The Center for Defence Space and Security (CenSec) is a Danish membership-based organization that focuses on promoting the defense, space, and security industries in Denmark. CenSec provides a platform for networking, knowledge-sharing, and collaboration between private companies, knowledge institutions, and public authorities in these sectors. The organization aims to strengthen the competitiveness and innovation capabilities of the Danish defense, space, and security industries. (CENSEC, 2023; Medlemsfolder Online Vinter, 2023)

According to the official website of CenSec, it is a membership-based organization with 188 members, including private companies, knowledge institutions, and public authorities (CENSEC. Vores medlemmer)

Additionally, CenSec works with prime contractors, system integrators, Ministry of Defense procurement, logistic and repair agencies etc. to identify, develop and recommend appropriate supplier and sub-contractor capability (CENSEC, 2023; Medlemsfolder Online Vinter, 2023). CenSec was founded in 2004 and established in 2007 as an industrial cluster. In 2018, CenSec was approved by the Danish Ministry of Higher Education and Science to also become a national Innovation Network for Security (Inno-Sec) (European Cluster Collaboration Platform, March 17, 2023)

The Innovation Network for Security (Inno-Sec) is a Danish national innovation network that focuses on promoting innovation and collaboration within the security industry in Denmark. The network is part of a larger initiative by the Danish government to establish innovation networks in various industries to promote research, innovation, and commercialization of new ideas and technologies. The network is funded by the Danish Ministry of Higher Education and Science.

In October 2020, CenSec was appointed by the Danish Ministry of Higher Education and Science and the Danish Board of Business Development to be the national Danish cluster for defense, space, and security in the four years from 2021-2024 (CENSEC, 2023; Medlemsfolder Online Vinter, 2023).

CenSec facilitates various collaborative projects with Danish knowledge institutions, collaborating with various universities, research institutions, and knowledge networks to support innovation and development in the defense, space, and security sectors. Some of the areas where CenSec and its partners are collaborating include cybersecurity, unmanned systems, space technologies, and advanced materials. In the past, CenSec has facilitated several collaborative projects and initiatives with Danish knowledge institutions, including the development of new defense technologies, research into advanced materials for the defense industry, and the promotion of education and training programs for the next generation of professionals in the defense, space, and security sectors. The collaborative projects are co-financed by the Danish Agency for Education and Research (CENSEC, Samarbejdsprojekter, Retrieved March 14, 2023). CenSec is also a member of several European networks and initiatives related to defense, space, and security. For example, CenSec is a member of the European Network of Defence-Related Regions (ENDR). ENDR is a network of regional authorities, clusters and companies across Europe. It offers a platform to share information about new initiatives, increase their visibility, and build partnerships, and share experiences and best practices in building defense-related strategies and accessing E.U. funds.

CenSec is also part of the EU-DK Support Netværk's, the purpose of which is to coordinate advisory and service offerings within research, innovation, entrepreneurship and higher education with a view to supporting increased participation in E.U. programs and ensuring synergy effects between the various advisory services (CENSEC, Netvær, Retrieved March 15, 2023). CenSec has received funding from EU-funded programs such as the Alliance for Strategic Skills Addressing Emerging Technologies in Defense -ASSETS+ project. ASSETs+ project aspires to build a sustainable human resources supply chain which allows defense sector companies to innovate by both attracting highly skilled young workers and upskilling their employees thanks to customized, complementary education and training programs addressing three main technologies: Robotics, C4ISTAR and Cybersecurity aspects related to the first two (CENSEC, ASSETS alliance for strategic skills: Adressing emerging technologies in defence [Blog post]. Retrieved March 15, 2023). CenSec has also received funding by the European Defence Fund (EDF) as part of the Disruptive Technologies project' Robust and Light AM components for military systems' project. The project presents advanced research for additive manufacturing technologies for defence applications. It will design and manufacture lightweight military grade parts with novel materials for three military use-cases: a light metal emergency wheel, a cargo bay-door hinge and a large-scale antenna. (European Cluster Collaboration Platform, CENSEC receives funding from the European Defence Fund for the project RoLiAC. Retrieved March 13, 2023).

The European Defence Fund (EDF) is a financial mechanism set up by the European Union (E.U.) to support the development of the E.U.'s defense capabilities. The EDF aims to strengthen the E.U.'s strategic autonomy and improve its capacity to act as a security provider by supporting the development of defense technologies and equipment, as well as the collaborative research and development of defense capabilities among E.U. member states. The EDF is the first E.U. program to provide direct funding for defense-related activities, and it represents a significant step towards closer defense co-operation among E.U. member states (Camporini *et al.* 2017).

Table 2 presents the main characteristics of the CenSec Cluster, according to Markusen's typology.

As already mentioned, the main scope of the paper is to investigate if CenSec is "anchored" to one or several large governmental institutions and/or policies (Markusen 1996) or if other initiatives/ policies accelerate the cluster's development. It will not be an overstatement to say that CenSec can be characterised as a state-anchored cluster. The reason is that it relies on the support and resources provided by the Danish government. The government offers financial support for the cluster's operations, infrastructure development, and workforce training through the funding of national collaborative research projects.

Also, the Danish cluster cooperates with the Ministry of Defense procurement, logistic and repair agencies etc. to identify develop and recommend appropriate supplier and sub-contractor capability, as part of its efforts to promote innovation and entrepreneurship in the defense, space, and security industries. The cluster brings together a range of stakeholders, including firms, research institutions, and government agencies, to collaborate on research and development projects, business development and investment opportunities.

The cluster provides access to funding, expertise, and infrastructure that would be difficult for individual firms to obtain independently. In addition, the close relationships between the firms and the government can lead to knowledge sharing and innovation, which can benefit the entire cluster.

Table 2. Main characteristics of the CenSec Cluster, according to Markusen's typology

CenSec			
Cluster's Members	**Innovation**	**Governmental Institutions**	**Co-operation with companies and/ or other entities not part of the cluster**
Private companies, knowledge institutions, and public authorities	CenSec facilitates various collaborative projects with Danish knowledge institutions, collaborating with various universities, research institutions, and knowledge networks to support innovation and development in the defense, space, and security sectors.	Cooperate with the Ministry of Defense procurement, logistic and repair agencies etc.to identify develop and recommend appropriate supplier and sub-contractor capability CenSec is an Inno-Sec, funded by the Danish Ministry of Higher Education and Science CenSec was appointed by the Danish Ministry of Higher Education and Science and the Danish Board of Business Development to be the national Danish cluster for defence, space and security	CenSec has received funding by the European Defence Fund (EDF) and other EU-Funded programs CenSec is also a member of several E.U. networks and initiatives related to defense, space, and security

Source: Author's estimations and evaluation

The ministry can provide funding and support for research and development projects that are strategically important to the ministry and the firms, leading to innovations and products. In addition, the ministry can provide access to government contracts and procurement opportunities, which can be important sources of revenue for firms in the cluster. The close collaboration between the two helps to ensure that the cluster's activities are aligned with the ministry's goals and objectives.

Moreover, in 2018, CenSec was approved by the Danish Ministry of Higher Education and Science to also become a national Innovation Network for Security (Inno-Sec) and was appointed by the Danish Ministry of Higher Education and Science and the Danish Board of Business Development to be the national Danish cluster for defence, space and security.

Overall, CenSec can be characterized as a state-anchored cluster because it relies on the support and resources provided by the Danish government to promote innovation and entrepreneurship in the defence, space, and security industries. Nevertheless, some characteristics of CenSec are not endemic to the state-anchored clusters. CenSec plays a significant role in promoting E.U. funding and innovation initiatives within the local defence industry. It positions itself as a mediator between local defence companies and E.U. institutions, giving a distinct "E.U. flavor" to the cluster. CenSec is dedicated to facilitating the development and advancement of strategic alliances between the local industry and E.U. institutions. It seeks to be a focal point and catalyst for these collaborations, promoting understanding and encouraging co-operation among all parties involved. The E.U. flavor of CenSec, also, aligns with the concept of "smart specialization." This concept stresses the significance of associating regional innovation strategies with E.U. policies and programs, as highlighted by Foray and colleagues in their 2012 work.

4. Discussion

In this study, we delved into the intricate landscape of industrial clusters, focusing on the Danish Defence Space and Security (CenSec) cluster, and sought to categorize it within the framework of Markusen's typology. Our primary hypothesis was that CenSec embodies the characteristics of a state-anchor cluster, given the decisive role of the Danish government due to the nature of the defense industry. As the discussion unfolds, it becomes evident that CenSec indeed aligns with the concept of a state-anchored cluster, given its symbiotic relationship with the Danish government and the crucial support it receives in terms of funding, infrastructure, and workforce training.

One of the significant contributions of this paper focuses and lies in highlighting the multifaceted nature of industrial clusters and the implication this has in the broader European business and innovation ecosystem. To achieve this, we expanded the conventional understanding of clusters beyond mere physical co-location, emphasizing the quality and degree of interactions and relationships among firms and institutions. This nuanced perspective allowed us to recognize the unique characteristics of the defense industry, where collaboration, innovation, and competitiveness are deeply intertwined with government support and policies.

Equally important our findings underscore the pivotal role of the E.U. in shaping the trajectory of industrial clusters, as we shed light in the "E.U. flavor" of the CenSec cluster, which mainly refers to its role in promoting E.U. funding and innovation initiatives within the local defence industry and its efforts to facilitate strategic alliances between local companies and E.U. institutions. This is significant because it highlights the importance of E.U. policies and programs in shaping the development of the cluster. In a study of innovation in state-anchored clusters in Denmark, Lundvall and Sørensen (2004) argue that government support and intervention can benefit clusters, particularly in terms of providing resources and creating an environment that encourages innovation. However, they also note that state-anchored clusters can be subject to limitations and challenges, such as a lack of responsiveness to market demands. In the case of CenSec, the cluster's collaboration with E.U. institutions and promotion of E.U. funding initiatives can help to mitigate some of these limitations by providing access to broader markets, innovative ecosystems, and resources. This is consistent with the concept of "smart specialization," which emphasizes the importance of aligning regional innovation strategies with E.U. policies and programs (Foray *et al.* 2012). Moreover, CenSec's role as a mediator between local companies and E.U. institutions is in line with the E.U.'s broader efforts to promote cross-border collaboration and innovation. For example, the E.U.'s Horizon 2020 program and the European Defence Fund (EDF) program aim to support innovation and collaboration across the E.U. through funding and other initiatives. Overall, the E.U. flavor of the CenSec cluster reflects its integration into broader E.U. innovation and collaboration initiatives. Highlights the importance of aligning national strategies with E.U. policies and programs, creating a sue generis situation where governmental and pan-European strategies and considerations coexist.

Finally, it is equally important to acknowledge the limitations of our study and to suggest further topics of elaboration that could facilitate the better understanding of the phenomena studied in this paper. One significant constraint lies in the scope of our analysis, which focuses specifically on the dynamics of CenSec. A more extensive understanding of the complexities of cluster collaborations could be achieved through a comparative study involving multiple clusters across diverse E.U. countries. Comparing different clusters allows for the identification of commonalities and divergences in collaborative strategies, government interventions, and industry-specific challenges, offering a wealth of insights and findings for further elaboration and study. Additionally, a more extensive study could involve longitudinal analysis, tracking the evolution of cluster/s over time. Such an approach would provide valuable insights into the sustainability and adaptability of collaborative models, helping to identify and analyse patterns, challenges, and successful strategies that emerge over the years.

Conclusions and Further Research

The aim of this paper is to investigate and identify which of the four types of industrial clusters described by Markusen, CenSec cluster belongs to, thus using a case study as a main tool to investigate the key question set. Despite the inherent challenge of generalizing findings from a single case study to larger populations or diverse contexts, this study has managed to overcome the associated limitations, as the specificity of our case, centered around the CenSec cluster, does not limit the broader applicability of our conclusions. In fact, the implications of our study stretch far beyond the defense industry, encompassing diverse sectors and international collaborations. The findings actually highlight the importance of nurturing collaborative ecosystems in an intra E.U. level, suggesting that similar strategies could be applied in other strategic sectors.

Moreover, the significance of our study extends far beyond its academic context, reaching policymakers, industry leaders, and scholars alike:

▪ For policymakers, our study offers crucial insights into the role of government support in fostering industrial clusters, particularly in the sensitive domain of national security. This is examined in close correlation with the E.U. innovation ecosystem, thus providing guidance to policymakers on integrating their initiatives/ institutions/ governmental entities within the broader European frameworks. Though this process a broader pan/inter European process could be facilitated that will allow for the identification of synergies and the maximization of impact.

▪ For industry leaders, our study serves as a blueprint for successful collaboration and innovation strategies. Recognizing the importance of collaboration in advancing innovative solutions within the defence

sector, industry leaders could understand the impotence of knowledge exchange, seeking to create synergies that will benefit not only their own business entities but also the wider defence research and innovation ecosystem.

▪ Last but not least our study contributes to the academic discourse on industrial clusters, offering a nuanced perspective that expands the conventional understanding of these economic entities. Through our comprehensive exploration of theoretical approaches, and the study of the CenSec cluster, we have successfully provided an extra "flavor" to the traditional concept of a cluster, and we propose a definition that goes beyond the geographical concentration of firms and institutions, encompassing the qualitative aspects of their interactions, relationships, and the unique attributes of their respective industries. This expanded definition operates synergistically with existing theories, rather than contradicting them. In essence, the results of our study serve as a collateral addition to the comprehensive understanding of clusters, shedding light on the intricate web of interactions and relationships that define their importance and functions.

As already mentioned, a future research direction could potentially try to provide further elaboration to the phenomena studied by providing a comparative study involving multiple clusters across diverse E.U. countries. Such an approach could potentially validate and reinforce our current findings and also uncover sector-specific nuances on cluster dynamics and international cooperation. Longitudinal studies tracking the evolution of clusters over extended periods could also provide insights into their sustainability and adaptability in the face of economic, political, and technological changes, thus providing another decisive future research direction.

Towards that direction, a rather insightful and radical aspect could also be to delve into the integration of emerging technologies, such as artificial intelligence, within collaborative ecosystems, similar to the one described in this paper, assessing how these new technologies could facilitate information exchange, and streamline collaborative efforts. Obviously, this represents a significant and challenging avenue for future research, mainly due to the fact that a multidisciplinary approach is needed in which researchers across fields like computer science, engineering, social sciences, and policy studies should collaborate. Despite the complexity, exploring this intersection holds the potential for groundbreaking insights. In this context, several pivotal research questions emerge, aiming to unravel the complexities of this transformative synergy, such as this one: "*How can artificial intelligence enhance the understanding of complex collaborative networks, aiding policymakers and industry leaders in strategic planning"?*

Such an approach could also "multiple" the practical applications for the results of this study, by facilitating the easier integration of a bigger set of results and/or date. Nevertheless, even without this very radical but also difficult to elaborate aspect, our study has profound practical applications across various domains, offering actionable guidance to policymakers, industry leaders, and collaborative initiatives. In essence, our conclusions offer a steppingstone for future research, policy formulation, and practical applications, opening doors to a multitude of future endeavors.

Credit Authorship Contribution Statement

Vasileios Kyriazis: Conceptualization, Investigation, Methodology, Software, Formal analysis, Writing – original draft, Data curation, Validation).

Theodore Metaxas: Project administration, Supervision, Writing – review and editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Stock Market Performance during COVID-19 Pandemic: A Systematic Literature Review

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Abstract: *This study provides a comprehensive review using a systematic database to comprehend the pragmatic studies that examine the stock market performance during the COVID-19 pandemic. This study systematically searches and synthezises the results of stock market performance during COVID-19 to provide an overview of the current state of knowledge. The objectives of this study are (1) to investigate the impact of COVID-19 on stock market performance, (2) to analyse the reaction of the stock market during a pandemic, and (3) to identify the perspective and gaps for future research. This study employs a Systematic Literature Review (SLR) approach and follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The databases used are Scopus and Web of Science (WoS), covering a period of 2020 to 2023. The articles were identified using specific keywords and were screened based on predefined criteria. A total of 57 articles were included in this study for review. This study examined the impact of the COVID-19 pandemic on stock market returns and volatility. Also, the study examines the interconnectedness between global stock markets. In addition, it explored the potential of government response to mitigate the pandemic's effect on the stock market. The study found that the initial impact was felt in the short term and negatively impacted investor sentiment, but the stock markets began to stabilise and recover over time. The study's findings suggest that future research should not only concentrate on the short-term impact and correlation between the stock market and the pandemic but also their long-term impact.*

Keywords: stock market performance; COVID-19 pandemic; systematic literature review.

JEL Classification: G10; I18; L10; Z11.

Introduction

Coronavirus disease 2019 (COVID-19) has recently become a major topic. The virus was first identified in Wuhan, China, in late 2019. The virus quickly spread to nearly every country worldwide, leading the World Health

Organization to declare a global public health emergency and classify the outbreak as a pandemic on March 11, 2020. COVID-19 goes beyond just a health crisis, and it has also caused significant economic difficulties for people, households, and companies in various industries worldwide (Chatjuthamard *et al.* 2021). This pandemic has significantly impacted society and the economy worldwide, creating a public health and economic crisis. The stock market is one of the most vulnerable sectors to the effects of COVID-19 (Nguyen *et al.* 2021). As the pandemic progressed and its economic impact became more apparent, stock markets worldwide experienced significant declines. Therefore, controlling the pandemic is crucial to preventing a further financial recession. To avert the spread of the virus, many countries have implemented policy stringencies such as stopping public transportation, implementing travel restrictions and curfews, banning large gatherings, and closing educational institutions, entertainment venues, gyms, and restaurants (He *et al.* 2020; Subramaniam and Chakraborty 2021). Anh and Gan (2020) examined the effect of COVID-19 on stock market performance in Vietnam during both the pre-lockdown and lockdown periods. The pre-lockdown phase of COVID-19 had a negative impact on stock returns, whereas the lockdown phase had a positive impact. It suggests that the government's response to the outbreak can positively affect stock returns. The stock market has also seen significant volatility as investors try to navigate the economic uncertainty caused by the pandemic. COVID-19 caused a loss of up to $6 trillion in the world's stock markets between February 24 and 28, 2020 (Ozili and Arun 2020). The US stock market, the largest economy, experienced a significant drop of 34% in the SandP 500 index from 19th February to 23rd March, the largest daily percentage drop since the 1987 crash. The NASDAQ also declined by 30% during the same period (Yiu and Tsang 2021).

Moreover, the stock market's reaction in developed and developing countries produces a different effect. Salisu *et al.* (2020) examined the impact of COVID-19 on developing and developed countries. They found that the pandemic particularly hard-hit developing markets, as many policy measures were ineffective in improving the stock market performance. Additionally, they found that developing stock markets were more vulnerable to the uncertainty of pandemics than developed stock markets. In contrast, Su *et al.* (2022) argue that developed countries were more affected by the pandemic's economic impact, despite having better healthcare systems. For example, the United States has been one of the countries most affected by the COVID-19 pandemic. There are kinds of literature related impact of COVID-19 appears to cause various financial issues such as decreased stock returns (Abdelkafi *et al.* 2023; Amin *et al.* 2022; Choi and Jung 2022; Saif-Alyousfi 2022) increased stock market volatility (Mobin *et al.* 2022; Rakshit and Neog 2022; Vo *et al.* 2022) heightened financial risk (Zhang *et al.* 2020) , systematic risk (Muna and Khaddafi 2022) and potential financial crises (Uddin *et al.* 2021). Furthermore, numerous studies have investigated the potential of policy responses and macroeconomic factors to mitigate the impact of COVID-19 on stock market performance (Abdelkafi *et al.* 2023; Al-Najjar *et al.* 2021; Bole *et al.* 2022; Caporale *et al.* 2022; Ghosh *et al.* 2022; Saif-Alyousfi 2022).

This study aims to add the existing literature in two ways. Firstly, it seeks to examine the stock market reactions to the COVID-19 pandemic. Secondly, to analyse the stock market performance during the COVID-19 outbreak, as well as the effects of COVID-19 on stock volatility and market returns. Lastly, based on this analysis, the study offers recommendations for governments or policymakers worldwide on managing and mitigating the impact of COVID-19 on stock markets. This paper is organised as follows. Section 1 presents the background of the topic used in the research, including the objectives and research questions of the study. Section 2 presents the methodology used to review the articles. Section 3 presents the distribution of articles used in this research. In Section 4, an analysis is conducted to identify the main themes in the literature reviewed. The current research findings on these themes are then discussed and summarised. Additionally, the implications of the COVID-19 pandemic on the stock market are discussed in this section. In the last section, we present the conclusion and limitations of this study.

1. Materials and Methods

This study employs a systematic literature review (SLR) methodology and follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines for reporting. A high-quality systematic literature review is a comprehensive review of the existing research on a specific topic. It involves a systematic and standardised approach to identifying, evaluating, and synthesising the findings of relevant studies. This type of review typically involves strict inclusion and exclusion criteria to ensure that only the most relevant and reliable studies are included. It also involves a transparent and reproducible method for searching for, selecting, and assessing the quality of the reviewed studies (Page *et al.* 2021)**.**

1.1. Identifying of Studies

This systematic review utilised a combination of two databases, Scopus and Web of Science (WoS), to search for relevant publications in various selected journals. Scopus is a database that contains peer-reviewed academic literature in various fields, such as social sciences, life sciences, and health and physical sciences. Like Scopus, the Web of Science is an academic database that contains information on journals in various disciplines, including arts, humanities, sciences, and social sciences. The process for screening and determining eligibility for literature in this study included three steps: identification, screening, and inclusion. In the first step, we identified the articles using the key terms in Scopus and WoS, resulting in 550 documents in Scopus and 112 documents in WoS. A total of 96 duplicate articles were removed, leaving a total of 566 documents. Next, the articles were screened based on specific criteria such as publication year, subject area, document type, publication stage, source type, and language. A total of 365 documents remained after removing 201 documents that did not meet the criteria. Then, we excluded articles we could not access or were unavailable, leaving 353 documents. The final screening step involved removing research letters and documents irrelevant to the topic. Finally, a total of 57 documents were included in the review. The flow diagram of the literature review is shown in Figure 1.

Figure 1. The flow diagram for systematic literature review
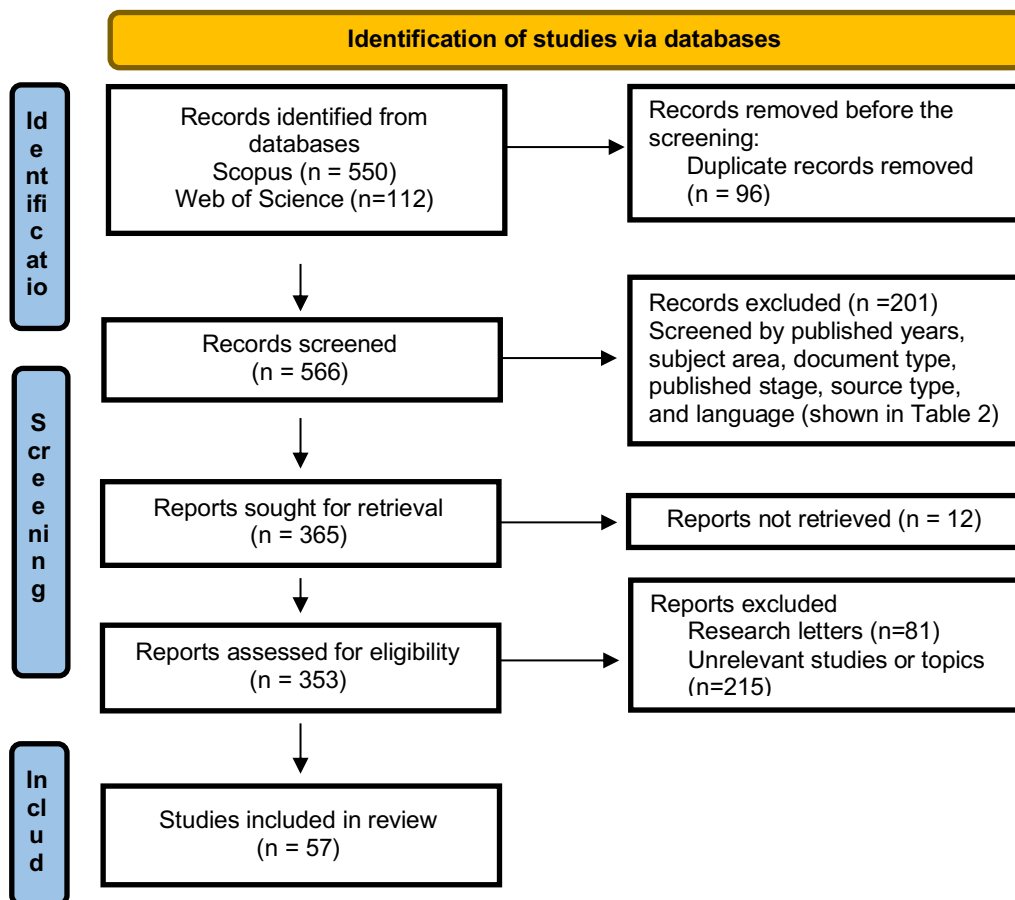
Source: Adapted from Page *et al.* (2021).

1.2. Selecting of Studies

The quality of a literature review depends on the collected materials, as stated by Xiao and Watson (2019). This study utilised articles from refereed journals published between 2020 and 2023, which were obtained from two major databases, Scopus and Web of Science (WoS). The databases used in this study include Science Direct, Emerald Insight, Taylor and Francis Online, Springer, SAGE, RGN, MDPI, and WILEY. We craft search queries to identify relevant literature and utilise filters to obtain optimal results aligned with our research objectives. The search query used the keywords "stock markets", "stock market performance", "stock market return", and "stock market volatility". The search string for selecting articles is listed in Table 1.

Table 1. Literature search strings for the database

Search field	Search string	Scopus	WoS	Last updated
Title/ Abstract/ Keywords	Stock markets	20.064	12.716	January 7, 2023
	Stock market performance	4.579	3.418	January 7, 2023
	Stock market returns	6.854	5.9	January 7, 2023
	Stock market volatility	3.499	3.812	January 7, 2023

To filter out only the relevant papers, the search was restricted to documents that had the initial search terms in the publication title and included the keywords combination of "stock markets", "stock market performance", and "COVID-19", also using a boolean "OR" and "AND" operators (as shown in Table 2). Finally, the result shows 550 documents in Scopus and 112 in WoS.

Table 2. Attribute identification of search strings

Databases	Search string/ keyword used	Result	Last updated
Scopus	TITLE (("stock markets" OR "stock market performance") AND ("COVID-19"))	550	January 7, 2023
Web of Science (WoS)	TITLE=(("stock markets" OR "stock market performance") AND ("COVID-19"))	112	January 7, 2023

1.3. Eligibility of Studies

In a systematic literature review, inclusion and exclusion criteria are used to define the scope of the review and identify which studies should be included or excluded from the analysis. Inclusion criteria are the characteristics that a study must have to be included in the review, while exclusion criteria are the characteristics that will disqualify a study from being included. These criteria are defined based on the research question and the study's specific aims. Using inclusion and exclusion criteria helps ensure that the studies included in the review are relevant and of high quality and that the review results are reliable and valid. The inclusion and exclusion criteria in this study are detailed in Table 3.

Table 3. Details of inclusion and exclusion criteria for studies

Feature	Inclusion criteria	Exclusion criteria
Published year	2020-2023	<2020
Subject area	Economics, econometrics, and finance Business, management, and accounting	Health, computer science, and social science.
Document Type	Article	Conference papers, books, reviews, notes, and short surveys.
Published stage	Final	Article in press
Source type	Journal	Conference proceedings, books, trade journals, reports, and pre-print archives.
Language	English	Non-English

1.4. Assessing the Quality of the Studies

The selection of 57 articles for the study was based on their quality, as assessed using the Joanna Briggs Institute's (JBI) Critical Appraisal checklist for systematic reviews, suggested by Rathnayaka *et al.* (2022). The JBI Critical Appraisal checklist is a tool used to evaluate the methodology and reporting of systematic reviews, and it can help determine the level of confidence that can be placed in the review findings. The checklist includes criteria that are rated as "yes", "no", "unclear", or "not applicable", with "yes" indicating that the review meets the criterion and "no" indicating that it does not. The total score is calculated after all the criteria are scored; it may range from 0-100 (found in Appendix 2). A score of 65 or above is considered good quality.

2. Results

This section presents the review results derived from the key findings and methods employed in the selected literature. The discussion is divided into three parts: an analysis of the years of studies (Figure 2), an examination of the methodology used (Table 4), the study setting of articles (Figures 3 and 4), and the themes of the studies (Figure 5 and 6). The COVID-19 pandemic began in late 2019 and has been a research focus in 2020.

Figure 2. Number of published articles by year
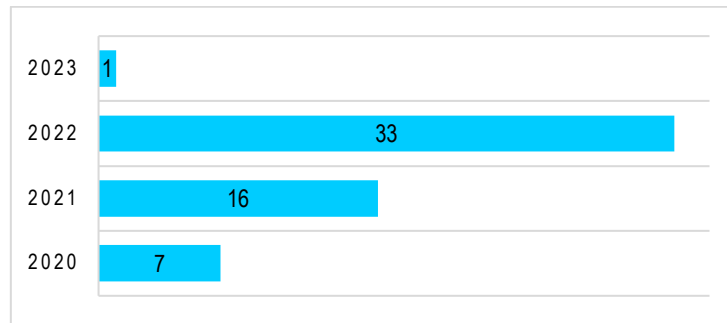
Figure 2 displays the most frequent year of publication of articles used in this study is 2022, with a total of 33 articles (57.8%), followed by 16 articles in 2021 (28%), a total of 7 articles in 2020 (12.3%), and 1 article in 2023 (1.7%).

Table 4. Most frequent research methodology in the study

Methodology	Frequency	Percentage (%)
GARCH and its various models	15	26.31
Panel data	11	19.29
Event Study	5	8.77
Ordinary Least Square (OLS)	4	7.01
Granger causality	3	5.26

Table 4 illustrates the main methodology employed to investigate the stock market performance during COVID-19 in all selected articles. The most used methodology in the selected articles is GARCH and its various models (26.31%), followed by panel data (19.29%), event study (8.77%), OLS (7.01%), and Granger causality (5.26%) across all the selected articles. For detailed methodology used in all articles selected can be shown in Appendix 3. The Generalized Auto Regressive Conditional Heteroskedasticity (GARCH) is a widely used approach many researchers employ to measure stock market volatility and identify risk. It is particularly useful for analysing time-series data, where the variance error is considered serially autocorrelated (Khattak *et al.* 2021). At the same time, the Exponential General Autoregressive Conditional Heteroskedasticity (EGARCH) method captures what is not considered by the GARCH model. It was employed to examine the impact of COVID-19 on the stock market in Ghana and forecast current stock returns based on past returns (Insaidoo *et al.* 2021).

Figure 3. Item density visualisation (country) using Scopus and WoS databases
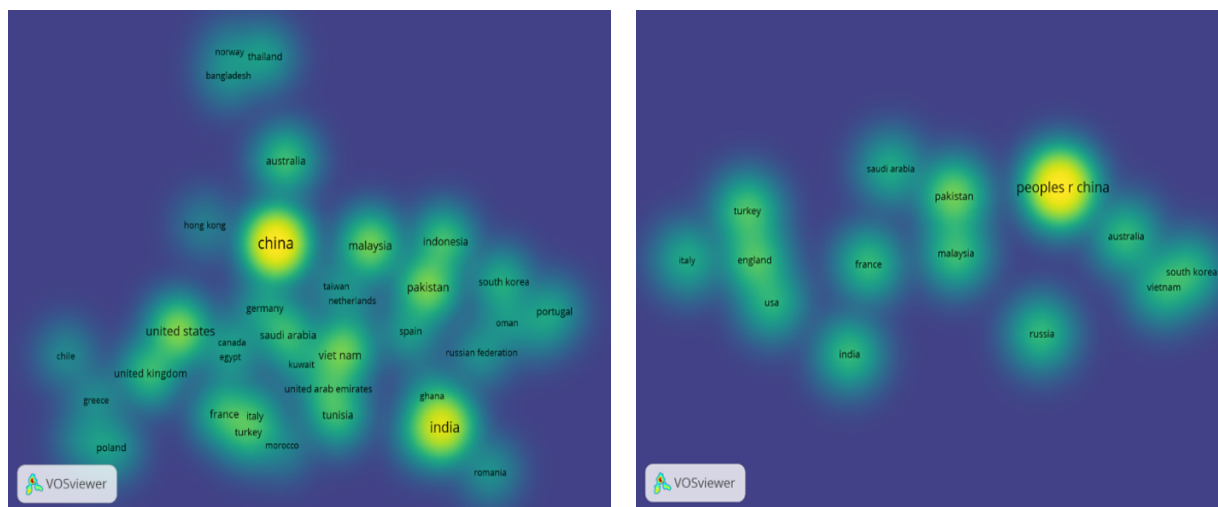
The results of the density visualisation are displayed as a map with colour-coding by country or study setting, as shown in Figure 3. The left figure is the result obtained from Scopus, and the right is from Web of Science databases. Bright yellow and uppercase keywords indicate the highest prevalence in recent research.

The result using Scopus databases shows that China is prominently displayed in bright yellow, indicating it is the most commonly used country in the study, followed by India and the United States. Similarly, the density visualisation results using WoS also show China as the most frequently used study setting by researchers in this study.

Figure 4. Network visualisation (keywords) from Scopus
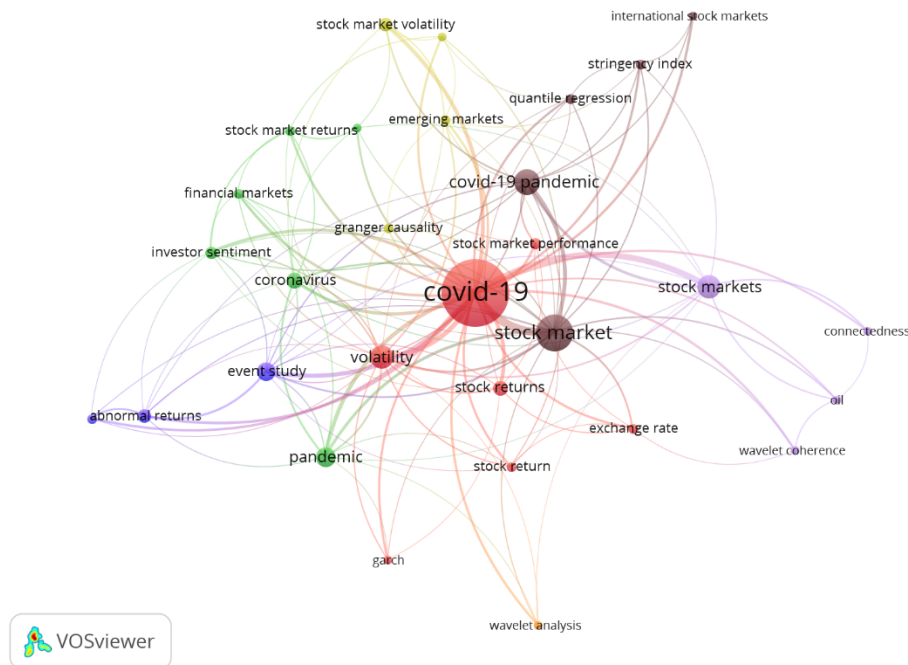
Figure 5. Network visualisation (keywords) from Web of Science.
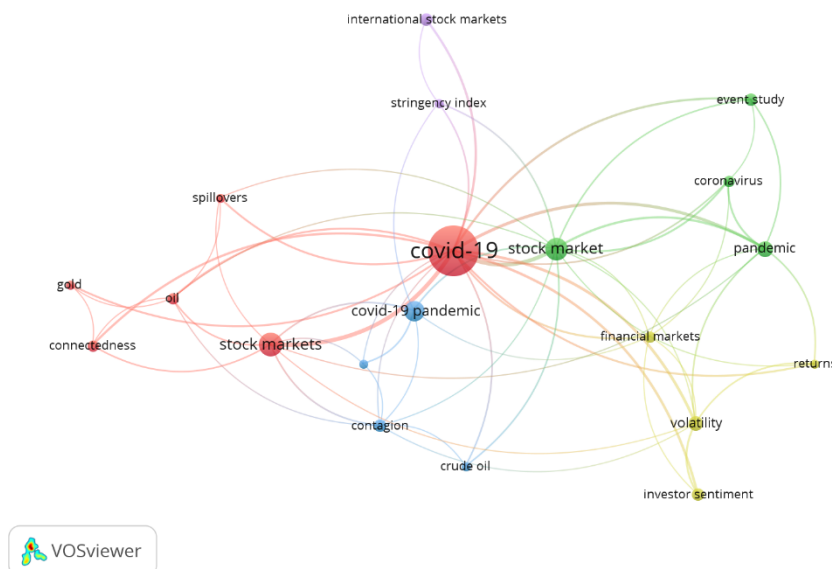
Figures 4 and 5 show the articles' mapping based on the keywords using VOSviewer. In Figure 5, we use the Scopus database and identify seven clusters related to the stock market during the COVID-19 pandemic. However, some keywords were placed in incorrect groups because the classification was based on how often the words were used together. For instance, "wavelet analysis" and "wavelet coherence" were not in the same group. Another example is "stock returns", which should not have been grouped with "stock market returns". As a result, the study adjusted to clarify the groupings and reduced the number of clusters to four. The first cluster, referred to as "stock market performance," is the blue cluster identified by VOSviewer. The main focus of this research is to analyse the stock market's performance, specifically by examining stock market returns and volatility. The second

theme, "investor sentiment," is represented by a green cluster. The third theme, referred to as the "stringency index," relates to the international stock market and is represented by a brown cluster. Lastly, the theme is called "connectedness" and is represented by a purple cluster. In addition, using the Web of Science database (Figure 6), we identified five clusters related to the stock market during the pandemic. The results obtained from mapping clusters using the Web of Science database were similar to those obtained from the Scopus database. Thus, we combined the results from both databases for the themes discussed in this study.

3. Findings

The themes in the literature were identified by performing a content analysis. This analysis aimed to answer the research questions and validate the findings. Four main themes were identified and organised as follows:

3.1. COVID-19 Pandemic and Stock Market Performance

The rapid and widespread transmission of the coronavirus has had a profound impact on global capital markets (Viona *et al.* 2023). The stock market, as a significant component of the capital market, has been particularly affected by the pandemic. The spread of COVID-19 exerts a significant and immediate impact on stock movements, particularly in the short term (Rahman *et al.* 2022). A study conducted by Wajid and Gupta (2022) has demonstrated that the pandemic had a significant negative impact on the indices of the world's 20 largest stock markets. Additionally, negative impacts on the stock market were also observed in eight countries in Africa during the pandemic, as noted by Takyi and Bentum-Ennin (2021). The pandemic caused a sharp and sudden fall in stock prices, as investors became increasingly concerned about the economic impact. However, this impact has not been uniform across all regions and markets, with the effects growing from east to west as the virus spread (Jakub Szczygielski *et al.* 2022). According to Lee *et al.* (2022), the stock markets and COVID-19 have a strong connection due to several reasons. Firstly, the COVID-19 pandemic is an unpredictable black swan event, making it difficult to prepare for. Secondly, stock markets are influenced by speculation, causing decreased returns following pandemic announcements. Lastly, the downturn in stock returns is related to the extreme stringency measures put in place to control the spread of COVID-19. The global stock market reaction was strong during the early days of confirmed cases of COVID-19 in Major affected WHO Regions which experienced a steep drop on the 26th day, followed by another sharp decline between the 30th and 35th day (Al-Qudah and Houcine, 2022). Moreover, a study by Ashraf (2020) also found that the market reaction occurs between 40 to 60 days after the first date of confirmed cases.

The stock market return and volatility, as an important indicator of stock market performance. Hong *et al.* (2021), also showed a significant response. The Ghana Stock Exchange Composite Index (GSECI) showed a downward trend during the pandemic with some fluctuations over the period (Ofori-Boateng *et al.* 2022). Moreover, the stock market returns also decline in China, India, and Thailand (Al-Awadhi *et al.* 2020; Bhama 2022; Suwannapak and Chancharat 2022). Interestingly, Kusumahadi and Permana (2021) studied stock market returns in 15 affected. Their findings revealed that each country experienced its highest and lowest returns in March 2020. For example, the Brazilian stock exchange recorded a significant decline of 15.99% in returns, followed by a subsequent increase of 13.02% on the following day. Additionally, the Singapore stock indices reached their lowest point on March 23, 2020, with a return of -7.64%. However, within two days, they managed to recover, reaching a return of 5.89%. Furthermore, it is notable that there is a strong relationship between the increase in COVID-19 deaths and recoveries and the fluctuations in stock returns. In Italy, a rise of 1000 deaths corresponds to an average decrease of approximately 0.014% in stock returns, while a rise of 1000 recoveries is associated with an average increase of 0.0044% in stock returns (Basuony *et al.* 2021). Abouelfarag and Qutb (2022) have shown that the mortality rate and transmission speed of COVID-19 have caused market instability and influenced stock returns. Additionally, macroeconomic factors such as interest rates, inflation rates, and exchange rates, as well as market sentiment, rumors, and trends, can also impact stock returns (Barakat *et al.* 2022).

The COVID-19 pandemic had a significant impact on stock markets, leading to a substantial increase in volatility, particularly in March 2020 (Ganie *et al.* 2022). Volatility plays a crucial role in various aspects of financial decision-making, including portfolio selection, derivative pricing, and risk management (Yong *et al.* 2021). Higher volatility implies greater uncertainty and risk, while lower volatility suggests a relatively stable investment. During the pandemic, information becomes more abundant and spreads at a faster pace. Consequently, market volatility becomes increasingly sensitive to news updates related to COVID-19 (Xu 2022). Numerous countries experienced high volatility in their stock markets. Singh *et al.* (2020) revealed in their research that statistically all the indices in G20 countries show a high fluctuation in abnormal returns (ARs) from day 0 to 57. The stock market

volatility for 43 stock indices in the world rose (Chatjuthamard *et al.* 2021). In line with a study by Kusumahadi and Permana (2021) in 15 countries in Asia, Europe, the Americas, and Africa. Meanwhile, countries characterized by low political stability showed decreased volatility in stock indices. This can be attributed to the likelihood of countries with centralized power adopting strong and effective measures to curb the spread of the virus, resulting in reduced panic in the stock market (Chatjuthamard *et al.* 2021). Furthermore, a study conducted by Zhang *et al.* (2023) revealed that stock markets in developing countries exhibited higher volatility in comparison to developed markets. For instance, studies examining the Indian stock market during the COVID-19 period have revealed a significant increase in volatility. Moreover, these studies have consistently found that the returns from the market exhibited non-normal patterns, deviating from the expected distribution of returns (Chaudhary *et al.* 2020; Sreenu and Pradhan 2022).

Each country has its own unique situation. The stock market performance in one country might not be the same as in another. It also can be influenced by the domestic economic situation, the level of integration with the global economy, and the effectiveness of the government's response to the pandemic. Subramaniam and Chakraborty (2021) found that developed markets are better at handling market fluctuations than developing markets, as shown by the correlation between market volatility and the interaction term of developing markets and economic resilience. For example, the US stock market indicates a market that is more resilient to the impact of the pandemic revealed significant negative only in the 6th window (Lee *et al.* 2022). In line with the study by Chowdhury (2022), the US stock market saw a sharp decline during the first three weeks of March 2020 but began to recover from the first week of April 2020. Japan's Nikkei 225 also saw large declines early on in the pandemic but has also since recovered, driven by government stimulus and relatively quick control of the pandemic within those countries (Li *et al.* 2022). Similarly, the study by Gupta *et al.* (2022) in the 20 largest economies' stock markets showed that at the end of April 2020, stock market indices had recovered, with 9 out of 20 stock market indices showing improvement, particularly the Canadian, Russian, Saudi Arabian, and US markets. Meanwhile, the Indian and Indonesian stock markets were still trending downward. The effects of the pandemic on the stock market fluctuate over time based on each country's economic and health situation. Each country experiences similar phase changes, with some stages marked by a peak and others by a trough, meaning there are positive and negative correlations (Cervantes *et al.* 2022).

3.2. Government Policy Response Through the Stringency Index

As the COVID-19 pandemic continues to spread and affects economic growth, it has become a major concern for policymakers. Governments quickly took preventive actions, which had a negative impact on various sectors, specifically service, tourism, and finance. Consequently, this situation caused public panic and heightened concerns about the leadership's ability to respond to the crisis effectively (Alkhatib *et al.* 2022). The implementation of COVID-19 control measures in the Asia-Pacific region appears to have a tendency to alleviate market volatility (Vo *et al.* 2022). Studies conducted by Amin *et al.* (2022) indicate that stock markets have shown high responsiveness to these government-implemented containment and stabilization policies. Moreover, government policies may indirectly mitigate the negative effects of daily confirmed COVID-19 cases and deaths (Guven *et al.* 2022). However, it is important to note that such measures also have consequences, including reduced economic activities and disruptions in global supply chains, particularly affecting industries such as travel, tourism, manufacturing, and labor-intensive sectors. These disruptions have implications for businesses' profitability and household consumption (Insaidoo *et al.* 2021). Governments around the world have implemented various stringency policies to slow the spread of the virus and mitigate its economic impacts such as closing borders, cancellation of international fights, ban of large gatherings, closure educational institutions, entertainment avenues, gyms, restaurants, bars, etc. (Subramaniam and Chakraborty 2021). A study conducted by Saif-Alyousfi (2022) has demonstrated that the stringency index has a positive and significant impact on stock markets across the Americas, Europe, Asia-Pacific, the Middle East, and Africa, with a significance level of 1%. This finding supports the idea that government intervention contributes to heightened stock market activity. While government policies in America and Latin countries may have been effective in containing the spread of the virus, they may have also inadvertently resulted in negative economic consequences by generating uncertainty and instability for businesses and individuals (Abdelkafi *et al.* 2023).

The stock markets quickly and negatively responded to the pandemic when lockdown restrictions were announced (Ji *et al.* 2022). During the lockdown in Italy, the lockdown not only helped reduce new infections but also had severe economic repercussions, leading to a significant decrease in Gross Domestic Product (GDP) by as much as 13% by the end of the second quarter of 2020, marking one of the largest declines in Italy's history (Keliuotyte-Staniuleniene and Kviklis 2022). Moreover, studies by Caporale *et al.* (2022) have shown that in G7

countries, stock markets are more affected by government restrictions rather than the direct impact of the pandemic itself. Furthermore, it has been found that the positive impact of government policy only occurs during the first wave of the pandemic in different regions like Africa, Asia, Europe, South America, North America, and Oceania (Marobhe and Kansheba 2022). Overall, the effectiveness of these policies in reducing the impact of the pandemic on the stock market will depend on a variety of factors, including the severity of the pandemic, the speed of vaccine distribution, and the ability of governments to effectively implement and follow through on these policies as mentioned by Barakat *et al.* (2022). Governments that can swiftly address the health crisis and implement well-coordinated policies are more likely to achieve better outcomes in stabilizing and restoring confidence in the stock market.

3.3. The Investor Sentiment During a Pandemic

During the initial stages of the COVID-19 pandemic, when the virus was spreading rapidly and the economic impact was not clear, investor sentiment was heavily influenced by fear and uncertainty. Consequently, there was a sharp and sudden decline in stock prices as investors reacted with overreactions and sold off their holdings to mitigate potential financial losses. Consequently, there was a sharp and sudden decline in stock prices as investors reacted with overreactions and sold off their holdings to mitigate potential financial losses (Lie *et al.* 2022). Normally, rational investors would sell their stocks before the pandemic intensifies (Insaidoo *et al.* 2021). During times of deteriorating economic conditions, investors may tend to exhibit a reduced willingness to invest their funds in high-risk assets such as stocks (Tiwari *et al.* 2022). In response to this situation, financial market regulators may impose restrictions on short selling or stock repurchasing (Ji *et al.* 2022). The increased volatility in the stock market and the uncertainty also made investors more risk-averse, it was primarily triggered by the impaired investor sentiment due to the announcement's effects, and this tendency to avoid risk has led to a more cautious investment behaviour (Mishra and Mishra 2021).

Investor sentiment had a negative impact on the volatility of the Tadawul All-Shares Index (TASI) during the COVID-19 period (Wasiuzzaman 2022). However, as more information became available about the impact on the economy and society, investor sentiment began to recover. Positive news such as the development of vaccines, treatment, and the efficacy of different policy responses, can enhance investors' outlook and restore confidence in the market. Moreover, government policies, monetary and fiscal responses, and the progression of the pandemic can heavily influence investor sentiment. Government support, including bank loans extended to sectors like travel, tourism, and manufacturing, can help alleviate uncertainties that contribute to stock market volatility (Insaidoo *et al.* 2021). Starting in mid-April 2020, the pattern of stock return volatility in Asia changed direction and returned to the pre-event levels. It could be attributed to an increase in investor confidence due to proactive fiscal and monetary actions taken by governments in Asia (Mishra and Mishra 2021). Investors must diversify their investments to reduce risk by including a combination of investments that correlate negatively to the stock market (Rahman *et al.* 2022). For example, more appropriate for investors to invest in companies like banks and telecommunications, as many of these companies are performing well and generating strong profits from their business activities at that time than investing in industries like manufacturing and oil and gas may carry more risk (Khattak *et al.* 2021).

3.4. Stock Market Connectedness

The degree of connectedness among stock markets has increased during the COVID-19 pandemic, as the crisis has led to a high degree of market synchronisation. Globalisation has connected the economies of the world and heightened the mutual dependence of global financial markets (Chatjuthamard *et al.* 2021). The correlation between global stock indices has grown stronger, leading to similar movements in stock markets worldwide (Zaheer *et al.* 2022). As can be seen, the overall interdependence of volatility among the G20 countries has significantly increased during the pandemic period (Li *et al.* 2021). The ASEAN5 stock markets are also influenced by events in the global financial market due to the spillover effect (Yiu and Tsang 2021). The market's interconnection between ASEAN and COVID uncertainty indices is strong, with Indonesia and Singapore stock market indices being significant transmitters of shocks. On average, they transmit 59.40% and 58.89% of shocks to other indices respectively (Behera and Rath 2022). This is likely because the pandemic has affected economies and industries globally, leading to similar reactions in different markets. The increased connectedness has also led to greater co-movement among different asset classes, including stocks, bonds, and commodities. This is partly because investors have been moving money out of riskier assets and into safe-haven assets such as government bonds.

Furthermore, the connectedness of emerging markets and developed markets has also increased during the pandemic, as the crisis has had a similar impact on both types of markets. Cheng *et al.* (2022) found that the COVID-19 outbreaks in Europe and America had a significant effect on the interconnectedness of stock market volatility in 19 economies around the world. It was also observed that the connectedness within the Asian markets was higher during the second stage of the COVID-19 pandemic but decreased in the third stage. Moreover, the negative impact of COVID-19 on the stock market in six countries in the Arabian Peninsula, namely Saudi Arabia, United Arab Emirates, Kuwait, Qatar, Bahrain, and Oman markets has a spillover effect on the Chinese stock market. There is evidence of a bidirectional spillover effect of COVID-19 on stock markets in both the Arabian Peninsula and China (Salman and Ali 2021). Conversely, the European, American, and Australian stock markets were found to be consistently closely connected during the COVID-19 pandemic. Moreover, a study by Aslam *et al.* (2020) on 56 global stock indices revealed that before and during the COVID-19 pandemic, developed markets typically exhibit a positive correlation, indicating a tendency for their movements to align. However, it is important to note that during the COVID-19 period, the strength of this relationship experienced a decline. Furthermore, the spillover result indicates that the stock market performance in emerging countries such as Brazil, Chile, Peru, Mexico, and Russia was heavily impacted by China's exchange rate volatility during the pandemic (Rakshit and Neog 2022). Overall, the COVID-19 pandemic has led to increased connectedness among stock indices, as the crisis has led to increased volatility and correlations among different markets.

Conclusions and Further Research

This study identifies the most cited and influential manuscripts, journals, publishers, and authors, along with the themes of research, from the keywords and conclusions of research publications. The focus of this study is to analyse the stock market performance during the COVID-19 pandemic. The research encompasses articles published in the Scopus and WoS databases, covering the period from 2020 to 2023. A total of 57 articles were evaluated following the PRISMA guidelines. The study encompasses four main themes. The first theme examines the adverse impact of COVID-19 on the stock market performance. The second theme explores the significant role of government policies in mitigating the pandemic's impact. The third theme investigates the response of investors and investor sentiment toward investment risk during the pandemic. Lastly, the fourth theme addresses the global interconnectedness of the stock market during the pandemic. This study can provide valuable information for both policymakers and investors. For policymakers, this research can help inform decisions related to economic stimulus and recovery measures. It can also shed light on the impacts of different policy choices on the stock market and the broader economy. For investors, this research can provide insight into the potential short- and long-term effects of COVID-19 on various industries and companies, which can help inform investment decisions. Additionally, such research can also help investors to understand the behaviour of the stock market during a pandemic and help them to anticipate any future pandemics.

In general, this research can help to better understand the economic effects of the pandemic and guide decisions related to investment and policy. This review process has generated several suggestions for future studies. Firstly, it is important to acknowledge that this study was limited to published articles in Web of Science (WoS) and Scopus databases, which introduces selection bias. To obtain a more comprehensive understanding of the trends in research on stock market performance during COVID-19, future research should consider including other sources as well. Secondly, this research has focused on four themes and primarily examined the short-term impact of the pandemic on stock market performance. Therefore, conducting studies that explore the long-term impact of COVID-19 on stock market performance and incorporating additional correlated aspects would be worthwhile. Lastly, it is worth noting that the use of certain keywords in the search term might have excluded relevant articles from being reviewed. To broaden the scope of literature, researchers can consider adding more specific keywords such as "stock market reaction" or "stock market returns" instead of broader terms like "stock markets" and "stock market performance." In summary, these limitations highlight valuable research opportunities within the field of stock market performance during the pandemic.

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Credit Authorship Contribution Statement

Pingkan Mayosi Fitriana: Conceptualization, Investigation, Methodology, Formal analysis, Writing – original draft, Writing – review and editing, Visualization.

Jumadil Saputra: Conceptualization, Investigation, Methodology, Project administration, Software, Formal analysis, Writing – original draft, Supervision, Data curation, Validation, Writing – review and editing, Visualization, Funding acquisition.

Zairihan Abdul Halim: Conceptualization, Investigation, Methodology, Project administration, Software, Formal analysis, Writing – original draft, Supervision, Data curation, Validation, Writing – review and editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Modern Approaches to Reforms in the Economy: Performance Measurement Development in the Armed Forces of Ukraine

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Abstract: *This paper reflects the empirical study of how the environment affects the performance measurement evaluation methodology in the organization, based on research of the Ukrainian Armed Forces experience. The problem is defined by the different needs of main stakeholders and management. This paper seeks the possibility to develop the role of stakeholders in performance measurement. In this research, several sources and methods were used to collect data. First, the interviews were conducted by the representatives of the research organization. Documents analysis and meetings also played a significant role in research. The paper emphasizes the influence of the environment, represented by the external actors and development vector, on the performance measurement building. Balancing between interests of stakeholders and levels of management helps to develop a performance system, which will be suitable to reflect the Armed Forces outputs and outcomes. Originality of the study of the Armed Forces of Ukraine is an extreme and interesting case because the institution is under high pressure during reforms and military conflict. But such cases facilitate the existing theory, depicting the problems and advantages of the management approaches. Future research in this area should pay more attention to the interaction between the external and internal actors in performance management methods building, especially in the defense sector.*

Introduction

In the current global landscape, marked by geopolitical tensions and ongoing military conflicts, nations are grappling with the imperative to reevaluate their economic priorities. The reverberations of these conflicts extend beyond the immediate security concerns, compelling countries to reassess their budgetary allocations, with a particular focus on defense spending. This research, centered on the performance measurement of the Armed Forces of Ukraine, assumes heightened significance amid these circumstances. The outcomes of this study are poised to offer valuable insights into the efficacy of defense expenditure in the face of external threats, shedding light on the intricate interplay between military reforms, economic stability, and national resilience. As countries worldwide navigate the complex terrain of economic reforms necessitated by military engagements, the findings presented here are poised to be of paramount interest to researchers and specialists in the field of economics, providing a nuanced understanding of the challenges and opportunities inherent in crafting effective budgetary strategies within the defense sector.

The decisions of the collegiate of the Ministry of Defense of Ukraine established the priority tasks for the Armed Forces of Ukraine, which are developing a national defense system and improving its effectiveness according to the NATO practices. This should lead to the designing of the new defense resources management system. But the army is stuck in the reforms for a long period, and their pace is slowing down and not reflect the necessary outputs from the money spending. And in this situation, the Ministry of Defense increase their projected budget request. In the eyes of the community, representatives of state authorities do not execute their plans and promises, as they have announced publicly, and the financial resources are not efficiently spent. For Ukraine, in case of the real external threat to sovereignty, territorial integrity, and independence, the development of a strong army is extremely important.

Therese is a strong dependency among defense spending and economic growth for some countries, especially if they take part in military conflicts or situated in unstable regions (Kusi 1994, 152). Ukraine could be also included in this category. But under the conditions of resources deficit and in the situation of economic recession, appears a question about defense spending effectiveness measurement. The problem of "Guns and Butter" (Yakovlev 2007) is inherent for all states, because in the case of resources distribution always exists alternatives for spending in social areas, which are extremely important during the pandemic.

The problem of organizations' performance measurement was intensively studied over the last decades both in the private and public sectors. It was established that organizations' performance measurement depends not only on the main stakeholders but also on the outside actors (Kaplan and Norton 1992, 71; Kaplan and Norton 1996, 75). Despite the wild popular ideas of westernization and private sector methodologies expanding, some researchers define that the public sector is progressive in performance measurement (Llewellyn 1996, 166). While on the other side some argue that we measure a lot of unnecessary things (Atkinson *et al.* 1997). This is the result of different stakeholders' needs and interoperability among them, which affects the development of multidimensional performance measurement system development (Fitzerald *et al.* 1991; Kaplan and Norton 1992, 71; Lynch and Cross 1991). We couldn't deny that in the public management system, it is becoming more and more popular to use private-sector patterns to solve existing public sector problems. This may be the result of the emergence and development of the theory of new public management and its popularization in the public authority in government bodies (Andrews and Van de Walle 2013, 762; Cohen 2016, 20).

In this study, the Armed Forces of Ukraine, which have existed for as long as the state, is an example of the development of performance measurement approaches and the application of new public management theory, under the pressure of in- and external powers. At this stage of reforms, the emphasis is increasingly shifting towards such definitions as management, performance, output, decentralization, efficiency and optimization, downsizing. These operations should help to increase the total performance of the ministry. However, there is a fundamental difference between the order and way of functioning of the public sector and private enterprises, and therefore some questions arise as to the appropriateness of using these methods (Barton 2004; Carling 2003) because the performance of the public sector is difficult to assess and measure through the usual business methods.

But the role and necessity of building a strong measurement system for business transactions and processes (Cyert and March 1992; Hedberg and Jönsson 1978, 47) cannot be denied, as well as its need for assessing the performance of budgetary expenditure classification programs. Measurements in quantitative terms allow us to assess the role of agents of the new public management system in these processes and to estimate their effectiveness because, with a qualitative approach, management compares plans with results. This is very important as it allows to create better transparency and improve measurement of processes (Almqvist 2004).

Bolton (2003) and Hood (1991) emphasized the introduction of new approaches to assessing program performance, as the emphasis has shifted significantly from resource accounting to performance accounting, which, of course, is one of the key elements in NPM. Recent years have influenced the role and place of performance measurement in the general system of public administration because now it is an integral structural unit of a more complex phenomenon that covers many dimensions (Skoog 2003, 487). It now combines tactical and strategic levels, a formal but not formal approach, financial and statistical indicators. The new methods are designed to provide answers to questions about the rationale for the existence of organizations and their contribution to the general welfare (Yahelska *et al.* 2021).

Such a multidimensional measurement system is a base for the development of a performance measurement system in organizations. In institutional theory, we are paid more attention to the question of the powers and pressure of the stakeholders, different groups (Pollitt 1986, 155). This helps to understand the process of building such a system and the influence of actors. DiMaggio and Powell (1983) determine two main institutional actors in contemporary society as state and different professions. Altered by the New Public Management theories, new topics for scientific discussion were developed. The combination not only of the resources management but also professional values stand on the cutting-edge of the research point of view (Abernethy and Stoelwinder 1990, 17; Broadbent *et al.* 1991, 1; Jones and Dewing 1997, 261; Llewellyn 1996, 166). The other widely discussed topic is the politician role in budgeting, and their influence on performance measurement (e.g., Covaleski and Dirsmith 1983, 323; Covaleski and Dirsmith 1986, 193; Jönsson 1982, 287; Wildavsky 1975). New trends, in theory, required the incorporation of purchases of public services (Brunsson 1994, 323; Powell 1991, 183). Also, according to Hood (1995) exists an important international difference in public sector model development.

The Ukrainian Armed Forces are undergoing significant transformation, with a focus on meeting NATO standards (Ordynovych 2020, 69). This includes the development of new financial supply methods to optimize resources (Bekishov 2021, 133) and the use of neural network and index forecasting to align development strategies with economic capabilities (Porokhnya and Ostapenko 2019). However, the effectiveness of these reforms is hindered by corruption, as seen in the need for improved internal audit processes (Sokolenko 2023, 49).

This paper presents the case of the Armed Forces of Ukraine as an example of fundamental reforms in the existing environment. This was the impetus for the search for new approaches to assessing results and setting targets for resource planning, considering the existing and necessary capabilities. However, there is still a problem of evaluating the efficiency and allocating resources, because there is a conflict between representatives of the professional class and financial managers, new stakeholders appear on the scene. This is especially noticeable for Ukraine under the conditions of a change in power after the elections and a change in the priorities of the new government (Almqvist and Hogberg 2003), which is an example of the inconsistency of reforms as a result of the absence of a pre-stock strategic vision of development.

The objective of the paper is to develop the existing theory domain of performance measurement (Lukka and Vinnari 2014, 1308), determine the role of performance measurement. We are going to inspect the impact of purchases of public services on the development of an effective measurement system in the public sector. As it was suggested earlier, there is a difference among different countries and cultures in the public sector. So, in this research will be provided action research of only one country, but some practical conclusions will advance existing theory. Moreover, a lot of recent studies were primarily concentrated particularly on healthcare and educational systems. While previous similar studies were conducted, we still have a lack of works in the defense sector.

In this research, the focus is on performance information. How it is affected by the actions and interests of different groups, what kind of information we accumulate in the defense sector for management needs.

The paper is structured as follows: in the second section, a brief literature overview is presented, outlining the accountability variations and discussing the performance measurement. In the third section, the methodological choice and the data are described. The fourth section represents the contextual background of the research, and the fifth is findings. Finally, the study closes with a concluding discussion and perspectives for future research.

1. Literature Review

The Ukrainian defense reform is expected to result in the establishment of effective, mobile defense forces equipped with modern weapon systems, military and special hardware able to guarantee national security and defense as well as provide an adequate and flexible response to military threats to the national security of

Ukraine sustainably using the available operational (combat) capabilities and resources of the nation (Ordynovych 2020, 69). We know that military reform is a necessary component of political and socio-economic reforms (Bekishov 2021, 133). One of the principal directions of such changes is development of performance measures.

Performance management is still a very difficult question for different sectors and a lot of papers examine it. Some efforts to estimate the multidimensional performance measurement was conducted by Lynch and Cross (1991), Kaplan and Norton (1992). Those methods were successfully implemented in the business environment. The next step was to research the implementation of such models in organizations (Kaplan and Norton 1992; Kaplan and Norton 1996). But only some of them were concentrated on practical issues.

A lot of studies discuss the effectiveness and of public sector organizations (e.g., Mayston 1985, 51; Midwinter 1994, 37). The other important point, in this case, is inputs, outputs, and outcomes in performance measurement (Van Peursem *et al.* 1995, 34). However, various performance dimensions are linked to different stakeholder interests. We are going to inspect this more thoroughly in this research. The successful implementation of multidimensional PMSs in public-sector services like defense is especially difficult.

This task has been affected by the fact that in recent years many public services have come under pressure to become more efficient and effective. To reduce their demands on taxpayers, while maintaining the volume and quality of services supplied to the public. This shifted the search for effectiveness in the public sector to private sector methods.

Jalali Aliabadi *et al.* (2019) discussed the "slack" problem of performance-based budgeting in public universities. According to their research, an important role in this problem plays performance measurement, which was also remarked by Van der Stede (2000) and Daumoser *et al.* (2018). But how to measure effectiveness in a situation, when as usual future expenses in the proposed budgets are overestimated to receive more budgeted resources from the ministry of finance (Niskanen 1971). The budgeting practices and their performance effect in the educational field were also analyzed (Agyemang and Broadbent 2015, 1018; Alach 2017, 102; Broadbent 2007, 193; Kallio *et al.* 2016, 685; Modell 2003, 333; Modell 2005, 537; Modell 2006, 219; Ter Bogt and Scapens 2012, 451), and their implementation of the business logic of actions through evaluation of performance consequences in the field. The other widely described and interesting sector from the point of performance in healthcare. Pizzini (2006) learned this question in US hospitals, while Kurunmäki and Miller (2006) examined the same problem in the UK, performance management methods and its accountability was developed in a lot of recent papers (Gebreiter and Ferry 2016, 719; Lachmann *et al.* 2016, 661; Veronesi *et al.* 2014, 35). A valuable summary of all actual recent studies in accounting and management fields was performed by Grossi *et al.* (2019).

It is extremely difficult to measure the performance of public sector organizations because of the growing hybridity and specificity. In public services there are interests of stakeholders and multiple dimensions of performance should imply a situation of complexity. The organization should build a balanced performance management system, reflecting all interests. For example, comparative analysis of Spain and Finland police performance measurements represents the influence of different logic in this case from various dimensions (Rautiainen *et al.* 2017, 165): there may be the financial and professional (operational and administrative) emphasis in measurement (Burns and Scapens 2000, 3; Burns and Vaivio 2001, 389; Kurunmäki 2004, 327; Lapsley 2009, 1; Lounsbury 2008, 349; Rautiainen and Jarvenpaa 2012, 164; Reay and Hinings 2009, 629).

Lynch and Cross (1991) and Kaplan Norton (1996) proposed an important idea for this research that performance indicators cascade according to the organizational hierarchy because each level has responsibility for different performance dimensions. This developed a specific instrument for management to explicitly analyze organizational activity.

Institutional theory defined performance, as institutional factors, which determine the different interests in the organization (Scott 1987, 493). Meyer and Zucker (1989) determine by several points:

(a) Elites dominate an organization.
(b) A high degree of professionalization exists.
(c) The organization performs a technical function, outputs of which are measurable.

These ideas combine propositions from institutional theory (stakeholders and actors are involved) and make a significant emphasis on the role of performance measurement (what and how to measure, which leads to the idea of the right accountability).

The issue of performance budgeting and measurement in defense was considered from different perspectives: management and management accounting (Almqvist *et al.* 2011, 122), accounting (Catasus and Gronlund 2005), in terms of comparing costs and benefits and macrolevel (Kinsella 1990, 295), assessing the

implementation of specific defense programs (Hartley and Martin 1993, 195), and the micro-level for specific operations (Billyard and Donohue 2016, 794; Blanken and Lepore 2015, 516; Johansson 2019). All early studies were more concerned with outputs, while the latter focused more on outcomes. This is the transition in the public management theory to new approaches.

Billyard and Donohue (2016) define efficiency as the ratio of results to resources in military organizations but notes that only specific results are considered. However, we understand that the abundance of results and the specific indicators that are considered in the assessment have evolved. They proposed the practical side of the issue of assessing specific outputs and resources in terms of sigma accountability. Meanwhile, the outcomes are more and more difficult, because it is difficult to assess the world and the sufficient level of funding and the size of the armed forces for this.

Vasquez (2001) investigating the likelihood of wars and the achievement of peace established the defining factors of the existence of alliances and participation in blocs that guarantee collective defense, the dynamics of clashes with territorial and political issues, the development of weapons, and the army. At the same time, Wagner (1994) in his work proved that war is least likely if power is distributed equally, but only taking into account the distribution of political forces and prerequisites, as well as taking into account the interests of other states. One of the tensest periods in human history, characterized by competition between two opponents, is the Cold War (Allison and Zelikow 1999). However, it should be noted that the result of this confrontation was the development of such a phenomenon as proxy wars (Williams 2012, 61). This leads us to the conclusion that in order to assess the amount of "force required" it is necessary to clearly assess the potential threats. It should also be noted that in the skillful art of command and control, in order to increase the level of success in conducting defense or offensive operations, there are minimum standards for the balance of forces, which are determined by regulations and orders: personnel, weapons and military equipment, resources. In this way, we can rethink and more concretize peace outcomes for omega accountability.

$$Outcome = \frac{Peace}{Money} \xrightarrow{convert} \frac{Right\ power\ allocation\ (abilities)}{argmin(Money)}$$

The right power allocation in terms of finance means effective resource partition among defense sectors. It should be noted that the distribution of resources will be affected by participation in military blocs, provided that an effective system of collective defense falls asleep, it reduces the total defense spending of the state (Gonzalez *and* López, 2013). However, most modern conflicts take on the characteristics of hybrid and carry a very large destructive impact (Bluszcz and Valente 2022, 1). As Balcaen *et al.* (2022) point out, hybrid threats strongly shift the balance of power and force states to look at budget resource allocation. Right power allocation depends on the total amount of total resources distributed according to the threat's distribution from the potential state enemy and defense priorities. While minimizing the amount of funds is achieved through the application of innovative approaches to procurement, process optimization, savings, and the like.

As we could conclude from the mentioned above different approaches to measure effectiveness and efficiency were developed and adopted by the management. All of them try to balance the interest of the main stakeholders and professionals. The new power, which is extremely important in this process is the purchase of public services. They affect the transparency of the organization's accountability and, as a result, performance measurement, because the amount of the resources is limited it is important to control their spending. The main problem derives from the definition of defense and security. How to measure (account) such things, as a result, how to determine their performance.

In general, all discussed approaches could be divided into those related to budget planning and resource control, as well as those related to the assessment of results, development strategy. But the important thing is how we develop them, and who causes the primary influence on this process.

2. Methods and Design of the Study

In this research, the aim was to use various sources of information. In turn, to assess the impact of reforms, legislative acts over the past few years and their impact on the development of performance measurement were analyzed. Both national and internal ministerial acts were analyzed. We also took part in the meeting of the command level, either the further direction of the development of the structure of the Armed Forces, or the system of financial support and the state of accounting were discussed. Several interviews were conducted with managers of the financial departments of military units, who work in both civilian and military positions.

One of the authors of the paper was involved in the teaching of the course "Accounting in the Armed Forces". It has been given to the cadets of the Military Institute of the Taras Shevchenko Kyiv National University for over 10 years. It is laid out for future officers of financial and economic bodies, as well as for current officers in

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different courses. Among the listeners, there are representatives of the Land Forces, Airborne assault forces, Air Forces, as well as Naval Forces and other formations. The course focuses on the role of the financial officer in local units as chief accountant, examines the issues of accounting, reporting, the role and responsibility of officials of different departments, their interaction. The issues are primarily focused on the tactical level but within the framework of the general strategy for the development of accounting in the state and the Ministry of Defense. During the teaching, there are many practical discussions, because the cadets annually go to practice (internship) in local units, and the officers on the courses already have their own experience in positions in the troops, so they are familiar with the system of financial support, accounting, and administrative work. These people are representatives of the financial managers of the third, lowest, level.

The next level is the financial and economic departments of the branches of the armed forces, operational and military commands, and territorial districts. They are composed of both civil and military personnel, however, the number of personnel in financial departments is small, and this depends on the implementation of the tasks. Several nearby local units are subordinate to these departments. Financial managers at this level have extensive professional experience in managing various departments and resources. They delve less into accounting processes in local units and focus more on management accounting. Their task is to collect low-level information and provide it to other users for making management decisions.

The Finance Department of the Ministry of Defense maintains records and summarizes information at the highest level. They are subordinate to the financial bodies of managers of funds of the second and certain third levels. At this level, attention is already being paid to the analysis of the activities of the branches of the Armed Forces and their state of health. Nobody focuses on individual local units, because they do not serve as the basis for accounting at such a high level. The advantage here is also given to management accounting. The units are composed primarily of officers and civilians, who may or may not have military experience, but many of them have at one time passed military service.

During the study, interviews were conducted with representatives of various levels of budget funds managers and branches of the Armed Forces in order to compare approaches to assessing the effectiveness of their activities and budget performance. Some interviews were organized remotely due to the distance of the units.

Conducting a documentary analysis append the whole picture with more objective answers to these issues. Fig. 1 depicts the logic of the interviewing process, moving from general to specific questions. To reflect the picture and collect necessary information the questions were structured to answer: who, why, what, and how. More than twenty interviews were organized with representatives of different command levels.

Figure 1. Typical interviews comprising from several questions.
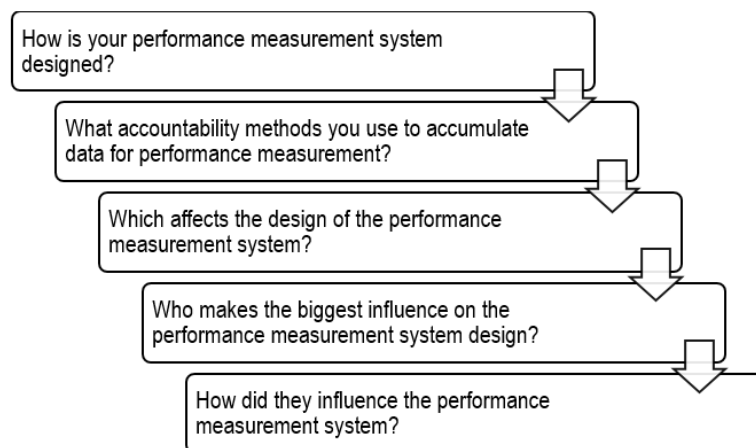
At the command-level discussions, representatives of various controlled units described the internal environment of the units, as well as the possible risks that arise in the process of their functioning. Subsequently, the reflection of the results of this work was formalized in risk catalogs, regulations, and instructions, as well as other working documents of these units.

Attention was also paid to reports on the implementation of budget programs, which were published for 2012 - 2018 by the Armed Forces. The chosen period was selected by us as it reflects undistorted data, which in subsequent years were distorted by the COVID-19 pandemic, and from 2022 to the present by the state of war in Ukraine. An important document is the annual White Papers, which contain all areas of activity and determine

priorities for the coming years. It also researched numerous interviews of officials on the website of the Ministry of Defense, as well as in the official publications of the Armed Forces.

The greatest attention was paid to what was declared and implemented in the reform process and what attention was paid to budget performance. Of course, given the long period of reforms, there is no direct implementation of changes, they are introduced non-linearly. Moreover, it should be noted that this phenomenon is typical for different time intervals during which the study was carried out. Of course, one can appeal to the subjectivity of researchers and respondents, because they have been working in the field for a long time and are already accustomed to the peculiarities, but the data was provided for review to unauthorized persons. The Armed Forces in this study reflect the development and implementation of new approaches in management theory to solving problems of assessing results.

The next section presents context and key findings obtained after analyzing the interview and official documents, and from meeting with civil and military personnel in the defense sector.

3. Contextual Background of the Reform in the Armed Forces of Ukraine

The manning system of the Armed Forces of Ukraine is hybrid. It provides for the compulsory conscription of men and recruitment by contact of officers, sergeants, and soldiers. Civilian personnel mainly perform administrative functions. The development of civil defense and the training of reserve units play a significant role in the state's defense system. The service of women is not compulsory, as in some countries of the world, but if they wish, they can be accepted into military service on contract and perform duties in positions for which there are admissions for women. This approach, a combination of compulsory military service for men and the gradual recruitment of the Armed Forces on a professional basis, aims to mobilize significant forces quickly and effectively if necessary.

However, the normative number in recent years has been constantly changing and since 2001 more than 400 thousand people have been reduced until 2014. The increase in the number was facilitated by the temporary annexation of the territory of the state and the beginning of an anti-terrorist operation. This led to the growing importance of the role of the Armed Forces in society, as only one of the directions of government spending, but also as a guarantor of the territorial integrity and independence of Ukraine. Although after the end of the acute phase of the conflict and after the establishment of the regime of silence, the issue of optimization, redundancies are again beginning to rise in the offices of government officials.

As well as the number of personnel, the amount of funding for defense needs has seriously changed. Despite the officially approved volume of 3% of the state's GDP, it exceeded this figure only after 2014. Although it should be noted that in dollar terms, the volumes have increased, the percentage is still distributed between budget programs as follows: 70-80% of the maintenance of the Armed Forces, 10-15% of weapons, and 10-15% on reform.

Using the annual financial statements and White Papers of the Ukrainian Armed Forces, the table 1 below was constructed. It reflects the 2001-2013 trend towards a reduction and decrease in defense funding, as well as positive developments since 2014. As noted earlier, special attention should be emphasized on the fact that the goals and conditions for the functioning of public sector institutions depend on political forces, stability in the state, priority directions of its development, which are set by the main actors. They can change from election to election. However, in addition to the supreme commander in chief, the vision within the ministry is also extremely important. We understand that the results of reforms cannot be expected in the short term, and they can be felt only after a certain period of time with consistent and structural changes and in case of stability. With constant changes in the command-and-control apparatus, it is difficult to determine the main vectors of development of the Armed Forces and follow them for a long time.

Only after 2014, amid the existence of open-armed aggression, it was possible to determine the final direction of Euro-Atlantic integration, develop a strategy and achieve certain stability in the medium term. Now we are at the stage of adapting European norms and standards, developing new doctrines, laws, orders, and instructions that would help Ukraine in building interoperability among NATO countries in an existing co-defense system. Significant structural changes have taken place in the structure of the Armed Forces, in the delineation of powers in planning and managing resources and troops.

These reforms can be considered to be the result of manifestations of isomorphism (DiMaggio and Powel 1991), which are inherent in many organizations. For the Armed Forces of Ukraine in a situation of uncertainty, it acquires signs of mimetic and coercive changes. There are attempts by the state to copy the patterns of more progressive European partners, and to adopt NATO STANAG norms as necessary prerequisites for the integration. The pressure for these transformations that exists from the point of view of society no longer sees Ukraine as a constituent of the post-Soviet republics, but the country wants to be a full-fledged member of

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European society. Biased by this fact, the army on the crest of these changes is a component important for maintaining the integrity of the state. And according to Oliver (1991), we could highlight the military response to reforms as compromise and acquiescence. There is a strong gap between the planned activities and the results.

Table 1. Reflect of the trends towards a reduction in defense funding

Year		Share of GDP	Military expenditures in current USD $m.	Personnel			Political Actors	
				Military	Civilian	Total	Political power (President)	Ministers of Defense
Peace time	2001	1.9%	741.71	314,395	101,455	415,850	Leonid Kuchma	Oleksandr Kuzmuk
	2002	2.0%	872.39	306,507	98,780	405,287		Volodymyr Shkidchenko
	2003	2.1%	1,104.81	295,490	94,525	390,015		Yevhen Marchuk
	2004	2.0%	1,322.22	265,535	89,485	355,020		Oleksandr Kuzmuk
	2005	1.9%	1,680.11	210,000	75,000	285,000	Viktor Yushchenko	Anatoliy Hrytsenko
	2006	1.9%	2,085.90	180,000	65,000	245,000		Anatoliy Hrytsenko
	2007	1.9%	2,860.87	165,000	56,000	221,000		Anatoliy Hrytsenko
	2008	1.8%	3,360.26	152,000	48,000	200,000		Yuriy Yekhanurov
	2009	1.9%	2,320.41	149,000	51,000	200,000		Valeriy Ivaschenko
	2010	1.9%	2,587.45	150,000	50,000	200,000	Viktor Yanukovych	Mykhailo Yezhel
	2011	1.5%	2,502.30	144,000	48,000	192,000		Mykhailo Yezhel
	2012	1.6%	2,835.91	139,000	45,000	184,000		Dmytro Salamatin
	2013	1.6%	2,895.00	120,900	44,600	165,500		Pavlo Lebedev
Anti-Terrorist Operation	2014	2.2%	2,997.18	204,000	46,000	250,000	Oleksandr Turchynov Petro Poroshenko	Ihor Tenyukh, Mykhailo Koval, Valeriy Heletey
	2015	3.3%	2,959.58	204,000	46,000	250,000		Stepan Poltorak
	2016	3.2%	2,943.81	204,000	46,000	250,000		Stepan Poltorak
	2017	2.9%	3,246.79	204,000	46,000	250,000		Stepan Poltorak
	2018	3.2%	4,169.71	204,000	46,000	250,000		Stepan Poltorak

Therefore, given the speed of changes, the state leadership understands that the prospect of Ukraine's potential entry into NATO is far away. However, Ukraine, first of all, relies solely on its forces to protect the borders. That is why the participation of personnel in peace and security operations abroad has been minimized. After all, the geopolitical situation around our borders becomes tense and unstable from almost all sides. The main priority goals for the Armed Forces at the moment in accordance with the strategic defense bulletin approved by the Presidential Decree are:

1. Development of the control system of the Ukrainian Armed Forces based on the principles and standards adopted by the NATO member states;

2. Improving the defense planning system, introducing transparent and efficient resource management in the Ministry of Defense and the Armed Forces using modern Euro-Atlantic approaches;

3. Acquisition of the potential of the Armed Forces for a guaranteed rebuff of armed aggression, defense of the state, and participation in the satisfaction of peace and international security;

4. Creation of a unified system of material and technical support and improvement of the medical support system of the Armed Forces in accordance with NATO standards,

5. Professionalization of the Armed Forces of Ukraine and the creation of the necessary military reserve of the Armed Forces of Ukraine;

6. Supporting the existing capabilities of the Armed Forces of Ukraine;

7. Development of weapons and military equipment.

According to the strategic goals, operational goals for the direction of the development of the Armed Forces related to resource management have been determined, which need to be resolved within a short period of time. Among them, the introduction of Euro-Atlantic approaches and principles to the construction of a defense planning system, the creation of an integrated risk management system, the introduction of planning the development of the defense forces' capabilities, the creation of an integrated procurement system in the Ministry of Defense of Ukraine, the improvement of the mechanism for the formation and implementation of the state defense order, the implementation of an infrastructure management system and its development, depriving the Ministry of Defense of Ukraine of functions unusual for it.

Therefore, the revision of approaches to assessing the results of budget execution closely correlates with the strategic and operational goals that have been identified for the Armed Forces. This is especially true for Ukraine as a state, takes part in armed conflicts, and is also constantly at the stage of reforming and developing the army. Since 2001, there have been many changes in the size of the Armed Forces, the state of funding, and a change in the direction of development and integration, which were due to the political component.

An analysis of the functioning of the Armed Forces and the context of their functioning allows us to conclude that it is political forces that have a significant impact on the vector of development. When the political regime changes, the representatives of power in management and command change. At the same time, only recently we came to the distribution of functions between the Ministry of Defense and the General Staff. That is, the distribution of responsibilities in the allocation of resources has risen to a higher level, and the issues of accounting and efficiency have reached a new level.

There is substantial evidence that defense spending decisions in democratic countries are influenced by citizen preferences (Eichenberg and Stoll 2003, 399). Findings also show that defense budgeting is representative: public support for defense spending is the most consistently significant influence on defense budgeting change in some countries.

Public attention to the transparency of processes in the army increased after the revolution of dignity and the outbreak of armed conflict. Civilian control by recipients of public sector services has become widespread. At the moment, many positions are being introduced, the functional responsibilities of which are related to public control over decision-making by management. And they have a significant impact because they represent the interests of the public, special attention is paid to the reforms of accounting and spending of financial resources. Therefore, the Armed Forces have become one of the leaders who have joined the transformation of defense procurement, because this has made it possible to optimize costs and save resources.

It should also be noted that pressure from international organizations has increased since 2014. This is due to the fact that the Armed Forces of Ukraine have chosen the vector of development in NATO. Thus, the Euro-Atlantic community makes demands on the standardization of all processes in the army. Most directorates and departments now include representatives from international organizations as consultants. As donors of international technical assistance and grant providers, they are interested in implementing accountability and performance measurement.

The next section will reflect findings regarding performance budgeting measurement and accountability.

4. Findings

The main basic elements of the strategic development vector of the Armed Forces are established in the strategic level documents. The issue of resource management in accordance with international standards and performance monitoring, capacity planning play an important role in this. So, by order of the Ministry of Defense of Ukraine dated December 29, 2020, No. 497 "On the implementation of the Decision of the Board of the Ministry of Defense of Ukraine" it is determined:

"[...] the acquisition of the operational (combat, special) capabilities of the defense forces necessary for a guaranteed repulse of armed aggression, state defense, maintenance of peace and international security [...]."

Isomorphism and imitations of NATO countries are now also of a normative nature since it contains a clear formulation in strategic documents:

"[...] building a defense management system based on the best practices of NATO member states, creating a modern defense resource management system [...]."

The Minister of Defense set the task of harmonizing regulatory documents and doctrines as a basis for further cooperation with NATO member states. We are also reforming the organizational structure in accordance with these principles.

"[...] harmonization of the hierarchy of doctrines of the Armed Forces of Ukraine and high-level doctrinal documents (in NATO terminology) with the principles and approaches of NATO and partner states [...]."

"[...] conducting a clarifying GAP analysis of the capabilities of the Armed Forces of Ukraine, which provides for a comparison of the desired and real results and determining the gaps between them, and the development of programs (projects), the acquisition (achievement) of the necessary operational (combat) capabilities [...]."

These changes are due to pressure from international regulatory bodies and advisers who seek to implement an effective system of accounting, monitoring, and performance evaluation. They already had a negative experience in implementing reforms in Afghanistan:

"[...] We have spent a lot of time and effort in reforming Afghanistan. Corruption at various levels has become a major obstacle to our reforms. The leadership of the state and the military has distorted and transformed all our efforts through the prism of corruption. We are forced to accept that we have failed, but we have drawn the appropriate conclusions. [...]"

As a result, international advisers increase the requirements for the organization of internal control and accounting in the Armed Forces. It also encourages the development of democratic civilian control over the military organization and law enforcement agencies of the state. Today in Ukraine there are certain achievements in the formation of democratic civil-military relations - the creation of a public forum for an open dialogue, increasing the level of transparency in defense planning and budgeting processes.

"[...] The system's resilience to change is predictable and expected, but we will continue to aggressively expand the practice of good democratic civilian governance in the defense sector, following the example of NATO member states. The prospect of membership in the Alliance forces us to abandon the military hierarchy of the model of a past era and is the key to the inevitability of our Euro-Atlantic transformation. [...]"

The key point in this transformation for civil control as representatives of purchases of public services was effective resources allocation. During the briefing, the Head of the Department of Military Policy, Strategic Planning and International Cooperation of the Ministry of Defense of Ukraine noted that:

"[...] Speaking about the efficiency of resource management, it is necessary, first of all, to talk about effective planning. Each allocated hryvnia should be used with maximum efficiency. which will allow for more rational use of resources for defense needs to develop the capabilities necessary to perform certain tasks. [...]"

Based on a specific strategy and vision for the further development of the Armed Forces, recommendations for defense planning based on capabilities were developed, which included a catalog that meets NATO standards. He determined that:

"[...] Capability-based defense planning involves functional analysis. Functions and tasks to be performed in anticipated (likely) future operations are transformed into capability requirements, on the basis of which their creation, maintenance, and development are planned. [...]"

Capability-based defense planning involves the creation, development, and maintenance of an optimal mix of required capabilities within available resources. Material resources are not always the determining factor in the development of abilities. Effective ways to build up capabilities can be improving the doctrines, increasing interoperability, structures of military command and control bodies and military units, the introduction of new forms and methods of conducting operations and hostilities, improving the system of selection, training, exercising, and motivation of personnel.

Unlike threat-based planning, capability-based defense planning is about focusing efforts not on creating new organizational structures to counterbalance the enemy's appropriate combat potential, but on developing the capabilities of troops (forces) to effectively perform certain tasks.

Representatives of top-level military command and control bodies believe that capacity-based planning and performance measurement are rather vague concepts, but with which the constant needs to operate in their activities when assessing the implementation of programs.

"[...] The activities of the Armed Forces are difficult to evaluate from the point of view of a specific result in the form of specific figures to describe combat readiness and its sufficiency. However, now we are moving alongside the assessment of capabilities, territorial integrity and ensuring inviolability [...]"

Outcomes become especially important in situations where financial resources have to be allocated between different ministries. But the need for the Armed Forces grows only when there is a real threat. In peacetime, a sense of security is possible even with a minimum number of troops, as the experience of many states shows, especially if they participate in military blocs to ensure collective security.

Financial managers of the intermediate level, located between the local units and the high level, note that they are more focused on the results of the work of subordinate units, on the balances of financial resources, and the directions of their use.

"[...] We ourselves develop forms for accounting and monitoring the implementation of parts of estimates. We are interested in the allocated financial resource and the procedure for its use, the result. I report to the commander, and he is interested in the state of the subunits' progress, their fulfillment of planned targets, and what effect this has on their readiness to perform tasks as intended [...]"

For the heads of financial bodies in the smallest structural units, special attention is paid to monitoring the resources received and monitoring the compliance of officials with the norms and requirements of governing documents.

"[...] Our financial and budgetary reporting is built around indicators, centered around control over the accounting of allocated resources. We do not report on the efficiency of spending funds. The main issue was and remains controllability and accountability, legality, minimization of risks in the process of spending funds. a cut of the functioning of accounting for us the results of audits [...]"

Managers of all levels do not operate with the concepts of theory and are not based on it when making their decisions. However, it should be noted that even without understanding the theoretical basis, many of their conclusions and actions strongly correlate with the concepts of PPM, NPM, and Institutional theory.

5. Discussion

It is difficult to underestimate the role of the Armed Forces for the state at this stage. On the one hand, they are designed to satisfy society's need for security, and on the other, they reflect changes in society towards European integration. Under pressure from society and international organizations, many systemic changes have been made, which consist of the implementation of NATO standards, as an imitation of the experience of more successful countries. The military understands that we are a country of the post-Soviet Union, where defense planning was carried out not in accordance with the available capabilities, but taking into account potential threats, which means it was not limited in resources. The conditions of a market economy set restrictions, and as for a post-Soviet country, we are forced to adapt to them. Effective assessment of capabilities and planning of resources, conducting joint forces operations, hybridization of approaches to accomplishing assigned tasks, development of new scenarios and approaches are designed to optimize these processes. That is why, given these new approaches, accounting and performance management issues play a decisive role as a prerequisite for assessing efficiency.

The answers of practitioners and the analysis of documents allow us to assume in the construction of a system of indicators used and needed at various levels of management (Table 2).

Table 2. System of indicators used at various levels of management

Level of management	Elements of Performance Management system			
	Inputs	Process and control	Outputs	Outcomes
I	+	+	+	+
II	+	+	+	
III	+	+		
Public management theory	Progressive public administration		New public management	Neo public management

While local units are focused on controlling inputs and processes, which in fact is a reflection of the combination of lambda and theta accountability in PPM, the leaders of territorial groupings consider the issues of control over outputs as an element of sigma accountability in NPM. The most important, but least deterministic here is the measurement of outcomes from the point of omega accountability. This is a new wave of Neo public management.

The Armed Forces of Ukraine are changing, and despite the presence of gaps between some planned activities and actual results, we understand that the process of introducing completely different and new approaches to resource management and assessing the effectiveness of their use is underway. And this is evident in the increasing attention that is given to the values and principles of NATO, and the outcomes of the defense sector.

Experts note that it is external forces that have a significant impact on the formation of the domestic system of accounting policy and performance assessment: public organizations, civil control, international advisers and organizations (Figure 2). And although some efforts are also being made by representatives of the

command, they also agree that, in fact, in the process of introducing new multidimensional systems for assessing performance and accounting policies, they are faced with problems of corruption risks that stimulate deliberate imitation of changes and reforms, and also do not allow achieving the desired results.

Figure 2. External forces that have an impact on the formation of the domestic system of accounting policy and performance assessment
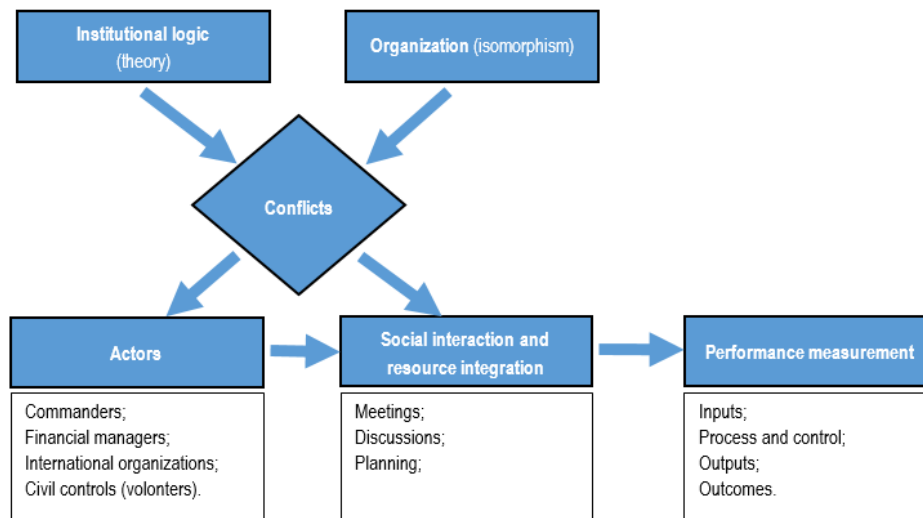
The main driving force that makes it possible to overcome these obstacles is precisely the external oversight by the subjects who are not involved in the system and have no interest or compromising ties with other actors. Therefore, reforms in accordance with NATO standards are so important for the Armed Forces of Ukraine. They include external observers from direct consumers of the defense sector, international observers. These are all steps towards building an effective control and accounting system.

Conclusion

The findings of this study relate to the combination of different theories for the case of the Armed Forces of Ukraine, as a reflection of their transformation in response to existing challenges.

First of all, we see that reform is a response to an internal need for change and imitation of more successful, efficient, and progressive armies.

Secondly, these changes are taking place under external pressure from society, as a response to the integration of the state into the Euro-Atlantic space and a new vector of development.

Under the pressure of these institutional changes, there is also a revision of efficiency indicators, a system for constructing an assessment of budget execution and their measurability. We see that despite the evolution of public management approaches, they should be considered only systematically, since different components of the theory are important at different levels of management and are also concentrated on various accountability objects.

This study shows a structural shift to the outcome values in performance and introduction of a new approach to its meaning as "peace outcome" definition. It was determined the role of accountability for performance measurement and the role of external actors in this process.

We determine the new power of actors for Armed Forces. While during the previous years we observed only indirect influence of society on the performance management system. Today, we have a lot of representatives on the command level. This civil control actively participates in the process of performance management and control development. This was a Ukrainian emerging phenomenon called volunteers, which developed into powerful public movement and force.

Further research can be directed not only at the qualitative but at the quantitative side of the problem. The researchers could dive deeply into the question of hybrid threats for defense management, their evaluation, and the reaction of the management. Probably it could develop the idea of interaction among command staff, financial managers, civil control representatives, and external organizations.

Credit Authorship Contribution Statement

Vadym Pakholchuk: Conceptualization, Methodology, Project administration, Writing – original draft.

Kira Horiacheva: Conceptualization, Investigation, Supervision, Writing – original draft.
Yuliia Turchenko: Investigation, Data curation, Validation, Writing – review and editing.
Oles Koval: Methodology, Project administration, Validation, Writing – review and editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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The Moderating Effect of Digitalisation on the Relationship between Corruption and Domestic Resource Mobilisation: Evidence from Developing Countries

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Abstract: ***Purpose:*** *Domestic Resource Mobilisation (DRM) is vital for government financing of essential sectors like infrastructure, education, and healthcare, but corruption impedes revenue collection and erodes trust in government institutions. Nevertheless, digitalisation offers a promising way to combat corruption and improve DRM. This study aims to explore how digitalisation can enhance transparency and efficiency in addressing these issues by specifically investigating how digitalisation can moderate the relationship between corruption and DRM in developing nations.* ***Methodology:*** *Utilizing panel data of 65 developing countries from 2007 to 2019, a Panel Corrected Standard Errors (PCSE) estimator was employed.* ***Findings:*** *The findings indicate that corruption negatively affects DRM, while digitalisation has a positive influence. Importantly, digitalisation was found to moderate the adverse impact of corruption on DRM, albeit after a certain threshold level of digitalisation. Across regions, the net effect of this interaction varied, with some regions experiencing negative consequences. Notably, the existence of a threshold level of digitalisation above which its influence becomes more pronounced in mitigating corruption's impact on DRM revealed that the association is non-linear.* ***Originality:*** *This study addressed an important gap in the literature by examining how digitalisation moderates the connection between corruption and DRM in developing countries, offering nuanced insights into the feasibility of leveraging digital technologies to bolster revenue mobilisation despite corruption challenges.* ***Implication:*** *These results have significant implications for policymakers, highlighting the potential of digitalisation to enhance revenue mobilisation and combat corruption in developing countries, albeit with context-specific considerations.*

Introduction

Corruption and Domestic Resource Mobilisation (DRM) are pressing challenges faced by many developing countries, impacting their economic development and stability. DRM plays a crucial role in providing governments with the necessary financial resources to invest in vital sectors such as infrastructure, education, and healthcare (Jackson, 2023) However, corruption undermines revenue mobilisation efforts by hindering tax compliance and

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eroding trust in government institutions (Ajaz and Ahmed 2010). With external financing becoming increasingly uncertain, developing countries are compelled to focus on maximising DRM to drive sustainable growth and meet their socio-economic objectives.

Digitalisation has emerged as a potential solution to combat corruption and enhance DRM in these nations. The adoption of digital technologies in governance, financial systems, and public service delivery has shown promise in reducing opportunities for corrupt practices, enhancing transparency, and improving overall efficiency (Gupta *et al.* 2017). Digitalisation offers the potential to create more streamlined and accountable revenue collection processes, enabling governments to boost their resource mobilisation efforts and allocate funds more effectively to critical development initiatives.

Despite the optimistic outlook on the role of digitalisation in combating corruption and bolstering DRM, the specific moderating effect of digitalisation on the relationship between corruption and revenue mobilisation remains largely unexplored. While previous studies have individually investigated the impacts of corruption on DRM and the benefits of digitalisation in countering corruption, there exists a research gap in understanding the combined effects and interactions of these factors in developing countries. Therefore, this study aims to address this gap by examining how digitalisation influences the relationship between corruption and DRM, shedding light on whether and to what extent digital technologies can enhance revenue mobilisation efforts despite the presence of corruption in these contexts.

The primary research question driving this study is: How does digitalisation moderate the relationship between corruption and revenue mobilisation in developing countries? To answer this question, the study will focus on the following specific objectives: (i) To assess the level of corruption in selected developing countries and its impact on revenue mobilisation efforts, (ii) To examine the extent of digitalisation initiatives implemented in these countries and their potential influence on curbing corruption and enhancing DRM, and (iii) To analyse the moderating effect of digitalisation on the relationship between corruption and revenue mobilisation, considering various contextual factors and governance mechanisms.

The current literature has widely recognised corruption and DRM as critical issues in developing countries, and scholars have explored the role of digitalisation in combating corruption and improving DRM separately. However, there remains a research gap in understanding the joint effect of digitalisation on the corruption-revenue mobilisation nexus. This study seeks to address the gap by providing empirical evidence and a nuanced understanding of how digitalisation can impact revenue mobilisation efforts even in the presence of corruption in developing countries.

The remaining sections of the study will be organised as follows: Section Two will address the Literature Review - this will provide a comprehensive review of existing literature on corruption, DRM, and digitalisation in developing countries. It will highlight the gaps in the current knowledge and establish the rationale for investigating the moderating effect of digitalisation on the relationship between corruption and revenue mobilisation. Section Three will address the Methodology –this section will outline the research design, data collection methods, and analytical techniques employed in the study. It will also justify the selection of countries and data sources, ensuring the robustness of the findings. Section Four will provide details of the Empirical Findings - here, the study will present its empirical results, analysing the level of corruption, the extent of digitalisation, and the relationship between corruption and DRM in the selected developing countries. The moderating effect of digitalisation will be assessed using regression or other relevant statistical methods. Section Five will discuss and present the Implications of the empirical findings and conclusion. The implications of the study's results for policymakers, practitioners, and scholars will be discussed, emphasizing the potential role of digitalisation in enhancing DRM despite corruption challenges. This section will also conclude the study by summarising key findings in relation to its contributions to existing literature and the suggestion of avenues for future research. It will also provide practical suggestions for policymakers to leverage digitalisation in improving revenue mobilisation and combat corruption in developing countries.

1. Literature Review

The literature review is divided into two sections namely, Theoretical and Empirical reviews as outlined in the subsequent sections.

1.1. Theoretical Review

Corruption and inefficient revenue mobilisation pose significant challenges to economic development in developing countries. The interaction between corruption and revenue mobilisation is a complex and multifaceted issue. Digitalisation, characterized by the adoption and integration of digital technologies, has been touted as a

potential solution to mitigate corruption and enhance revenue mobilisation. This theoretical literature review aims to explore the theoretical foundations of the moderating effect of digitalisation on the relationship between corruption and revenue mobilisation in developing countries.

Corruption and Revenue Mobilisation: Corruption has long been recognized as a major impediment to economic growth and development. A vast body of literature explores the adverse effects of corruption on revenue mobilisation in developing countries (Mauro 1995; Tanzi and Davoodi 1998). Studies show that corruption leads to revenue leakages, misallocation of resources, and weakened tax systems, thus hindering the government's ability to mobilize funds for public goods and services.

The Role of Digitalisation in Combating Corruption: Digitalisation, often synonymous with e-governance and e-government, involves the use of digital technologies to enhance the efficiency, transparency, and accountability of public institutions. Digitalisation offers tools such as e-filing, online tax payment systems, and electronic monitoring, which can help reduce opportunities for corruption and enhance revenue collection (Máchová *et al.* 2018). Digital platforms enable citizens to interact with the government and access public services without intermediaries, thereby reducing the scope for bribery and rent-seeking behaviors.

Digitalisation and Revenue Mobilisation: Studies suggest that digitalisation can positively impact revenue mobilisation by increasing tax compliance and reducing tax evasion (Bird and Zolt 2008; Bellon *et al.* 2022). Digital tax systems provide efficient and automated methods for tax assessment and collection, minimizing human discretion and opportunities for corruption. Moreover, digitalisation can facilitate data integration, enabling tax authorities to identify discrepancies and uncover hidden sources of revenue.

The Moderating Effect of Digitalisation on Corruption and Revenue Mobilisation: Theoretical arguments propose that digitalisation can moderate the relationship between corruption and revenue mobilisation in developing countries. Digital platforms and automated processes decrease the direct interaction between taxpayers and tax officials, which can minimize opportunities for corrupt practices. By reducing face-to-face interactions, digitalisation may curb the power of corrupt intermediaries who exploit administrative inefficiencies.

However, the effectiveness of digitalisation as a moderating factor depends on various contextual factors, including the level of institutional capacity, internet penetration, and digital literacy (World Bank, 2016). Therefore, in countries with weak governance structures, the impact of digitalization on reducing corruption and improving revenue mobilization might be limited.

In summary, the theoretical literature suggests that digitalisation has the potential to play a crucial role in moderating the relationship between corruption and revenue mobilisation in developing countries. By enhancing transparency, accountability, and efficiency in tax administration, digital technologies can reduce corruption and improve revenue collection. However, the effectiveness of digitalisation in combating corruption and enhancing revenue mobilisation depends on the overall governance environment and the level of institutional readiness in each specific country.

1.2. Empirical Review

In the landscape of developing countries, the intricate dynamics between corruption, resource mobilisation, and the advancing wave of digitalisation have emerged as a focal point for scholarly inquiry and policy considerations. This empirical literature review embarks on an exploration of the moderating role played by digitalisation in shaping the intricate interrelationship between corruption and resource mobilisation within these contexts. By analyzing a curated collection of empirical studies and theoretical frameworks, this review aims to provide a nuanced understanding of how digitalisation, as both a tool and a disruptor, influences the link between corruption and DRM, offering insights that hold significance for effective governance, sustainable development, and technological adaptation in the developing world.

DRM and Corruption

To begin, it is crucial to understand that measuring DRM is a complex task, and there is no direct way to measure it. Researchers commonly use proxies, with tax revenue and domestic savings being the most frequently suggested proxies (Gupta *et al.* 2017; Bhushan and Samy 2010; Culpeper and Bhushan 2010). Notwithstanding, the literature consistently indicates that corruption has a negative impact on DRM, regardless of the measure or methodology used.

Employing an Auto Regressive Distributed Lag (ARDL) approach, Abu and Staniewski (2022) assessed the impact of corruption on domestic savings in Nigeria and found that reducing corruption can increase long-term domestic savings. Similar results were observed in studies by Abu, Karim and Aziz (2013) and Swaleheen (2008) using different data and methodologies. Using tax revenue as a measure, Gauthier and Goyette (2014) also found an inverse relationship between bribery and tax payments in Uganda. Ajaz and Ahmad (2010) and other

studies also found a negative effect of corruption on tax revenue in developing countries. These findings collectively highlight the detrimental impact of corruption on DRM, whether measured through tax revenue or domestic savings.

Corruption and Digitalization

While the research in this field is relatively recent, it is steadily expanding. In a recent paper, Romero-Martinez and Garcia-Muina (2021) investigated how digitalization can act as an anti-corruption tool in Spain, revealing that greater digitalization has the potential to reduce corrupt practices. Similarly, Addo (2021) explored the control of petty corruption in Ghana's public administrations through digitalization, drawing on a 30-year case study and interviews with 91 individuals. The study found that digitalization, through changes in work practices and organizational arrangements, can effectively control corruption over time by reducing opportunities for corrupt practices.

A specific study by Setor *et al.* (2021) examined the link between digital payment transactions and corruption across 111 developing countries from 2010 to 2018. Using the Corruption Perception Index, they discovered a negative relationship between digital payments and corruption, suggesting that digital payment systems have the potential to reduce corruption by eliminating middlemen and increasing transparency in payment processes. Furthermore, digital payment methods have been shown to minimize petty corruption and information asymmetries, as payment data becomes transparent, and economic rents in billing and payments are limited (Ghosh 2017; Krolikowski 2014). This was exemplified in India's direct mobile payment system for welfare beneficiaries (Government of India 2015).

Moderating role of digitalization on the relationship between corruption and DRM

Given the paucity of studies in this regard, related studies are empirically reviewed to provide an insight into such dynamic relationships. Li *et al.* (2023) conducted an empirical investigation into the correlations between financial development and six distinct governance indicators, both individually and in combination, with inclusive growth in 48 African economies spanning 2000 to 2019. Employing Panel Quantile Regression with Fixed Effects estimations and Dumitrescu and Hurlin causality tests following rigorous econometric analysis, the study discerned that the interaction of financial development with corruption control significantly influences inclusive growth in middle-income African countries. In the broader African context and middle-income countries, the interaction of financial development with political stability, absence of violence/terrorism, and governance at large is pertinent to inclusive growth. However, for all country groupings, the interaction of financial development with voice and accountability, as well as with the rule of law, is connected to inclusive growth.

Examining 193 countries over the period 2010 to 2019, Adeleye *et al.* (2023) investigated the influence of the institutional quality index (IQI) and information and communication technology (ICT) on inclusive growth. Utilizing the panel spatial correlation consistent (PSCC-FE), instrumental variable-generalized method of moments (IV-GMM), and simultaneous quantile regressions (SQREG) models, the study assessed differential effects based on economic development levels (high-, low-, lower-middle-, and upper-middle-income countries). Notably, the IQI exhibited a consistent positive impact across all models in the full sample, while the impact of ICT varied, with mobile phones demonstrating a significant positive effect. Interaction effects were found to be contingent on the choice of ICT indicator. In sub-samples, both IQI and ICT, along with their interaction, displayed significant heterogeneous effects, consistently yielding positive outcomes (or negative interactions) in high-income countries. These findings underscore the imperative for policymakers to prioritize institutional quality and ICT to ensure that economic growth translates into improved living conditions across income groups.

In his work, Afolabi (2023) investigates how trade misinvoicing impacts DRM in Nigeria. By utilizing annual data spanning the years 1981 to 2018 and employing the Dynamic Ordinary Least Squares (DOLS) estimation method, the study conclusively demonstrates that trade misinvoicing detrimentally influences DRM. The research underscores the sensitivity of domestic resources to trade misinvoicing dynamics, as well as the significant roles played by factors such as public debt, official development assistance, trade openness, and inflation in shaping domestic resource mobilisation. Moreover, the study underscores the pressing need to address trade misinvoicing promptly to enhance Nigeria's capacity to finance developmental objectives and achieve the Sustainable Development Goals (SDGs). By bridging the gap in the comprehension of how trade misinvoicing affects DRM in the Nigerian context, this study makes a valuable contribution to the existing literature.

Oyinlola *et al.* (2020) conducted a study investigating governance's role in the relationship between resource mobilisation and inclusive growth. The research employs the Generalized Method of Moments (GMM) estimation technique to analyze this connection in 27 sub-Saharan African countries during 1995–2015. Utilizing both aggregate and disaggregated tax data, the study concludes that the persistence of inclusive growth significantly influences its current state in the region. While all dimensions of governance have a direct positive

impact on inclusive growth, neither aggregate nor disaggregated taxes exhibit a substantial effect. Interestingly, governance dimensions do not significantly enhance the link between resource mobilisation and inclusive growth. Consequently, low tax efforts and a growing governance infrastructure suggest a need for robust tax reforms and improved governance to actualize inclusive growth, prompting comprehensive institutional development and enhanced accountability mechanisms.

Adu *et al.* (2023) re-evaluate the impact of tax systems on poverty and inequality in Ghana, addressing potential asymmetries. They employ the Nonlinear Autoregressive Distributed Lag (NARDL) estimation method and analyze time-series data spanning 1983 to 2016. Results indicate asymmetric links: direct taxes influence poverty positively (negatively), while indirect and overall tax systems affect poverty adversely. Conversely, the relationship between tax systems and inequality is symmetric, with long-term positive ties observed mainly for indirect taxes. The study suggests a poverty reduction strategy involving tax reduction and emphasizes the significance of an indirect tax-based policy to address inequality in Ghana.

The empirical literature review provided above indicates that digitalisation has the potential to mitigate corruption and enhance DRM in developing nations by improving transparency, efficiency, and accountability. While the existing literature recognises corruption and DRM as crucial concerns, the interaction between digitalisation and the corruption-revenue mobilisation relationship has not been fully explored. This study aims to address this gap by examining how digitalisation moderates the connection between corruption and DRM in developing countries, offering nuanced insights into the feasibility of leveraging digital technologies to bolster revenue mobilisation despite corruption challenges. The comprehensive research design and methodology outlined in the study are poised to provide robust empirical evidence, ultimately aiding policymakers, practitioners, and scholars in understanding the role of digitalisation in these contexts and fostering effective revenue mobilisation strategies. The investigation is expected to be particularly pertinent to Africa, as it offers insights into how digitalisation could impact revenue mobilisation efforts in the presence of corruption within the developing country's specific context.

2. Methodology

2.1. Theoretical Framework

The relationship between corruption and DRM is conceptualized using the tax buoyancy[2] framework as its theoretical basis. Nonetheless, for the specific objectives of this research, adjustments and expansions are made to the original tax buoyancy model.

According to the original model, tax buoyancy measures the sensitivity of tax revenue to fluctuations in economic growth, assuming infrequent discretionary adjustments to tax rates and regulations (Osoro 1993). Consequently, when economic growth is strong, tax buoyancy is high, and tax revenues tend to increase at a faster rate. Conversely, during economic downturns, tax buoyancy may be low, and tax revenues may tend to decline. In the traditional approach for estimating the elasticity of a specific tax, denoted as "*k*", Osoro (1993) proposed a tax buoyancy model as follows:

$$TR_k = e^{\alpha_k} Y^{\delta_k} e^{\varepsilon} \tag{1}$$

where: *TR* is tax revenue, k is the type of tax revenue, Y represents economic growth (GDP), α is a constant term, δ is the buoyancy parameter, e is the base of the natural log, and ε is the error term. In this model, the tax base and tax revenue are directly linked to the growth in output/income.

However, while maintaining the original context, we propose an extension of the model to include corruption as another factor which can directly impact the generated level of tax revenue. In this study, we put forth the hypothesis that a higher level of corruption in an economy could decrease the effectiveness of the tax system, resulting in reduced tax revenue. When corruption is prevalent, individuals and businesses are more likely to evade taxes and engage in illicit activities to avoid their tax obligations. Additionally, corrupt public officials may misappropriate or fraudulently divert funds that should have been collected as taxes. Therefore, the overall result could be a decline in the generation of tax revenue.

Considering this extension, we now consider tax revenue as a function of economic growth and corruption. Furthermore, we assume that corruption negatively impacts tax revenue, implying that higher corruption is associated with low tax revenue. Mathematically, the extended model can be written as:

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[2] Tax buoyancy is among of various methods employed to gauge a country's revenue productivity or ability to mobilize domestic finance. Other measures include divisia index method, Constant Rate Structure (CRS) method, proportional adjustment method and the dummy variable method (Wawire 2017).

$$TR_k = e^{\alpha_k} Y^{\delta_k} Crr^{\beta_k} e^{\varepsilon} \tag{2}$$

where: *Crr* is the level of corruption, and β is the revenue elasticity of corruption. Taking natural logarithm on both sides of equation (2), we obtain equation (3) in its linear form:

$$lnTR_k = \alpha_k + \delta_k \ln(Y) + \beta_k \ln(Crr) + \varepsilon \tag{3}$$

In equation (3), the variables have been transformed using the natural logarithm. The term α_k represents the intercept, δ_k the coefficient for $\ln(Y)$ (the natural logarithm of GDP), and β_k represents the coefficient of $\ln(Crr)$ (the natural logarithm of the level of corruption). The variable ε stands for the error term. In this linear form, specifically, the coefficient β_k can be estimated through a regression analysis to provide valuable insight into the effect of corruption on tax revenue.

2.2 Empirical Model

Based on the extended version of the theoretical framework, the empirical model is constructed as:

$$lnTR_{it} = \alpha_0 + \gamma_1 lnCorr_{it} + \gamma_2 lnDig_{it} + \gamma_3 (lnCorr * lnDig)_{it} + \gamma_4 lnGDP_{it} + \gamma_5 lnInf_{it} + \gamma_6 lnOpn_{it} + \gamma_7 lnPop_{it} + \gamma_8 lngovtrust_{it} + \varepsilon_{it} \tag{4}$$

where: *TR* is Total revenue for country *i* at time *t*, *Crr* is the level of corruption for country *i* at time *t*, *Dig* is digitalisation level of country *i* at time *t*, *GDP* is Gross Domestic Product, measuring the growth rate for country *i* at time *t*, *Inf* is inflation for country *i* at time *t*, *Opn* is trade openness for country *i* at time *t*, *Pop* is the rate of population for country *i* at time *t*, *govtrust* represents the level of trust in governments for country *i* at time *t*. The variable α_0 is the intercept, while γ_i are the parameters to be estimated for *i*=1, 2, 3, …, 8. ε is the error term assumed to be independently and identically distributed with zero mean and constant variance.

In brief, DRM pertains to how countries raise and utilize their own financial resources, primarily through government taxation and private sector savings (Osoro 1993). This study focuses on measuring DRM using Tax Revenue (TR), which comprises compulsory charges imposed by the government, excluding fines and penalties. Corruption (Crr) is assessed through the World Bank's control of corruption (Coc) variable[3], with expectations of a negative impact on DRM due to its association with tax evasion, illicit economic activities, and potential misappropriation of funds. Digitalization (Dig) measures the adoption of Information Communication Technologies (ICT) and is expected to positively influence DRM by reducing tax compliance costs and fraud (Ndung'u 2017). Gross Domestic Product (GDP) serves as an indicator of national income and is anticipated to positively affect DRM, reflecting higher living standards, and providing a larger revenue generation market (Chelliah 1971). Inflation (Inf) serves as a proxy for macroeconomic stability, with high inflation levels negatively impacting DRM by eroding purchasing power and taxpaying capacity. Openness to Trade (Opn) measures the percentage of exports and imports in GDP, potentially positively affecting DRM by facilitating DRM. A larger population size (Pop) in a country is expected to have a positive impact on DRM, as it creates a larger tax base, increased economic activity, and a larger labor force (Bodnár and Nerlich 2022). Lastly, Trust in government (Govtrust) is crucial for revenue generation, as higher trust leads to greater compliance with tax laws, while lower trust can result in evasion and reduced revenue. Building trust between the government and citizens is essential for a healthy revenue system. A breakdown of variable sources is provided in Appendix 1.

2.3 Estimation Technique

This study used Panel Data from 2007 to 2019 to investigate how digitalization influences the connection between corruption and DRM in developing countries (see appendix 2 for countries under consideration). The study chose to use static panel data analysis instead of dynamic panel data analysis because dynamic estimation involves incorporating lagged variables, which would reduce available data points due to the unbalanced panel data in this study. This could result in less robust statistical results.

Static panel data analysis typically employs three primary estimators: Pooled Ordinary Least Squares (POLS), Random Effect Model (REM), and Fixed Effect Model (FEM). POLS assumes no relationship between explanatory variables and errors, but it overlooks individual-specific effects. FEM, on the other hand, addresses individual heterogeneity and controls for time-invariant unobservable factors that might be correlated with independent variables.

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[3] For ease of interpretation, the control of corruption scale of -2.5 to 2.5 (best) was rescaled using the formular; $Crr = 2.5 - Coc) \times 2$. This translates into a new scale of 1 – 10 (worst).

Adopting the FEM formulation, equation (4) can be restated as:

$$lnTR_{it} = \alpha_0 + \gamma_1 lnCrr_{it} + \gamma_2 lnDig_{it} + \gamma_3(lnCorr * lnDig)_{it} + \gamma_4 lnGDP_{it} + \gamma_5 lnInf_{it} + \gamma_6 lnOpn_{it} + \gamma_7 lnPop_{it} + \gamma_8 lngovtrust_{it} + \mu_{it} \quad (5)$$

where: $\mu_{it} = \vartheta_i + \varepsilon_{it}$ and; ϑ_i is the individual-specific effect?

When there is no relationship between the explanatory variables and individual-specific effects, the Fixed Effect Model (FEM) becomes inconsistent and unreliable. In such cases, the Random Effect Model (REM) becomes the most suitable and dependable estimator. REM assumes that there is no correlation at all between the explanatory variables and individual-specific effects, resulting in a covariance of zero between these variables. It is important to note that the choice between FEM and REM is determined using the Hausman test. This test hypothesizes that REM is the preferred model under the null hypothesis, while the alternative hypothesis suggests that FEM is the better model.

In situations where the model faces issues related to heteroskedasticity and serial correlation, this study will turn to the Panel-Corrected Standard Errors (PCSE) estimator. This estimator is known for its ability to handle heteroskedasticity and serial correlation problems, enhancing both the reliability and efficiency of the analysis, as demonstrated by Beck and Katz (1995). PCSE can be computed using either Ordinary Least Squares (OLS) or the Prais-Wintsen estimator.

2.4 The Moderating Effect of Digitalization on the Relationship between Corruption and DRM

The study anticipates that digitalization will play a favorable role in moderating the effect of corruption on DRM. Consequently, the coefficient (γ_3) associated with the interaction term ($lnCrr * lnDig$) is expected to be positive. Most importantly, both γ_1 and γ_3 must be statistically significant to have a conclusive outcome, otherwise the outcome becomes inconclusive. While several outcomes might emerge, it is the expected that $\gamma_1 < 0$ and $\gamma_3 > 0$. This would imply that as digitalization gains prominence, its positive influence could help mitigate the adverse repercussions of corruption on DRM. However, if the coefficient is negative, it could imply that digitalization might exacerbate the negative influence of corruption on DRM.

3. Research Results and Discussion

3.1 Descriptive Statistics

Table 1 presents a summary of the series, including results for the mean, standard deviation (St. dev), minimum (min), and maximum (max) values. The mean score for DRM, measured as tax revenue, is 2.56, with a standard deviation of 0.66. Additionally, the mean corruption score, rated on a scale of 1 (indicating least corruption) to 10 (indicating highest corruption) in developing countries, is 1.65[4]. The mean digitalisation score is established at 3.49, with a standard deviation of 0.53. In general, the standard deviation indicates varying levels of variability within the data.

Table 1. Descriptive Statistics

Variable	Obs.	Mean	Std. dev	min	max
LnTR	844	2.56	0.66	-0.36	3.98
LnCrr	845	1.65	0.41	-0.62	2.07
LnDig	845	3.49	0.53	1.75	4.54
lnGDP	845	3.08	0.22	-1.11	3.68
LnInf	845	4.36	0.24	-1.31	5.79
LnOpn	843	4.27	0.54	3.03	6.09
LnPop	845	4.14	0.13	3.87	4.46
lnGovtrust	706	0.99	0.38	0.22	1.87

Source: Authors computation

3.2 Correlation

Table 2 presents the results of the correlation matrix, illustrating the degree and potential relationships among the series. The correlation scores within the series are generally suitable for utilisation within the model and for conducting the analyses. In absolute terms, the highest correlation score was observed between lnPop and lnIct,

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[4] It is worth pointing out that without the log transformation, the mean corruption score is 5.51.

indicating a positive correlation between these variables. Conversely, the lowest correlation score was noted for lnGovtrust and lnInf, also indicating a positive association. While these results offer insights into the possible relationships among the variables, it is important to note that they have not been tested for statistical significance against any predetermined threshold.

Table 2. Correlation Matrix

	lnTr	lnCrr	lnDig	lnGDP	lnInf	lnOpn	lnPop	lnGovtrust
LnTR	1.000							
LnCrr	-0.062	1.000						
LnDig	-0.016	-0.526	1.000					
LnGDP	0.053	0.030	-0.056	1.000				
LnInf	0.091	0.014	-0.013	-0.033	1.000			
LnOpn	-0.037	-0.561	0.339	-0.033	-0.060	1.000		
LnPop	-0.138	-0.542	0.778	-0.051	-0.027	0.466	1.000	
lnGovtrust	-0.155	-0.649	0.409	-0.077	0.005	0.483	0.468	1.000

Source: Authors computation

3.3 Pre-Estimation Tests

Autocorrelation Test and Heteroskedasticity Test

The study employed the Wooldridge test to identify autocorrelation in panel data and employed the Likelihood-ratio test to evaluate the presence of heteroskedasticity. The compelling findings, as presented in Table 3, undeniably confirm that the models are indeed affected by both first-order autocorrelation and heteroscedasticity issues. This revelation significantly emphasises and reinforces the study's adoption of the PCSE estimation approach.

Table 3. Autocorrelation and Heteroskedasticity Test

Tests	Model 1 (Non-Interaction)	Model 2 (Interaction)
Autocorrelation	$F(1, 64)=167.934$ *Prob>F=0.000*	$F(1, 64)=9.126$ *Prob>F=0.004*
Heteroskedasticity	LR chi2(104)=1329.23 *Prob>chi2=0.000*	LR chi2(104)=1422.89 *Prob>chi2=0.000*

Source: Authors computation

PCSE Regression Result and Analysis

Having established that the models exhibit issues of autocorrelation and heteroscedasticity, the PCSE estimator was employed. The models were regressed with the correction for first-order autocorrelation and, as a default, the estimator is robust to heteroskedasticity. In Table 4, the PCSE regression outcomes present estimation results for two models: Model 1 (without the interaction term) and Model 2 (with the interaction term). In both cases, the variation explained by the regressors was approximately 74%, as indicated by the R-squared value. The statistical significance of parameters was assessed at the 5% level of significance. The analysis of the results will follow as outlined below:

Model 1

As expected, the primary variables of interest, Corruption and Digitalisation, exhibited a statistically significant negative and positive association with DRM, respectively. GDP, which measures market size, and trade openness also displayed the anticipated signs, although only the former was statistically significant. In contrast, population growth and trust in government deviated from the study's expectations.

The study reveals that a 1% increase in corruption diminishes the capacity of developing nations to generate domestic revenue by 0.32%, all other factors remaining constant (ceteris paribus). This finding aligns with studies conducted by Gauthier and Goyette (2014), and Ajaz and Ahmad (2010), all of which identified corruption as a hindrance to revenue mobilisation.

Table 4. PCSE Estimation results

	Model 1	Model 2
lnCrr	-0.321**	-2.412***
	(0.105)	(0.721)
lnDig	0.268***	-0.657
	(0.0569)	(0.337)
lnCrr*lnDig		0.522**
		(0.175)
lnGDP	0.169***	0.162***
	(0.0474)	(0.0468)
lnInf	0.0536	0.0440
	(0.0570)	(0.0572
lnOpn	0.0454	0.0627
	(0.0479)	(0.0480)
lnPop	-1.975***	-2.031***
	(0.425)	(0.410)
lnGovtrust	-0.163**	-0.190**
	(0.0626)	(0.0611)
_cons	9.537***	13.51***
	(1.702)	(1.929)
Obs	760	760
R-Squared	0.738	0.738
Standard errors in parentheses		
* p<0.05, ** p<0.01, *** p<0.001		

Source: Authors computation

Corruption can manifest through tax evasion, involvement in illicit economic activities that lead to tax avoidance, and potential misappropriation of funds by corrupt revenue officials. The pervasiveness of corruption in developing countries likely contributes to high revenue leakages, misallocation of resources, and weakened tax systems, which in turn impede governments' ability to generate domestic revenue. Consequently, this impediment hampers the implementation of developmental plans, leading to increased debt accumulation and overreliance on aid.

In contrast, assuming all other factors remain equal, a 1% increase in digitalisation results in a 0.27% increase in DRM in developing countries, indicating a positive impact of digitalisation on revenue mobilisation. The introduction of digital technologies in the economic system enhances processes, creates revenue opportunities, and improves efficiency by reducing tax compliance costs. Digitalisation offers efficient and automated methods for tax assessment and collection, thereby reducing opportunities for corruption as it eliminates the need for face-to-face interactions (Bird and Zolt, 2008). Data integration through digitalisation significantly enhances RM by enabling tax authorities to identify discrepancies and uncover hidden revenue sources. Implicitly, this finding aligns with the work of Adeleye *et al.* (2023).

Furthermore, a 1% increase in economic activities leads to a 0.17% increase in DRM in developing countries, assuming all other factors remain constant (ceteris paribus). This finding suggests that economic growth resulting from increased economic activities in the market reflects improved living standards and development, providing a larger market size for revenue generation (Chelliah, 1971). Unlike economic growth (GDP), both population growth and trust in government exhibit a statistically significant negative association with revenue mobilisation in developing countries.

The findings reveal that a 1% increase in population size reduces revenue mobilisation by 1.98%, assuming all other factors remain constant. This finding, although deviating from the study's initial expectation, can be explained by two plausible factors within the study's context. Firstly, developing countries may have a high dependency ratio among their population, indicating that a larger proportion of the population is outside the workforce or unemployed. If these individuals do not engage in meaningful economic activity contributing to economic expansion at a similar growth rate as the population, then tax revenue as a share of GDP may decline. Secondly, if population growth primarily involves an increase in lower-income groups, their contribution to raising revenue levels may be less compared to higher-income groups, subsequently reducing per capita tax revenue.

Similarly, a 1% increase in government trust is found to reduce DRM by 0.16% in developing countries, assuming all other factors remain constant. The study initially expected that higher levels of trust between a government and its citizens would result in greater tax compliance, leading to increased tax collection and reduced tax evasion. However, the political, economic, and social structures in developing countries can play a dominant role in revenue generation. For instance, the high level of informality in developing countries can lead to lower tax revenue regardless of government trust. Moreover, even if citizens trust the government, developing countries often lack the administrative and enforcement capacity required for effective DRM.

Model 2

In this analysis, the primary focus is on the moderating effect of digitalisation on the relationship between corruption and DRM. The results presented in Table 4 indicate that the parameters of interest, γ_1 and γ_3, enter with the expected signs (γ_1 < 0 and γ_3 > 0) and were found to be statistically significant. This discovery suggests that Digitalisation (Dig) moderates the detrimental impact of corruption on DRM in developing countries by complementing efforts to combat corruption, thereby increasing revenue collection through taxation. Consequently, a higher level of digitalisation corresponds to a greater likelihood of combating corruption and mitigating its adverse effects on DRM. This finding provides robust empirical support for studies by Bird and Zolt (2008), Máchová, Volejníková and Lněnička (2018) and Adeleye *et al.* (2023) regarding the positive influence of introducing digital technologies into the tax system.

Calculating the Net Effect

Furthermore, the moderating effect of digitalisation can be determined by computing the net or conditional effect of corruption on DRM. As previously mentioned, the coefficients γ_1 and γ_3 must be statistically significant for this evaluation. The moderator term can be assessed using three scores: mean, maximum, or minimum score, as recommended by Cohen *et al.* (2013). In line with Ofori, Osei and Alagidede (2022), this study utilises the mean score. The computation is performed using the following equation:

$$\frac{\partial lnTR}{\partial lnCrr} = \gamma_1 + \gamma_3 \overline{lnDig} = 0 \tag{6}$$

where, $\overline{lnDig}$ represents the mean digitalisation score which is 3.49.

In line with equation (6), the net effect is calculated as;

$$\frac{\partial lnTR}{\partial lnCrr} = -2.412 + (0.522 \times \overline{lnDig})$$

$$\frac{\partial lnTR}{\partial lnCrr} = -2.412 + (0.522 \times 3.49)$$

$$\frac{\partial lnTR}{\partial lnCrr} = -0.592$$

Utilising the mean digitalisation score, a negative net effect of -0.59% was determined. This result implies that introducing digital technologies at the current mean value of 3.49 to mitigate the adverse impact of corruption on DRM by 1% is expected to result in a negative net effect of approximately -0.59%. In simpler terms, the potential advantages gained from reducing corruption in the presence of digitalisation to enhance DRM are outweighed by negative consequences, which might encompass increased costs, inefficiencies, or unintended adverse outcomes.

Turning Point

However, having met the pre-conditions for digitalisation to mitigate the impact of corruption on DRM, the existence of a turning point cannot be disregarded. To address this, the point at which the impact of digitalisation dominates and becomes positive was calculated using equation (6). Although somewhat simplistic, the proposed approach involves solving for $\overline{lnDig}$ as outlined below:

$$\frac{\partial lnTR}{\partial lnCrr} = -2.412 + (0.522 \times \overline{lnDig}) = 0$$

$$\overline{lnDig} = \frac{2.412}{0.522} = \mathbf{4.621}$$

From this analysis, it can be determined that any value below the threshold means digitalisation score of 4.621 will result in a negative net effect. This implies that within that range, the interaction between corruption and digitalisation does not enhance DRM. Conversely, any mean digitalisation value above this threshold yields a positive net effect, indicating that digitalisation's influence on mitigating corruption could enhance revenue mobilisation in developing countries.

Evidence of a turning point indicates that the effect of digitalization on the relationship between corruption and DRM is not linear. The moderation of corruption's negative effect after the turning point suggests that the positive effects of digitalization on DRM might take time to manifest fully. Probably, this gradual process could be attributed to factors such as the adoption rate of digital technologies, institutional changes, and the development of a digital culture.

Comparative analysis

A comparative analysis of the moderating effect across regions is presented in Table 5. Regionally, the results indicate that two outcomes were inconclusive for the Middle East and North Africa (MENA) and South America. In contrast, outcomes for East Asia, Latin American Countries, and the Caribbean (LACandCA), Sub-Saharan Africa (SSA), and South Asia were conclusive, although only one of these outcomes did not align with the study's expectations (LACandCA). Surprisingly, despite having a positive net effect, the results revealed that the introduction of digital technologies would diminish the positive influence of corruption on DRM. This finding is entirely contrary to our initial assumption.

However, in the case of East Asia, Sub-Saharan Africa (SSA), and South Asia, digitalisation was discovered to alleviate the impact of corruption on DRM. Nevertheless, when considering the net effect, only East Asia, with its mean digitalisation score, experienced a positive net effect, reducing corruption by 0.033%. In contrast, for both SSA and South Asia, a mean digitalisation scores above 3.820 and 3.519, respectively, is required for the influence of digitalisation to effectively mitigate the adverse effects of corruption on DRM.

Table 5. Comparative analysis

Regions	Mean Digitalisation Score	γ_1	γ_3	Net effect	Turning Point
East Asia	3.745	-1.105*	0.304**	0.033	
LACandCA	3.750	4.713**	-1.220***	0.138	
MENA	3.781	4.612	-1.917**	Inconclusive	
SSA	3.815	-4.252**	1.113***	-0.006	3.820
South America	3.036	-1.637	-0.281	Inconclusive	
South Asia	3.055	-3.899***	1.108***	0.514	3.519

Source: Authors computation

Conclusions: Implications and Suggestions for Policy Actions

The empirical findings and analysis presented in this study offer valuable insights into the complex dynamics of DRM in developing countries, with a particular focus on the impact of corruption and digitalisation. These findings address a critical research gap by shedding light on the joint effect of digitalisation on the corruption-revenue mobilisation nexus, an area that has remained relatively understudied.

Firstly, it is evident from the results that corruption has a detrimental effect on DRM in developing countries. A 1% increase in corruption is associated with a 0.32% decrease in domestic revenue. This emphasises the urgent need for anti-corruption measures and reforms in these nations. Policymakers should prioritize efforts to reduce corruption through stricter enforcement of anti-corruption laws, enhancing transparency in government operations, and promoting a culture of accountability. Furthermore, measures to strengthen tax administration and reduce opportunities for corruption in tax collection processes are crucial. This may include the implementation of digital solutions for tax assessment and collection, as digitalisation has been found to have a positive impact on DRM by mitigating the adverse effect of corruption.

Secondly, the study highlights the positive influence of digitalisation on DRM. A 1% increase in digitalisation is associated with a 0.27% increase in domestic revenue. To harness the benefits of digitalisation fully, policymakers should invest in the development of digital infrastructure and technologies. This includes expanding access to the internet and promoting digital literacy among citizens and businesses. Governments should also prioritise the modernisation of tax systems by introducing digital tools for tax assessment, payment,

and reporting. These measures can help reduce tax evasion and improve tax compliance, ultimately leading to higher revenue collection.

Additionally, the study found the moderating effect of digitalisation on the relationship between corruption and DRM in developing countries to be non-linear. Understanding this non-linearity is crucial for policymakers, as it suggests that the benefits of digitalization may not be immediately apparent and could require a certain level of technological advancement. The specific digitalization score of 4.6 as the turning point implies that it's not just the presence of digital technologies but the quality and extent of digitalization that matters. Policymakers and stakeholders should focus on the depth and sophistication of digital infrastructure rather than just its mere existence. This underscores the importance of investing in comprehensive digitalization strategies.

Across regions, the moderating effect varies significantly, suggesting that policymakers should consider regional differences in their policy approaches. In regions where digitalisation has a positive moderating effect, such as East Asia, efforts should be made to accelerate digitalisation initiatives. In regions where a higher threshold of digitalisation is needed to realise positive effects, such as Sub-Saharan Africa and South Asia, policymakers should focus on building the necessary digital infrastructure and capabilities.

In conclusion, addressing corruption and promoting digitalisation are key policy actions for enhancing DRM in developing countries. By implementing anti-corruption measures and embracing digital technologies, governments can improve revenue collection, reduce economic disparities, and advance sustainable development. This study bridges a significant research gap by elucidating how these two factors interact and offers actionable insights for policymakers to navigate the complex landscape of revenue mobilisation in the digital age, ultimately contributing to the betterment of developing nations. Importantly, by examining how digitalisation moderates the association between corruption and DRM in developing countries, new and insightful revelations emerged. The study becomes the first to establish a possible turning point level on the moderating effect of digitalization on the relationship between corruption and DRM, suggesting a nonlinear relationship.

Credit Authorship Contribution Statement

Talatu Jalloh: Mr. Talatu Jalloh played a pivotal role in conceptualizing the research topic, collecting data, analyzing the methodology (including developing the theoretical framework), estimating the results, and providing a comprehensive analysis of the findings. Additionally, both Mr. Jalloh and the co-author contributed to developing the abstract and conclusion.

Emerson A. Jackson: Mr. Emerson A. Jackson significantly contributed to conceptualizing the research topic and contextualizing it by writing the research background/introduction. He also conducted a thorough review of both theoretical and empirical literature. Furthermore, both Mr. Jackson and the co-author collaborated on developing the abstract and conclusion.

Declaration of Competing Interest

The authors assert that they have no known competing financial interests or personal relationships that could have influenced the work reported in this paper.

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Appendices
Appendix 1: Summary Data description

Variable	Definition	Source	Expected sign
Tr	Tax revenue in percent of GDP	IMF, World Revenue Longitudinal data. https://data.imf.org/?sk=77413f1d-1525-450a-a23a-47aeed40fe78	
Crr	Corruption, rescaled from -2.5 (worst) to 2.5 (best), to 1(best) to 10 (worst)	World Governance Indicators, World Bank Databank. https://databank.worldbank.org/	-
Dig	ICT accessibility and integration of communication systems within the population.	UNCTAD stats, https://unctad.org/statistics	+
GDP	GDP growth (annual %)	World Development Indicators, World Bank Databank. https://databank.worldbank.org/	+
Inf	Consumer Price indices, annual	UNCTAD stats, https://unctad.org/statistics	-
Opn	Sum of exports and imports as share of GDP	World Development Indicators, World Bank Databank. https://databank.worldbank.org/	+
Pop	Population ages 15-64, (% of total population)	World Development Indicators, World Bank Databank. https://databank.worldbank.org/	+
Govtrust	Public trust in politicians measured on a scale of 1 -7(best) value	World Economic Forum, Global Competitive Index Historical dataset. https://www3.weforum.org/docs/GCR2017-2018/GCI_Dataset_2007-2017.xlsx	+

Appendix 2: List of countries

SSA	MENA	East Asia	LACandCA	South America	South Asia
Benin	Bahrain	Cambodia	Barbados	Argentina	Bangladesh
Botswana	Egypt	China	Costa Rica	Bolivia	India
Burundi	Jordan	Hong Kong SAR, China	Dominican Republic	Brazil	Nepal
Cameroon	Kuwait	Indonesia	El Salvador	Chile	Pakistan
Cote d'Ivoire	Mauritania	Malaysia	Guatemala	Colombia	
Gambia, The	Morocco	Mongolia	Honduras	Ecuador	
Ghana	Oman	Philippines	Jamaica	Paraguay	
Kenya	Qatar	Singapore	Mexico	Peru	
Lesotho	Saudi Arabia	Thailand	Nicaragua	Uruguay	
Madagascar	Tunisia	Vietnam	Panama		
Mali	United Arab Emirates				
Mauritius					
Mozambique					
Namibia					
Nigeria					
Senegal					
South Africa					
Tanzania					
Uganda					
Zambia					
Zimbabwe					

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Marketing Audit as a Tool for Assessing Business Performance

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Abstract: *The aim of this article is to determine an approach to the practical implementation of a marketing audit of business performance in a competitive environment. The aim will be achieved with the involvement of the following methods: trend, comparative and rating analyses, the BCG matrix, the Brand Health Tracking, and Delfi methods. As a result of the conducted research, an approach to conducting a marketing audit of business performance in a competitive environment with an emphasis on the use of modern digital platforms and web resources was proposed. The proposed approach to the implementation of a marketing audit of business performance in a competitive environment involved the use of the BCG matrix to determine the positions of the four leading confectionery companies of Ukraine in terms of revenue volume and growth, as well as the market share. The online presence analysis evaluated the online presence of the studied companies and to analyse other related indicators. The conducted analysis gave grounds to provide relevant recommendations. The importance of implementing each of them was determined with the help of the Delphi method. The obtained results can be applied in practice in the activities of companies in order to improve the approach to the implementation of marketing audit as a tool for assessing business performance in a competitive environment. Academic novelty is the developed comprehensive practical approach to the implementation of marketing audit as a tool for assessing business performance relative to competitors using modern digital platforms.*

Keywords: marketing audit; competitive environment; market positioning; online presence; confectionery industry; digital platform; BCG matrix; Brand Health Tracking.

JEL Classification: D4; F12; M21; M31; M42.

Introduction

The rapid development of market relations brings marketing to the forefront in the activities of any organization (Leonidou, Hultman 2019; Khan *et al.* 2022; Lim 2023). The high level of uncertainty in the modern operating environment of companies leads to the emergence of numerous risks, as well as opportunities for marketing (Krafft *et al.* 2020; Wang *et al.* 2020; De Bruyn *et al.* 2020). The range of existing opportunities and risks is expanding because of the further deepening of globalization and digital transformation processes (Morgan *et al.* 2019; Tong *et al.* 2020; Li *et al.* 2021). In such conditions, an effective marketing audit is an important area of activity for brands (Cancino 2019; Guliyev 2022). In the most general sense, marketing audit involves a comprehensive study of the marketing environment of the company's functioning and activities in order to identify problems and opportunities (Kotler *et al.* 2001). However, the concept of marketing audit has not become widely popular among companies, although they all use different methods of analysis to a certain extent. Marketing audit is an approach that is able to organize such an analysis and can be carried out by each company and individually given the variability of approaches to its implementation (Hadrian 2020; Cancino Gómez *et al.* 2021), which will allow solving existing problems and using hidden opportunities.

The key problems of implementing a marketing audit in a company are a lack of understanding of its benefits, a lack of experience and specialists in this field, a complex nature. In other words, it may take a lot of time and resources to cover all areas of marketing with an audit, as well as the lack of an established procedure. A marketing audit really cannot have a single procedure, it is individual for each company. Its complex nature is explained by the fact that the marketing audit is closely connected with other areas of the company's activity - with product and sales policy, finance, etc. Therefore, it may contain separate elements from related areas (for example, profitability analysis, etc.) depending on the researcher's views and the specific case of the audit (Santos 2020). Moreover, marketing audit can cover numerous areas within marketing itself - audit of marketing strategy, environment, consumers, competitors, etc. (Tien *et al.* 2019; Katsikeas *et al.* 2020; Varadarajan 2020). Despite this, the marketing audit has unconditional advantages, which requires a balanced approach to its procedure, the choice of methods and models, frequency, and other aspects.

So, if we consider the practical component of marketing audit, it is worth focusing on one specific direction of marketing audit within the scope of one study. The object of this study is the confectionery industry of Ukraine as one of the leading national sectors of the economy. In order to choose a specific direction or field of marketing audit, the key trends characteristic of this field in Ukraine and the world were studied. Current global trends in the confectionery market are characterized by increased competition, which is associated with a decreased growth rate of product consumption (Trade Map 2023; State Statistics Service of Ukraine 2023). There is a trend towards reducing the consumption of sugar-based products, but the behaviour of "intuitive eating" is increasingly being observed, which is characterized by the rejection of previously effective restrictions. Another trend is the tendency to buy products that are visually attractive because of the desire to display aesthetic photos on social networks. It is important to note the growth in the value of brands marked as "Made in Ukraine" - both in the national market and beyond (Food Technologies 2023). Considering the above, one of the most relevant areas of marketing audit for the confectionery industry in modern conditions is the marketing audit of business performance in a competitive environment.

The aim of the study is to determine an approach to the practical implementation of a marketing audit of business performance in a competitive environment. The aim was achieved through the fulfilment of the following research objectives:

- assess the global and national environment of the confectionery industry's operations to identify the main factors of influence at the macro level;
- determine the position of companies on the market relative to competitors based on the main performance indicators and indicators of the effectiveness in the online environment;
- evaluate the results and developed recommendations.

1. Literature Review

Most studies in the field of marketing audit focused on its theoretical aspects. Khabliuk *et al.* (2019) investigated the theoretical foundations of marketing audit, including the historical prerequisites of its emergence — from the

first definition of this category by Kotler. The researchers indicate the areas of marketing audit, the purpose, performance criteria and other basic foundations (Kotler *et al.* 2001). Analysing this work, it can be concluded that the marketing audit most often employs the methods of auditing the internal and external environment, which, in turn, contain the analysis of a number of different directions and factors. In the study of Sangkala (2023), marketing audit is understood as a mechanism aimed at collecting and analyzing information about the external and internal environment, including economic conditions, the level of market competition and business operations. So, the marketing audit is a complex process, and its directions and methods depend on the objectives of the audit.

In some studies, the concept of marketing audit is equated with the concepts of "marketing audit" or "marketing activity audit". Dealing with the theoretical foundations of marketing audit, Chmil and Verzilova (2020) provide, among other things, a broad classification of such audit methods. Depending on the object of the audit, such methods are divided into marketing analysis, marketing diagnostics, and marketing research. According to the nature of the indicators, the methods can be quantitative, qualitative, or mixed. Besides, methods of retrospective or prospective analysis can be applied, and the methods of analytical calculations, methods of economico-mathematical analysis, strategic and operational analysis are distinguished in terms of the method of assessment. The researchers see the process of marketing analysis in the following stages: definition of goals, planning, diagnostics, marketing audit itself, and the final stage. Within the marketing audit stage, researchers distinguish its component directions:

- audit of the external and internal environment;
- marketing strategy effectiveness audit;
- audit of price, product, sales policy;
- merchandising audit;
- audit of retail trade;
- branding studies;
- Internet marketing audit;
- audit of mass media in the direction of various types of advertising.

In a separate study, Verzilova (2020) supplements theoretical foundations with methodological and procedural aspects regarding the audit of marketing activities, including notes on various types of marketing audit support: technological, documentary, personnel, and informational. Besides, the researcher systematized approaches to creating marketing audit techniques. The researcher divides such approaches into accounting (according to sections of accounting of marketing activities), legal (verifications from a legal perspective), special (for groups of trading companies), and industry (taking into account the industry specifics). The study reveals the purpose of the audit according to each of the approaches, sources of information, classifier of violations, auditor's questionnaire, and list of audit procedures. The researcher noted that the purpose of audits is, first of all, finding mistakes in marketing activities. Hakimovna and Muhammedrisaevna (2022) share a similar opinion, noting that audits and auditors are responsible for determining whether the company's activities comply with current legislation, and for correcting mistakes.

Zyma *et al.* (2019) consider aspects of international marketing and marketing audit in the process of European integration. The researchers clarified the theoretical principles of marketing audit, defined its content, process, and areas - audit of marketing environment, audit of marketing strategy, audit of marketing organization. Separate directions and tools are distinguished within these spheres, in particular, product, price, distribution, communication. The stage of performance verification, which includes profitability analysis and cost effectiveness analysis, was separately noted. Berndt *et al.* (2023b) believe that marketing audit, in particular in the international environment, primarily consists of the assessment of marketing planning - on the one hand, as well as the audit of marketing strategy and marketing mix - on the other. In the context of international marketing, audits are aimed at evaluating country-specific marketing strategies and operational solutions. In a separate study, scientists (Berndt *et al.* 2023a) reveal the role of international marketing controlling as a management function aimed at achieving company goals and efficient use of resources. International marketing audit and international marketing control by results are key areas of international marketing controlling.

Some works focus on an attempt to unify the marketing audit model. Despite the differences in the possible goals of marketing audit, Hadrian (2020) develops a conceptual model of marketing audit that can be applied to any field and consists, in general, of input data, the audit process and output results - the need to correct certain marketing aspects or opportunities to retain the current state of affairs. The study noted that marketing audits were not widely used among companies, which makes it necessary to establish the reasons for

this phenomenon. Guliyev (2022) covers the main factors influencing the effectiveness and results of a marketing audit. Among other things, the researchers established the main barriers affecting the use of marketing audit.

In most works, the authors do not attempt to make the marketing audit model comprehensive and unified. Often, academics focus on specific marketing audit objectives or a specific economic sector. Thus, Mohsenipour Golmaghani *et al.* (2023) developed their marketing audit model to assess the position of fixed-line Internet providers. The results of this study are indicative, which prove that the main elements of this model are marketing operations, strategic marketing and marketing structure. In addition, the researchers established the main results from the implementation of marketing audit: branding of the organization and human resources improvement of marketing efficiency.

The works focused on the practical aspects of marketing audits, covering separate areas of auditing because a comprehensive marketing audit is so complex that it cannot be covered in a single study. For example, Chen and Yang (2019) reveal an approach to an environmental marketing audit using a model developed by researchers built on the basis of expert evaluation methods and other modern tools.

The focus of a number of studies is, as in this article, the audit and analysis of the competitive environment. Ghauri *et al.* (2021) study the global business environment. The researchers examine global trends in this field over the past 30 years and describe the current situation. The researchers singled out four main trends that have the greatest impact on competition at the international level. Many works reveal the importance of achieving competitive advantages in the online sphere. Tolstoy *et al.* (2022) reveal the indirect impact of online marketing opportunities on the international effectiveness of small and medium sized companies operating in e-commerce. Among other things, the researchers measure how companies compare to their competitors in terms of individual online marketing capabilities in the international market.

The complex nature of the marketing audit explains the fact that most studies focus on its separate areas or directions, because it is actually impossible and impractical to cover all directions in one study. In the current conditions, when it is necessary to act as soon as possible, it is better to focus on the most urgent or priority problems, and it is advisable to carry out a comprehensive analysis without a justified need only according to a pre-agreed plan with a certain frequency. It is also worth noting that the transfer of business processes to the online environment and new technologies automates part of the marketing audit process. So, an important theoretical task is to determine the priority areas of marketing audit for a specific company in specific conditions and study the possibilities of using technologies for processing part of the activities. The conducted literature review gives grounds to conclude that the majority of studies are theoretical, defining the procedure, stages of marketing audit and other aspects, so practical application of its tools is worth studying.

2. Methodology

Research Design

The research design consists of a preparatory stage and the marketing audit of business performance in a competitive environment. The preparatory stage involves the assessment of global trends and national trends in the confectionery industry and is aimed at obtaining a general understanding of the macro-environment of the companies. The preparatory stage provided for a study of trends in the volume of product sales on the national market, as well as a study of export trends in the world, and a study of key partners-importers of products.

In turn, the stage of implementing a practical approach to conducting a marketing audit of business performance in a competitive environment, contains several consistent and related elements (Figure 1).

Figure 1. Marketing audit of business performance in a competitive environment using modern analytical platforms
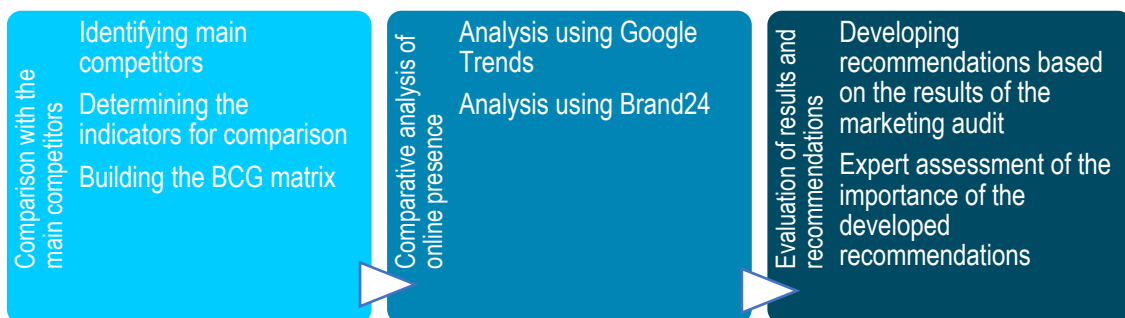
Sample

The sample of countries for the evaluation of global trends in the confectionery industry consists of the states that, according to Trade Map (2023), are among the top ten export leaders in each of the key categories of confectionery products, as well as Ukraine and the countries closest to it in terms of export volumes.

The objects for a marketing audit of business performance in a competitive environment are the companies included in the top-5 ranking of confectionery manufacturers of Ukraine:

- Roshen Kyiv Confectionery Factory, Private Joint-Stock Company;
- Konti Production Association, Private Joint-Stock Company;
- Kharkiv Biscuit Factory, Private Joint Stock Company;
- Zhytomyr Lasoshchi, Closed Joint Stock Company.

The confectionery industry was chosen as one of Ukraine's priority industries with significant export potential.

The sample of experts for the expert survey consists of specialists in the field of marketing, 16 of whom are representatives from Ukraine, 4 are foreign specialists. All are practicing specialists with at least 5 years of experience in the field of marketing. The survey was conducted using an online questionnaire on 07/27/2023 from 10:00 a.m. to 6:00 p.m.

Methods

The trend analysis is the key method used in the research to analyse the sales volumes of the industry's products in terms of main components as a key indicator that determines the size of the market, the companies' competitiveness, development trends, and the impact on the economy. Besides, comparative and rating analyses were used in the article to study absolute and relative indicators of the export of pastrycooks' products by countries; analysis using the BCG matrix to position the studied companies by net income, relative market share, and income growth rate; the Brand Health Tracking method for analysing the online presence of the studied companies. The recommendations were provided based on the results of the research, the importance of which was assessed by experts using the Delphi method. The essence of the survey according to this method consisted of the assessment by experts of the importance of each of the provided recommendations based on the results of the conducted research and further analysis of the results.

Instruments

The study employed the following instruments: the Trade Map platform to determine the export leaders in the industry, as well as Ukraine's neighbouring countries by export volume. In addition, the platform was used to identify the main importing countries of Ukrainian confectionery products. The Google Trends (2023) tool was used in the study of aspects of the online presence of companies in order to determine the number of inquiries by companies. The Brand24 application was used to implement the Brand Health Tracking method for the studied companies and compare them with each other. The MS Excel software environment was used to build the BCG matrix and other graphic materials.

Information Background

The information background of the study was made up of data on the sales volumes of the confectionery industry posted in open access on the official website of the State Statistics Service of Ukraine (2023), financial reporting data of the studied companies from the Clarity Project (2023) resource, data on exports by country from the Trade Map resource, as well as information on the level of online presence obtained through Google Trends (2023) and Brand24.

Table 1 provides information that were used to build the BCG matrix and taken from the Clarity Project (2023) resource.

Table 1. Initial data for building the BCG matrix

Company	2021	2022	Growth rate	Relative market share
Roshen Kyiv Confectionery Factory, Private Joint-Stock Company	979,286	903,195	0.92	0.24
Konti, Production Association, Private Joint-Stock Company	1,241,942	642,543	0.52	0.17
Kharkiv Biscuit Factory, Private Joint Stock Company	2,100,397	1,772,223	0.84	0.48
Zhytomyr Lasoshchi, Closed Joint Stock Company	249,536	406,025	1.63	0.11

Source: created by the author based on Clarity Project (2023)

Research Limitations

This study has its limitations, in particular, it could have been supplemented with data on AVK confectionery factory, which ranks second among confectionery manufacturers in Ukraine, but information on the company's net income for the studied periods is missing.

Besides, the Google Trends (2023) and Brand24 tools, which provide the most general information about the brand, have limitations, but other SEO tools and the study of different variations of search queries should supplement their use.

3. Results

An Overview of the Global Environment and National Trends

The main trends of Ukraine's national confectionery market were identified by studying the trend of the volume of sold products. Figure 2 shows the trend of this indicator across the main categories of goods.

Figure 2. Growth rates of confectionery sales in Ukraine by main categories
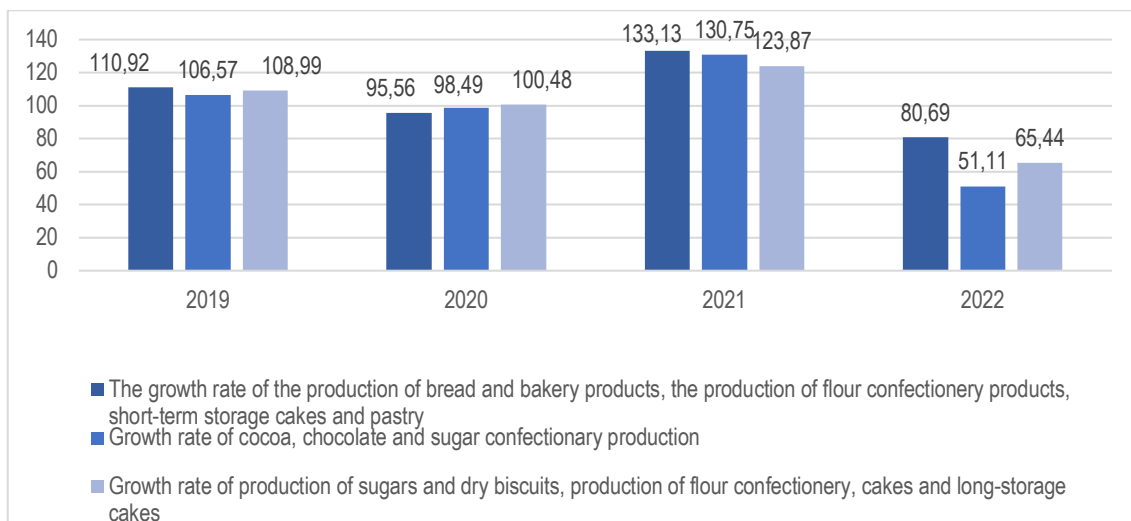
Source: State Statistics Service of Ukraine (2023)

Figure 2 shows that the largest volume of sales for all categories of goods was characteristic of 2021, which was followed by a significant decrease in 2022 most likely associated with a large-scale invasion of the territory of Ukraine. The reduction is particularly noticeable because of a significant decrease in the growth rates of sales of products, and, accordingly, their consumption. Such trends force companies to look for new methods and techniques of competitive struggle, as well as to make the most of the opportunities to spread to the international market. Table 2 shows the main exporters of pastrycooks' products by the main types of products: sugar and sugar products, cocoa and its products, as well as finished products from cereals, flour, starch or milk, confectionery products.

As Table 2 shows, Ukraine ranks quite high in the rankings for the export of various types of confectionery products. A particularly significant share of exports is sugar and sugar products: Ukraine ranks 32nd among countries, and its share in world exports reaches 0.5%. This category of goods is characterized by positive values of the trade balance, an increase in 2022 by 22% compared to 2021, and a slight decrease in 2022 compared to 2018 by 4%. Cocoa and cocoa products are characterized by a decline, both in terms of trade balance and growth rates. A positive trade balance was noted for finished products from cereals, flour, starch or milk, confectionery, as well as some growth in 2022 compared to 2018 (3%), and a significant decrease in growth when comparing the results of 2022 with 2021 (-39%).

The next step in the assessment is the analysis of the countries to which Ukraine exports. This is implemented with the help of special charts, which can be obtained through the use of the Trade Map platform (Trade Map 2023) (Figures 3-5). So, the largest trading partners of Ukraine to which it exports sugar and sugar products are: China, Italy, Germany, Saudi Arabia. For the category "cocoa and cocoa products": USA, Germany, Poland. For the category "products from cereals, flour, starch or milk; pastrycooks' products": USA, Germany, Great Britain.

Table 2. Export of sugar and sugar confectionery in 2022 by countries

	Country	Value exported in 2022 (USD thousand)	Trade balance in 2022 (USD thousand)	Annual growth in value between 2018-2022 (%)	Annual growth in value between 2021-2022 (%)	Share in world exports (%)	Average distance of importing countries (km)	Concentration of importing countries
				Sugars and sugar confectionery				
	World	56,613,565	-4,472,546	9	18	100	4,734	0.03
1	Brazil	11,240,382	11,129,824	17	20	19.9	10,726	0.05
2	India	6,327,113	5,945,891	51	47	11.2	3,732	0.06
3	Thailand	3,733,240	3,362,043	0	87	6.6	2,812	0.12
4	Germany	3,479,275	1,562,116	9	7	6.1	2,53	0.06
5	China	2,564,947	-1,069,614	7	33	4.5	6,145	0.05
	…	…	…	…	…	…	…	…
29	Malaysia	341,529	-756,454	16	7	0.6	2,676	0.12
30	Slovakia	322,542	181,65	9	19	0.6	874	0.09
31	El Salvador	312,808	271,138	8	-1	0.6	5,43	0.19
32	Ukraine	301,401	231,234	-4	22	0,5	1,546	0.08
33	Colombia	268,567	8,711	-12	-46	0.5	4,28	0.13
34	Pakistan	255,09	192,059	-19	66	0.5	6,806	0.13
35	Saudi Arabia	250,927	-678,552	24	46	0.4	1,988	0.2
				Cocoa and cocoa preparations				
	World	54,398,792	-417,921	4	-2	100	3,5	0.04
1	Germany	6,554,864	1,677,438	2	-2	12	1,764	0.05
2	Netherlands	5,303,376	1,062,868	1	-8	9.7	1,806	0.09
3	Côte d'Ivoire	4,959,539	4,952,315	4	-17	9.1	6,572	0.11
4	Belgium	4,080,522	1,212,807	3	-7	7.5	1,981	0.11
5	Italy	2,756,099	1,146,753	7	8	5.1	3,082	0.06
	…	…	…	…	…	…	…	…
39	Estonia	164,458	-23,313	1	6	0.3	816	0.42
40	India	154,23	-306,773	-6	-3	0.3	6,402	0.07
41	Romania	149,799	-293,647	10	4	0.3	1,097	0.13
42	Ukraine	147,485	-98,908	-5	-34	0.3	1,732	0.05
43	Hong Kong, China	139,674	-162,96	-9	-19	0.3	1,619	0.38
44	Serbia	118,807	-51,404	12	39	0.2	684	0.09
45	Colombia	116,308	38,223	3	-7	0.2	4,034	0.12
				Preparations of cereals, flour, starch or milk; pastrycooks' products				
	World	96,868,980	145,551	6	12	100	3,034	0.04
1	Germany	8,842,138	3,221,282	5	11	9.1	1,583	0.06

|	Country	Value exported in 2022 (USD thousand)	Trade balance in 2022 (USD thousand)	Annual growth in value between 2018-2022 (%)	Annual growth in value between 2021-2022 (%)	Share in world exports (%)	Average distance of importing countries (km)	Concentration of importing countries
2	Italy	8,787,542	6,557,567	11	18	9.1	3,108	0.07
3	Netherlands	7,009,983	3,598,132	5	14	7.2	4,307	0.14
4	Canada	6,210,486	2,172,165	13	24	6.4	1,463	0.92
5	France	6,062,161	1,133,391	5	9	6.3	2,684	0.06
…	…	…	…	…	…	…	…	…
44	Croatia	266,02	-164,368	12	3	0.3	939	0.09
45	Philippines	257,358	-438,21	0	4	0.3	7,052	0.07
46	Egypt	256,842	81,637	11	7	0.3	2,675	0.06
47	Ukraine	253,048	6,957	3	-39	0.3	1,781	0.06
48	Peru	250,23	79,602	14	10	0.3	2,62	0.11
49	El Salvador	192,006	160	6	11	0.2	751	0.29
50	Latvia	177,924	-28,164	13	20	0.2	1,081	0.19

Source: Trade Map (2023)

So, the assessment of global and national trends revealed that Ukraine's confectionery industry has broad prospects both within Ukraine and in the world. The reduction in sales of products and the negative values of trade balances and export growth rates by some types of products are most likely related to geopolitical problems, in particular, to the large-scale invasion of Ukraine, but the industry's prospects remain high. Some reduction in the consumption of sugar products can be compensated for by revising the product range, for example, increasing the share of snacks without added sugar, etc.

Figure 3. Ukraine's export of sugar and sugar confectionery in 2022 by countries
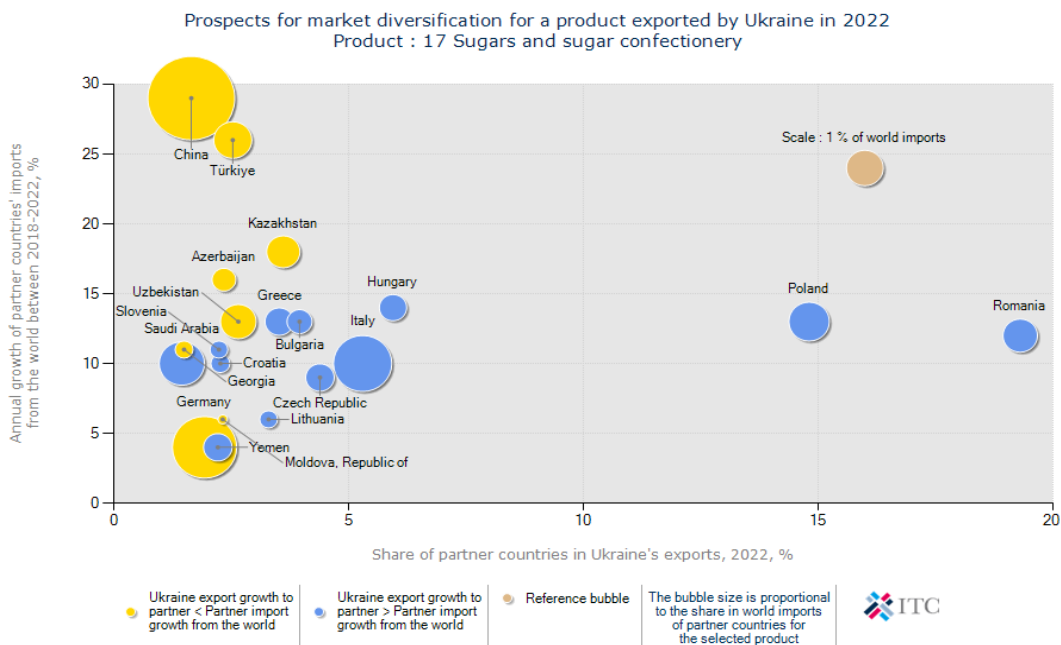
The conducted assessment of the global and national environments of confectionery companies is a necessary background for understanding the key trends of the studied industry at the macro level. It provides

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additional information for providing recommendations based on a marketing audit of business performance in a competitive environment.
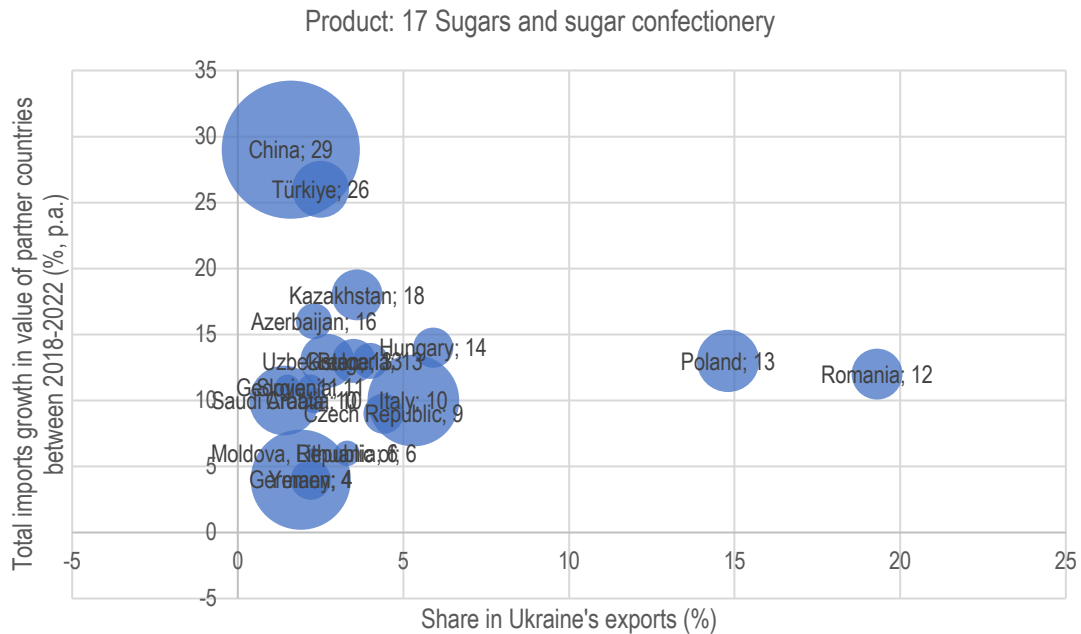
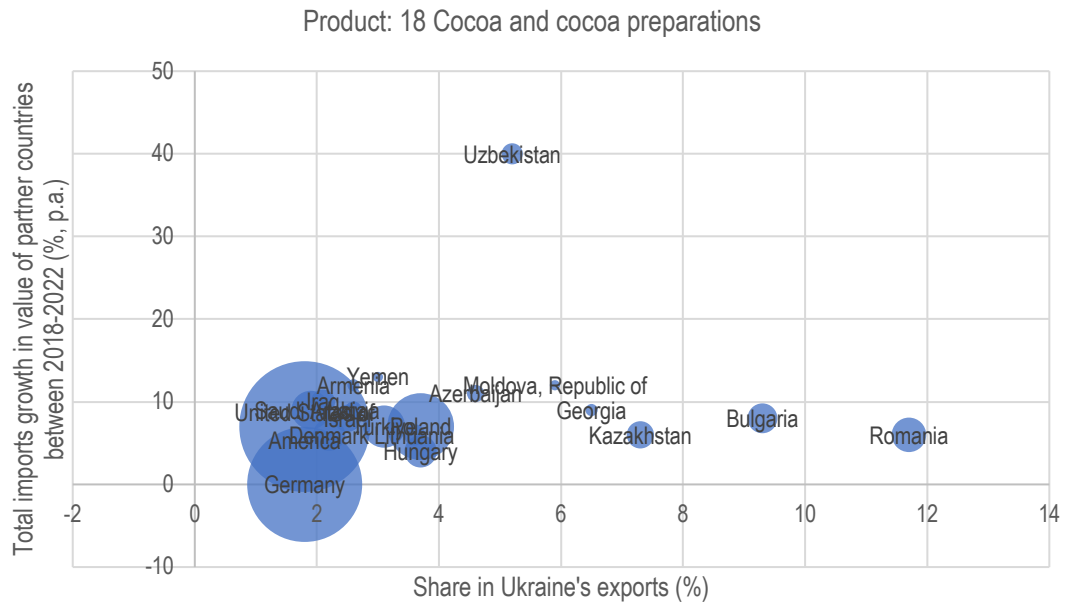Product: 17 Sugars and sugar confectionery

Note: The bubble size is proportional to the share of partner countries in world imports (%)
Source: Trade Map (2023)

Figure 4. Ukraine's export of cocoa and cocoa products in 2022 by countries
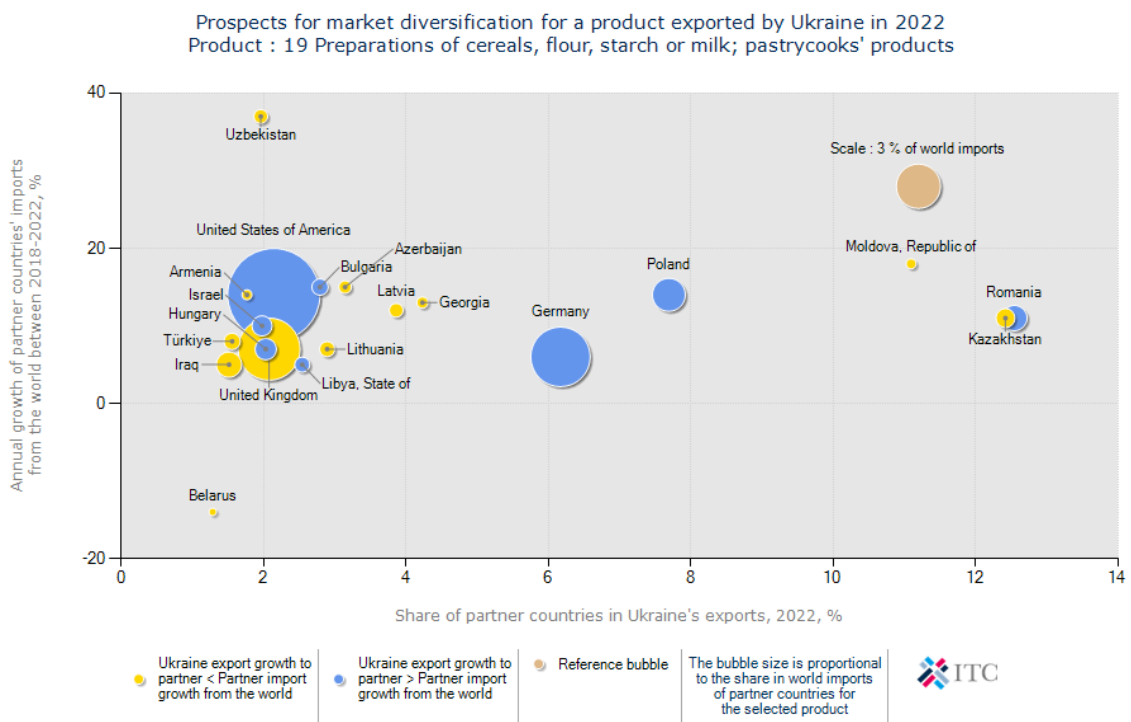
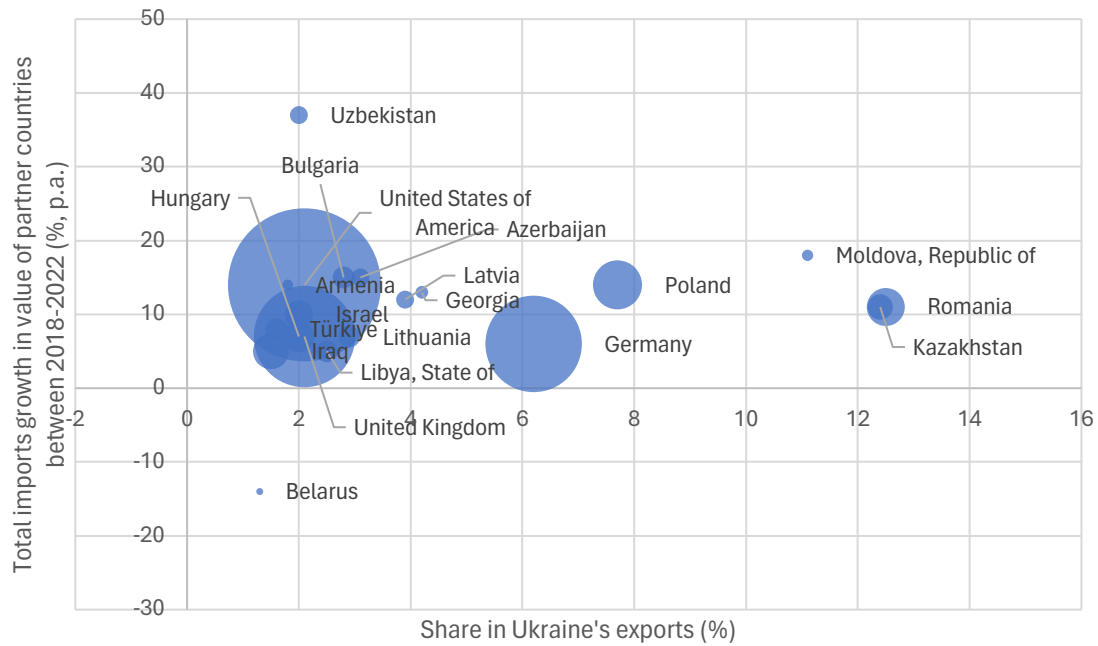Product: 18 Cocoa and cocoa preparations
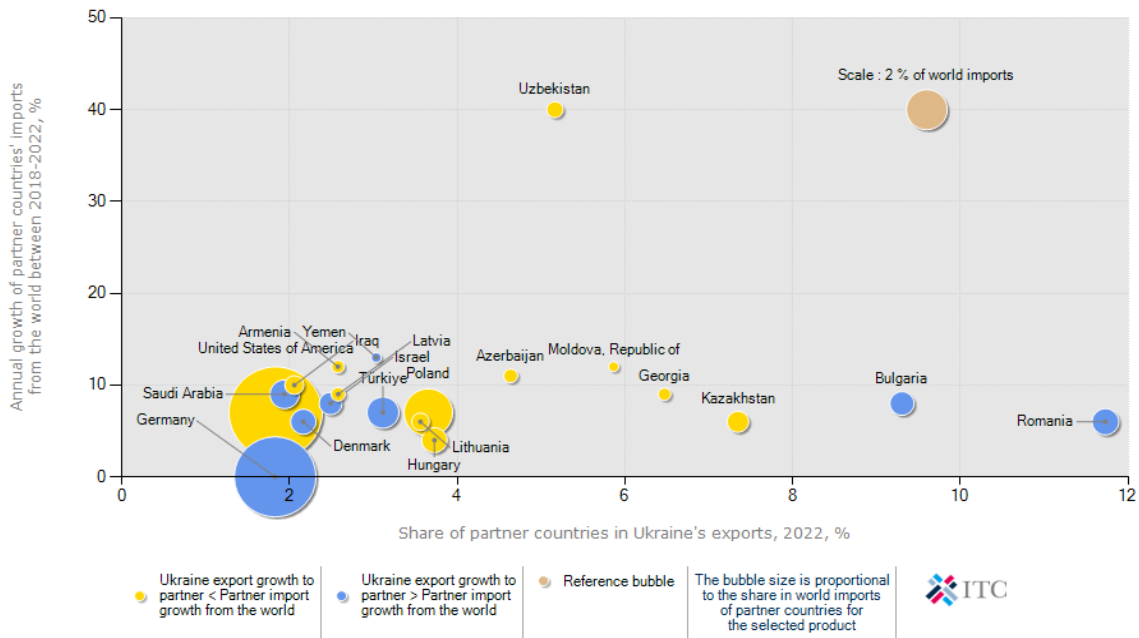
Note: The bubble size is proportional to the share of partner countries in world imports (%)
Source: Trade Map (2023)

Figure 5. Export of products from cereals, flour, starch or milk; of pastrycooks' products in Ukraine in 2022 by countries

Product: 19 Preparations of cereals, flour, starch or milk; pastrycooks' products
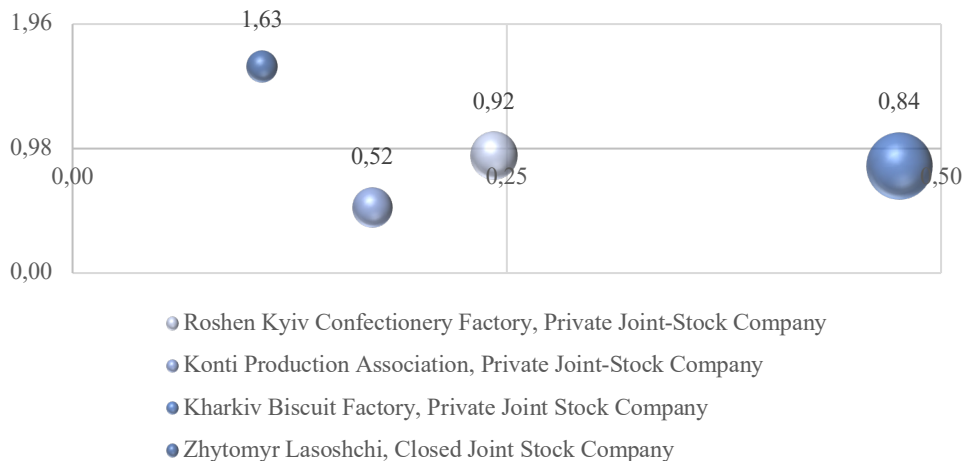

Note: The bubble size is proportional to the share of partner countries in world imports (%)
Source: Trade Map (2023)

Marketing Audit of Business Performance in a Competitive Environment

The comparison with the main competitors was made using the BCG matrix, which was slightly modified to compare individual companies instead of comparing the products of one company against one competitor. For this purpose, the maximum values on the axes are defined as the weighted average values of the growth rate of net income and relative market share, multiplied by two. Figure 6 shows the obtained result.

Figure 6. BCG matrix for comparing the studied companies based on the volume of net income, its growth rate, and market share relative to competitors

- Roshen Kyiv Confectionery Factory, Private Joint-Stock Company
- Konti Production Association, Private Joint-Stock Company
- Kharkiv Biscuit Factory, Private Joint Stock Company
- Zhytomyr Lasoshchi, Closed Joint Stock Company

Source: built by the author based on Clarity Project (2023)

As Figure 6 shows, the companies found themselves in different quadrants of the BCG matrix. According to the methodology, the following names and corresponding strategies are assigned to the quadrants:
- the upper right quadrant - Stars (high growth rates and market share; strategy - development);

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▪ upper left quadrant - Question marks or Problem children (characteristic rapid development, growth rates, but the market share is small; strategy - investment);

▪ lower left quadrant - Dogs (low growth rates and market share; strategy - disinvestment or cost management);

▪ lower right quadrant - Cash cows (objects-leaders in terms of market share, but with low growth rates; strategy - support).

So, Zhytomyr Lasoshchi, CJSC got into the "Stars" quadrant, Kharkiv Biscuit Factory, PJSC - into the Cash cows quadrant, PJSC "Production Association "Conti" - into the "Dogs" quadrant, and Konti Production Association, PJSC is actually at the intersection of all quadrants. Marketing strategies are determined according to the areas of the matrix in which companies fall.

Along with the study of net income and market share, it is important to describe the profitability indicators of the selected companies during the assessment of business performance.

Figure 7. Profitability of companies
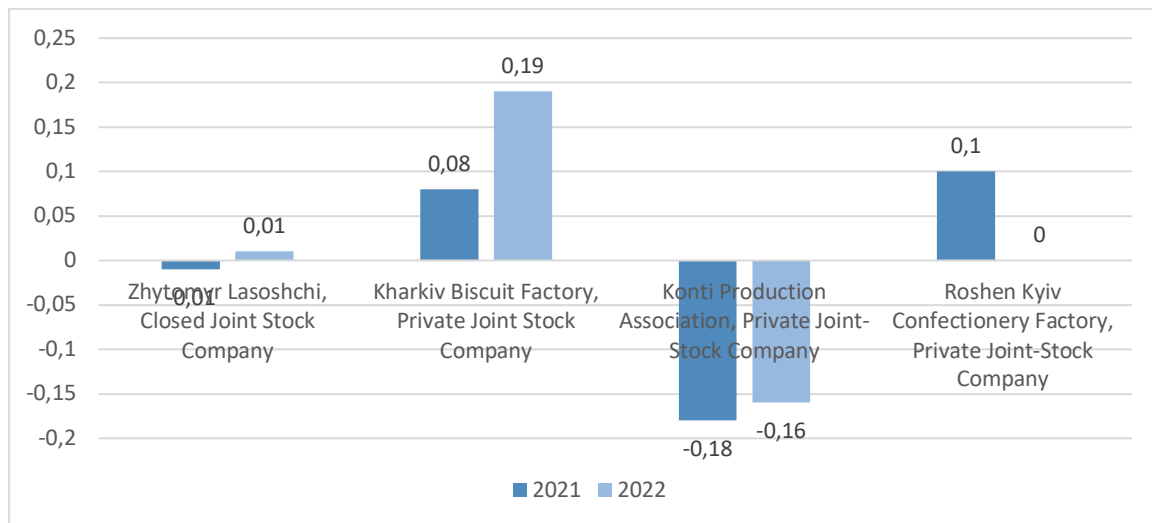
Source: built by the author based on Clarity Project (2023)

As can be summarized from the data presented in Figure 7, Zhytomyr Lasoshchi, CJSC and Kharkiv Biscuit Factory, PJSC made a profit as of the end of 2022 and increased their profitability. The activity of Konti Production Association, PJSC and Roshen Kyiv Confectionery Factory, PJSC was unprofitable.

An important area of marketing audit of business performance in a competitive environment in the current conditions is the analysis of online presence. An analysis of the number of queries in Google Trends was used for this purpose (Figure 8). The analysis was not carried out for a specific enterprise owned by the company but for the brand as a whole.

Figure 8. Analysis by the number of queries in Google Trends
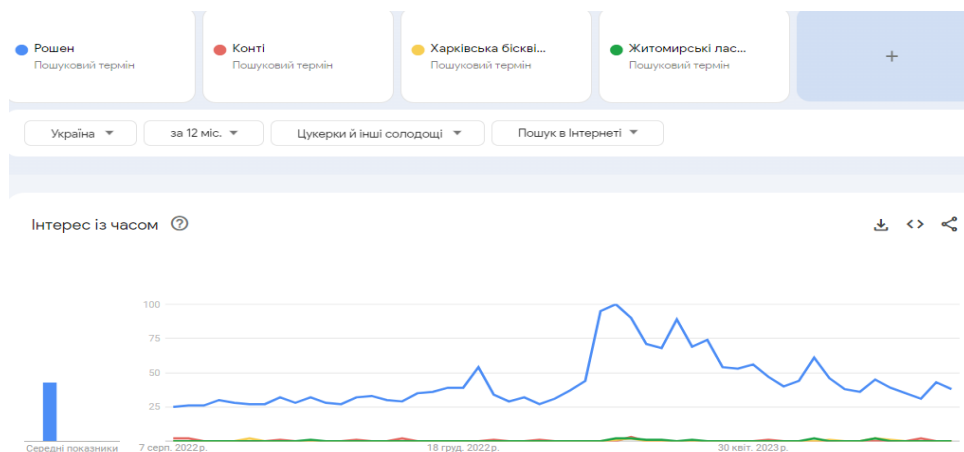
Source: Google Trends (2023)

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Figure 8 shows that Roshen is the absolute leader according to the conducted analysis. Therefore, the largest number of consumers are interested in this company's products. Moreover, this analysis determines periods when interest in the company is the highest - for example, on the eve of holidays. In such periods, it is appropriate to implement additional marketing solutions.

It is possible to obtain a more detailed testimony about the state of the online presence of companies using modern applications that allow tracking of the main indicators of the brand in the online environment. The Brand24 application was applied to determine individual indicators using the Brand Health Tracking method (Table 3).

Table 3. Indicators of the online presence of the studied brands

Company	Assessment of online presence	Mentions in general	Positive mentions	Negative mentions	Source (% of mentions)						
					Web	TikTok	Videos	News	Blogs	Forums	Twitter
Zhytomyr Lasoshchi	4	11	2	-	100	-	-	-	-	-	-
Kharkiv Biscuit Factory	3	5	-	-	60	-	-	40	-	-	-
Konti	13	23	-	1	73.9	-	8.7	8.7	8.7	-	-
Roshen	20	131	21	9	19.1	39.7	16.8	14.5	5.3	3.1	1.5

Source: Brand24 (2023)

The proposed methodology reveals the stages of a marketing audit of business performance in a competitive environment in such areas as comparing market position relative to major competitors and comparing online presence indicators. This will enable companies to quickly understand the main trends and problems existing in the industry and their activities, and to develop operational marketing solutions by deepening the analysis of the identified problematic aspects.

Evaluation of Results and Development of Recommendations

The final stage of a marketing audit of business performance in a competitive environment before the introduction of innovations is the evaluation of results and the development of recommendations. For this purpose, it is proposed to apply the Delphi method to collect and process expert opinions regarding the feasibility of introducing certain recommendations that can be proposed based on the results of a marketing audit of business performance in a competitive environment. The results are shown in Table 4, where recommendations (column 2) were provided in response to the problems identified during the analysis (column 1) and evaluated by experts on a 5-point scale. The table shows the number of experts who rated each question with the appropriate number of points.

Table 4, where, in addition to the main data, the mode of the experts' assessment for each question and the mode is indicated, the majority of experts attach great importance to almost all recommendations. A mode (that is, what score was given to each recommendation most often) below four was determined only for recommendations related to collaboration with influential personalities and interaction with bloggers. The experts rated the recommendations for the presentation of the success story, emotional/social marketing, promotions and discounts, advertising campaigns, cooperation with chefs and experts in the industry, video content, reviews somewhat higher (the mode is 4).

Table 4. Results of the survey of the expert group

Trend (problem/opportunity)	Recommendation	The importance of implementation					Mean	Mode
		1	2	3	4	5		
Global environment								
Growth in exports of industry leaders and nearest competitor countries. Reduction of exports of the nearest countries in the ranking. Export growth of the countries closest in the ranking. Reduction in the growth rate of exports to the partner country compared to imports from other countries. The increase in the growth rate of exports to the partner country compared to imports from other countries.	Improving the brand and positioning				5	15	4.75	5
	Strengthening the online presence			2	2	16	4.70	5
	Partnership with retail chains		1		4	15	4.65	5
	Adaptation of products to local requirements or tastes		1		6	13	4.55	5
	Feedback enhancement			1	6	13	4.60	5
	Presentation of the success story	2	3	5	7	3	3.30	4
	Consumer analysis				4	16	4.80	5
	Audience segmentation			2	1	17	4.75	5
	Marketing communication			1	1	18	4.85	5
	Analysis of competitors			2	1	17	4.75	5
National environment								
Reduction of consumption in the national market because of the departure of the population from the country in connection with military operations. Reduction of consumption in the national market due to the desire to reduce sugar consumption. Reduction of consumption in the national market because of limited financial opportunities caused by military operations. Increasing value of brands marked "Made in Ukraine". Propensity to buy visually attractive products. "Intuitive eating" behaviour.	International market entry			4	3	13	4.45	5
	Personalized approaches		3		3	14	4.40	5
	Consumer analysis				4	16	4.80	5
	Audience segmentation		2	3	6	9	4.10	5
	Cooperation with influential personalities	1	3	8	3	3	2.90	3
	Cooperation with humanitarian organizations			1	3	16	4.75	5
	Strategy adaptation to wartime			4	6	10	4.30	5
	Creating projects for recovery, raising funds for defence, etc.			2	4	14	4.60	5
	Emotional/social marketing	1	2	3	9	5	3.75	4
Competitive position								
Greater volume of net income compared to competitors Greater growth rate of net income compared to competitors Smaller market share relative to competitors	Product uniqueness	1		4	5	10	4.15	5
	Pricing strategy		1	2	2	15	4.55	5
	Partnership with retail chains	1		2	4	13	4.40	5
	Promotions and discounts	1	4		13	2	3.55	4
	Advertising campaigns	1	3	1	11	4	3.70	4
	Collaboration with chefs and industry experts	2	1	4	11	2	3.50	4
	Focus on quality				2	18	4.90	5

Trend (problem/opportunity)	Recommendation	The importance of implementation					Mean	Mode
		1	2	3	4	5		
Online presence								
High overall score for online presence A large number of mentions compared to competitors Positive reviews Negative reviews	Digital strategy	1	1	3	5	10	4.10	5
	Updating the website	1	1	2	6	10	4.15	5
	Social networks	2		3	4	11	4.10	5
	Video content	1	1		12	6	4.05	4
	Online advertising		1	2	6	11	4.35	5
	E-commerce		1		3	16	4.70	5
	Interaction with bloggers	4	5	7	3	1	2.60	3
	Reviews	2		4	8	6	3.80	4

Source: developed by the author

All other recommendations received the highest scores, and therefore it is advisable to take them into account in the course of further development of the marketing plan/strategy.

4. Discussion

The approach proposed in the article to the implementation of a marketing audit of business performance in a competitive environment is used to determine the company's position relative to key competitors, as well as in the online space. Recommendations made based on the results of the analysis and evaluated by experts according to the level of importance can be used to improve the marketing strategy in order to improve the competitive position.

Frequency of marketing audit is an actual problem for academic discussions. Khabluk *et al.* (2019) note that a marketing audit should be conducted recurrently, however, there are cases when there is a need to conduct it. For example, if there are problems with the sale of products, the need to adjust the volume of production, a lack or, on the contrary, an excess of information about the market, etc. It is worth agreeing with the views of researchers regarding the need to conduct recurrent marketing audits. Not only their frequency is important in this process, but also the selection of the most effective and efficient models that will contribute to the achievement of the goals of marketing audits in different areas of activity and those that may have different recurrency. For example, Hakimovna and Muhammedrisaevna (2022) note that a retail marketing audit can use daily data to determine which brands are contributing to the promotion of the product category as a whole, how the product range is changing, what corrections the pricing policy needs, etc. According to the results obtained in the author's article, it is also possible to propose a different frequency of conducting marketing audit depending on the field (Kryshtanovych *et al.* 2021). So, according to all areas of marketing audit of business performance in a competitive environment determined in the article, in addition to the analysis of online presence, the frequency of the audit may be once a year or once a quarter — simultaneously with the receipt of data from annual/quarterly reports and calculations. Analysis of the online presence should be carried out more often — especially when introducing new marketing solutions, releasing new products, releasing new products of competitors, etc.

In addition to frequency, there are differences in determining the goals of a marketing audit. In her studies, Verzilova (2020), Chmil and Verzilova (2020), the audit of marketing activities is considered as a process conducted by the auditor in order to find mistakes and determine the correctness of displaying marketing information or conducting marketing activities. This understanding of marketing audit is slightly different from the one used in the author's article and is not aimed at finding mistakes, but rather at studying the current state and identifying opportunities for its improvement. Zyma *et al.* (2019) note that a marketing audit identifies problems with the functioning of the marketing system, which lead to a decreased efficiency, as well as significantly save financial, human and time resources by adjusting the marketing strategy. It is worth agreeing with the definition of the goals of the marketing audit in this work — the marketing audit should really be aimed at finding possible problems and their solutions. In practice, the goals are usually narrow-er. In contrast to the mentioned studies, the purpose of the marketing audit in the author's study is more specific and concerns the aspects of conducting a marketing audit of business performance in a competitive environment.

The process of marketing audit also differs in the studies of different authors. The difference in goals, areas and other aspects of marketing audit logically explains this. However, some researchers are attempting to build a unified model of marketing audit. Hadrian (2020) developed a conceptual model of marketing audit, which contains input (organizational orientation, marketing strategy, level of marketing excellence, tactical, and operational marketing control), process (subjects, goals, research tasks, information resources, procedures) and output (repetition of elements of marketing orientation, confirmation or modification of marketing strategy, confirmation or modification of the level of marketing excellence, changes in operational activity and/or control process). This approach can be used to formalize the marketing audit process, but in practice the process will have significant differences (Bondarenko *et al.* 2018). For example, in the author's article, the marketing audit process is less formalized and covers one specific goal and area (competitive environment). This approach enables focusing on aspects of the problem that are closest to practice, as well as to develop effective recommendations by deep immersion in one specific area of research.

Some studies deal with determining the reasons why all companies do not use marketing audits without exception, although they have a number of unconditional advantages. Guliyev (2022) identifies the following barriers affecting the use of marketing audit: reluctance of companies to implement changes, reluctance to transfer information to a third party, ignoring marketing audit and not recognizing its positive results, lack of experience in implementing marketing audit, lack of qualified specialists in the field of audit, lack of financial resources for marketing audit, fear of audit results. However, such factors rather relate to a more formal marketing audit with the involvement of a third party (Gryshchenko *et al.* 2022). Anyway, any company implements at least several aspects of marketing audit in its activities, if this process is considered more broadly — from determining the number of views of the company's posts in social networks to analysing profit and cost effectiveness. Therefore, marketing audit is an integral activity of modern companies, and its formalization and optimization of the models used in the process can only increase the efficiency of activities (Bazaluk *et al.* 2020). The approach to marketing audit proposed in this article is less formal and more flexible, which can contribute to increasing the interest of businesses in its use in cases where the management has neither the desire nor the ability to conduct a full marketing audit with the involvement of a third party.

Ghauri *et al.* (2021) identifies four main trends that have a major impact on the global competitive business environment. These include: the rise of populism and economic nationalism, sustainable development and climate change, new digital technologies, and changes in power relations. Projecting these trends on the results of the analysis conducted in the author's article, it is possible to confirm the significant impact of each of them on the studied industry and the field of marketing. The reduction in the sale of confectionery products in Ukraine is directly related to changes in power relations, namely, the military invasion of Ukraine's territory, which caused the emigration of the population. New digital technologies are related to the level of online presence of companies, which depends on the effectiveness of their marketing on the Internet, etc.

Tolstoy *et al.* (2022) study online marketing opportunities, distinguishing the following areas of comparison of the company with competitors: search engine optimization, identification of business opportunities related to e-commerce, analysis of customer data, improvement of user experience on the website, adaptation to trends, etc. related to e-commerce, development of employee skills. Unlike this work, the author's study covers a wider list of recommendations in this area. The presence in social networks is a particularly important area that needs to be singled out in the context of online marketing.

At the current stage of the operation of companies, marketing audit can be aimed not only at improving profitability indicators, increasing market share, etc., but also at more effective implementation of aspects of sustainable development, ecological ways of doing business. Chen and Yang (2019) focus their study on determining the criteria of an environmental marketing audit, which, according to researchers, is an effective tool for measuring the achievement of environmental marketing goals. This direction was not considered in the author's article; however, it will be appropriate to compare the environmental indicators of a separate company and its main competitors as part of the audit of the competitive environment as a direction for further research.

Conclusions

Marketing is a key tool for maintaining the appropriate level of competitiveness of companies in the current conditions, which is characterized by increased competition both on the national and international markets, a reduced demand caused by various geopolitical, economic, social and other factors, an increased importance of Internet communications and e-commerce With the intensification of the globalization and digitalization processes, the number of directions and objects of marketing is increasing, which makes it necessary to conduct an audit of marketing activities.

The analysis carried out in the study gives grounds to state that the marketing audit is a complex process, which requires significant time and costs. It follows that the approach to the development of a marketing audit should be balanced and meet the goals of conducting it. It is important to identify optimal models, methods, tools, periodicity, and other aspects of marketing audit for a specific company within a certain period.

The academic novelty of the study is a developed comprehensive practical approach to the marketing audit of business performance in a competitive environment using modern digital platforms and the further development of recommendations determining their importance in a specific field. The practical value of the proposed approach lies in the possibility of its application by any company to determine the competitive position, evaluate the online presence, and develop recommendations. This audit can be carried out by the company's personnel, so the advantage of the method is its greater flexibility and the absence of the need to transfer information to a third party compared to the involvement of an external auditor.

Further research may focus on developing the methodology of a marketing audit of the implementation and use of digital technologies in the field of marketing.

Credit Authorship Contribution Statement

Iryna Feshchur: Conceptualization, Methodology, Supervision, Writing – review and editing.
Nataliia Hurzhyi: Investigation, Methodology, Project administration, Writing –original draft, Supervision.
Yuliia Kuzminska: Investigation, Formal analysis, Data curation, Validation, Visualization.
Olena Danchenko: Methodology, Project administration, Formal analysis, Data curation, Validation.
Yuliia Horiashchenko: Formal analysis, Supervision, Data curation, Validation, Writing – review and editing, Visualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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A Review and Comparative Analysis of Digital Literacy Frameworks – Where Are We Heading and Why?

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Abstract: *Digital literacy has become as important as other types of literacies that schools and universities teach. In this context, defining it and understanding its components are critical in order to be able to design meaningful policies meant to improve the digital literacy level of the population and to create adequate and well-articulated educational tools and curricula. The purpose of this paper is to identify, briefly describe and compare the existing digital literacy frameworks issued by academia, as well as by governmental and international organizations. Based on this comparative analysis, the paper concludes as to the strengths of the most recent and comprehensive digital literacy framework and discusses the need of progression from earlier frameworks to the most recent ones.*

Introduction

The academia and various other organizations have made numerous efforts to capture the entire extent of digital literacy in the digital frameworks they have proposed. Digital literacy is difficult to define, and this has been acknowledged by the researchers analyzing it - "[t]he term is so broad that some experts even stay away from it, preferring to speak more specifically about particular skills at the intersection of technology and literacy" (Loewus 2016, 2). Despite this difficulty of defining it, the European Commission has defined digital literacy as "the skills required to achieve digital competence, the confident and critical use of information and communication technology for work, leisure and communication". OECD (Organisation for Economic Co-operation and Development) (2016) stresses the importance of digital literacy for skills and expertise in the labor market. These are just some of the most frequently used definitions of digital literacy among the plethora of existing ones. Definitions are the backbone of designing and building digital literacy frameworks, as is the case of the European Commission or OECD case. While the importance of digital literacy has been increased as we get into the era of digital transformation, there has been a lack of effort in reviewing, comparing, and analysing various frameworks. In this article, we aim to identify and review, on one hand, and compare, on the other hand, the existing frameworks from the standpoint of their categories and items, and to comment on the most recent and comprehensive one, while stressing the need of progression from the earlier frameworks to the more recent ones.

1. Literature Review

There has been a continuous effort in defining digital literacy. Lanham (1995) claims that 'literacy' has extended its semantic reach from meaning 'the ability to read and write' to now meaning 'the ability to understand information' however presented.' He recognizes the changes of mode in delivering information from the conventional printed media to the digital multimedia and emphasizes the skill of deciphering complex images and sounds as well as the syntactical subtleties of words (Lanham 1995). Then, Gilster (1997) further emphasizes the inherent differences of conventional printed media from the new ones presented by computers that are connected via the Internet. He defines digital literacy as 'the ability to understand and use information in multiple formats from a wide variety of sources when it is presented via computers and, particularly, through the medium of the Internet' (Gilster 1997).

In the 1990s, due to the commercialization of the Internet, the amount of information increased super linearly, and the importance of handling information and media became crucial, resulting in the era of multimedia. In order to respond to the increased demand for better understanding of "digital literacy" and to provide digital workers with clear guidelines, it was necessary to refine the framework for the concept (Aviram 2004). Eshet-Alkalai (2004) proposed a new conceptual framework of digital literacy, which is consisted of five types of literacy skills: 1) photo-visual literacy, 2) reproduction literacy, 3) information literacy, 4) branching literacy, and 5) socio-emotional literacy.

In the 2000s, the concept of digital literacy extended to the ability to use digital technology including information processing and software handling. There was an additional effort in developing a more comprehensive framework because there was a belief that it was not sufficient only to include skills and competencies required for Internet literacy, ICT (information and communication technology) literacy, information literacy and media literacy (Shopova 2014). Ferrari (2012) suggests that the definition of digital literacy needs to include the different areas of learning, such as knowledge, attitudes and skills required to identify, locate, access, retrieve, store, and organize the information. Rather than focusing on technical skills, the framework highlights the importance of solving problems and building new knowledge. Then, Janseen *et al.* (2013) expanded the definition by identifying twelve digital competence areas such as 1) General knowledge and functional skills, 2) Use in everyday life, 3) Specialized and advanced competence for work and creative expression, 4) Technology mediated communication and collaboration, 5) Information processing and management, 6) Privacy and security, 7) Legal and ethical aspects, 8) Balanced attitude towards technology, 9) Understanding and awareness of role of ICT in society, 10) Learning about and with digital technologies, 11) Informed decisions on appropriate digital technologies, and 12) Seamless use demonstrating self-efficacy. Therefore, the concept of digital literacy evolved to digital competency that is comprised of knowledge, skills, and attitudes that are linked to various purposes, domains, and levels (Janseen *et al.* 2013).

As the information society is on its way in the 2010s, the concept of digital literacy further extended by including general knowledge in work and life, attitudes, ethics and even the citizenship of a member of digital society.

Digital skills have been acknowledged to be at the core of digital transformation capabilities and to contribute to the achievement of Sustainable Development Goals (SDG). According to Bravo *et al.* (2021), empowerment and technological mastery can be obtained by multidimensional digital literacy. The researchers state that such goals exceed the mere operational use of technology, and they regard 'broad, meaningful and innovative use of technology for the construction of an equitable society, decent employment, social participation' (Bravo *et al.* 2021, p. 76). The necessity to set up an inventory of digital skills and/or an index to measure digital literacy has arisen in the process of bridging digital divide in terms of skills acquisition. Also, a largely accepted digital literacy framework would ensure comparability of digital skills across countries and regions. It would also equip policymakers with an instrument that can help identify and then improve underdeveloped digital literacy areas (Chetty *et al.* 2017). At the same time, the existence of a framework and of an index would allow measuring the digital literacy performance of a country at a certain time moment and tracking progress over time (Kusumastuti and Nuryani 2019). Besides the macro approach rationale for developing a digital skills framework, other scholars have justified it in a university context – the need to create such a framework stem from the need to equip students with relevant digital skills for the workplace of the future (Johnston 2020). For narrower purposes, researchers have attempted to compile various other frameworks, as is the case of the digital media framework proposed by Reyna *et al.* (2018). The authors considered it useful to identify the set of digital media skills that students need in order to be able to produce digital artefacts during their higher education studies. Such a framework includes conceptual, functional and audio-visual skills.

For younger age learners, researchers have explained the importance of a digital skills literacy framework that is englobed in the broader emergent literacy skills, alongside proficiency in reading and writing (Neumann *et al.* 2017). The authors align digital skills with other life skills to highlight their importance in the current era. Peng and Yu (2022), from their work of reviewing digital literacy literature, pointed out the importance of gauging students' digital literacy and introduced three potential frameworks that have different focuses in measuring students' digital literacy. One of the recent works of reviewing 33 papers published in peer-reviewed journals (Nguyen and Habok 2023) noted that various frameworks access various aspect of digital literacy and the lack of effort in providing a comprehensive framework that fit all context exist.

It is not just universities and schools that are concerned about organising digital literacy components into frameworks (Handley 2018). Such endeavours belong to academia, as well. Feerrar (2019) worked on a digital literacy framework using consultations and focus groups. The output opens the way towards broad digital literacy initiatives.

Digital literacy frameworks mainly refer to skills and capabilities of the entire population. However, specific research has been conducted in the area of digital literacy for vulnerable populations, who are endowed with less supporting infrastructure. Thus, Nedungadi *et al.* (2018) proposes an Inclusive Digital Literacy Framework to concomitantly address digital and life skills via mobile technologies and to achieve digital inclusion. Also, the COVID-19 pandemic has revealed threats such as digital poverty, digital literacy and digital exclusion for the people with intellectual disabilities in a context in which survival of jobs and businesses depended on how quick adaptation to the online environment took place (Chadwick *et al.* 2022). From the recent study of the impact of digital literacy on people's daily lives, Tinmaz *et al.* (2023) discussed that digital literacy acquisition process has started with family in early ages and extended to lifelong learning approach implying the expanding scope of digital literacy.

Recently, the obvious intrusion of artificial intelligence (AI) in numerous fields has led to considering including AI in literacy education. Thus, Yang (2022) states that AI literacy is 'an organic part of digital literacy for all citizens in an increasingly intelligent society'. Nevertheless, there are voices that call for attention towards the ethical implications and challenges of AI use in the process of achieving quality education, which is one of the UNESCO 2030 Agenda SDGs (SDG4) (Flores-Vivar and Garcia-Penalvo, 2023).

2. Method

The research methodology used in this paper is a quantitative one. First of all, we did a review of all digital literacy components. To this purpose, we searched both the World Wide Web and the most representative databases of academic papers (Web of Science, Scopus). From each existing digital literacy framework, the authors extracted and listed the digital literacy components. Second of all, using the inventory of components collected in the first phase, a synoptic comparison of all digital literacy frameworks was performed. That is, the authors checked whether each item or category was present or not in each of the digital literacy frameworks under scrutiny. This comparative and synoptic analysis of the components was performed by three independent researchers in order to seek which items are common across the respective frameworks and which items are different or unique. It was necessary to have multiple people look at this checking of items due to the fact that items are called differently, but they may refer to one and the same thing (or not). A triple checking was needed to ensure error minimization. Therefore, the unit of analysis is the framework, and the criteria for comparison was the inventory of components (categories and items) identified. As a result of this endeavour, the authors identify the most comprehensive digital literacy framework, i.e. the Digital Literacy Framework of the CDL (Centre for Digital Literacy) and in what its scope is larger than that of other discussed frameworks. The items that make this model unique were found when performing the comparative analysis. At the end, we discuss the main implications based on the analysis conducted.

3. Research Results

3.1. The Identified Digital Literacy Frameworks

3.1.1. UNESCO on the Digital Literacy

In its efforts to achieve the Sustainable Development Goal thematic indicator 4.4.2: "Percentage of youth/adults who have achieved at least a minimum level of proficiency in digital literacy skills", UNESCO (United Nations Educational, Scientific and Cultural Organization) has designed the Digital Literacy Global Framework (DLGF) drawing on the European Commission's Digital Competence Framework for Citizens (DigComp 2.0).

According to UNESCO, digital literacy is a set of basic skills required for working with digital media, information processing and retrieval. It enables participation in social networks for the creation and sharing of knowledge. It also consists in a wide range of professional computer skills, includes awareness of the cognitive and ethical concerns, while applying skills to evaluate, synthesize and produce new information and critique, it brings about change or care about how to apply technologies in a new, innovative and responsible manner. Digital literacy also presumes to be able to discern what is appropriate and how to derive meaning whilst using digital technologies. Last but not least, it involves abilities such as copying files, managing a spreadsheet and writing a computer programme (UNESCO, 2011; UNESCO, 2016). In A Global Framework to Measure Digital Literacy (UNESCO, n.d.), the framework comprises competence seven competence areas (fundamentals of hardware and software, information and data literacy, communication and collaboration, digital content creation, safety, problem solving, and career-related competences) with their subsumed competences.

3.1.2. The G20 Vision of Digital Literacy

The G20 group initially focused on the digital divide and on how to address it across the countries through infrastructure development, digital trade and financial inclusion. However, the focus then shifted towards addressing this gap from the perspective of digital literacy. At the same time, it was signalled that improvement in infrastructure without a general upskilling cannot help bridging the gap. One obstacle was that of defining and measuring digital literacy. G20 investigated the rich literature to find the most appropriate digital literacy framework. G20 (G20 Insights) adopted a simplified version of the UNESCO proposal for the digital literacy framework, which uses five dimensions (information-digital content; computer-hardware and software; media-text, sound, image, video, social; communication-non-linear interaction; technology-tools for life situations) and three corresponding perspectives (cognitive, technical, ethical) for each of them.

3.1.3. The European Digital Competence Framework as an Integral Part of the European Digital Agenda

The European Union intends to provide secure digital spaces and services, a level playing field in digital markets and digital sovereignty. The three objectives of the European Digital Agenda are: 1) to provide better access for consumers and businesses to digital goods and services across Europe; 2) to create the right conditions for digital networks and services to flourish; and 3) to maximize the growth potential of the digital economy (European Parliament). In order to achieve these goals, the population needs to be equipped with a set of skills for facing the challenges and benefiting from the opportunities of the 21st century. As of now, the European Union is already using the second edition of the European Digital Framework, which is designed and updated in line with the European Digital Agenda (European Commission, n.d.a; n.d.b). DigComp 2.1, issued in 2017) comes up with proficiency levels and examples of use, unlike the previous one (DigComp 2.0 of 2016), which only comprised competence areas and competences.

3.1.4. Digital Literacy in the ASEAN Countries

Kusumastuti and Nuryani (2019) proposed a digital literacy framework within an academic paper by using various components, which are called levels. These levels are further broken down into items and description of their measurement. The resulting digital literacy framework was designed in the context of explaining digital literacy levels in ASEAN (Association of Southeast Asian Nations) countries. The framework brings together five digital literacy level indicators and corresponding item questions and measurement descriptions.

3.1.5. Proposal for a Digital Literacy Index

Rosa (2013) from Getulio Vargas Foundation designed a digital literacy index using seven main pillars: recognition, use, photo-visual, reproduction, branching, information, social interaction. The author intends to shift the focus from the concern about access to information and communication technologies to concern about skills that enable people to use such technologies.

3.1.6. An Index for Measuring Digital and Media Literacy Developed by James L. Knight School of Communication

An index to measure digital and media literacy was designed by James L. Knight School of Communication (2018) in North Carolina. This index is the result of the partnership between Queens University of Charlotte and the city to improve digital and media literacy. The index comprises five types of activities (access and share; analyse; create; reflect; take action), and in order to measure the level of literature, each of these types of activities uses two statements.

3.1.7. COQS Index

SIBIS (Statistical Indicators Benchmarking the Information Society) develops various indicators to reflect the e-Europe initiative priorities and targets, and COQS index is one of them. It is meant to measure a digital literacy score, using the skills below (SIBIS, 2003):

- Communicating with others (by e-mail and other online methods),
- Obtaining (or downloading) and installing software on a computer,
- Questioning the source of information on the Internet and
- Searching for the required information using search engines.

The SIBIS project dates back from the early 2000s and, although improved by the DigComp framework, it remains as a benchmark in measuring digital literacy.

3.1.8. The Global Standard for Digital Literacy, Skills and Readiness of the Coalition for Digital Intelligence

The Coalition for Digital Intelligence is a platform formed through the participation of the World Economic Forum, OECD, IEEE Standards Association and DQ Institute. This coalition proposed a global standard for digital literacy, skills and readiness in 2019 to measure digital intelligence, DQ. It comprises 8 large categories (digital identity, digital use, digital safety, digital security, digital emotional intelligence, digital communication, digital literacy, digital rights), each containing 3 items, being "a comprehensive set of technical, cognitive, metacognitive, and socio-emotional competencies that enable individuals to face the challenges and harness the opportunities of digital life" (DQ Institute, 2019).

3.1.9. Digital Literacy Framework of Edith Cowan University, Australia

Academia, too, has been involved substantially in designing digital literacy frameworks. One such framework is created by Edith Cowan University in Australia (n.d.). It proposes a simple and supple five-category framework, as follows: digital technologies, digital learning (professional and lifelong), digital creation and communication, digital citizenship and identity, information, academic, media and data literacy). Having a digital literacy framework is necessary in order to better equip students with digital literacy skills both for university purposes and for their future career. According to the university, the framework is a tool to be used in policies and strategies concerning curriculum design.

3.1.10. Jisc Digital Capability Framework

Jisc is a UK-based organisation committed to provide digital solutions for national education and research. In this context, it designed a digital capability framework to present the skills required in academia, administration and in different professional roles. This framework considers digital identity and wellbeing to be the largest purpose, with the ICT proficiency being at the core and crossroads of: information, data and media literacies; digital creation, problem solving and innovation; digital learning and development; digital communication, collaboration and participation (Jisc, n.d.).

3.1.11. The Digital Literacy Framework of the National Council for Special Education in Ireland

The National Council for Special Education in Ireland is a body that is in charge with improving the delivery of education services to persons and children with special educational needs stemming from various disabilities. Education should be inclusive, and so should digital education. To this purpose, the National Council for Special Education in Ireland (n.d.) has proposed a Digital Literacy Framework based on six competencies (communicate, create, collaborate, integrate, manage, access) and three main objectives (communication and participation, making of meaning, functional digital skills).

3.1.12. Digital Literacy Model of Media Smarts, Canada

Media Smarts is a Canadian not-for-profit charitable organization for Digital and Media Literacy. It has developed numerous digital and media literacy programs and resources. At the core of its preoccupations is the formation of critical thinking skills in children in order for them to cope with the media. It designed a multi-layer model of digital literacy, which comprises skills and competencies and objectives in a hierarchical fashion (Media Smarts, n.d.).

3.1.13. The BC Digital Literacy Framework, Canada

The Digital Literacy Framework designed by the British Columbia University (n.d.) has six main areas, each of them explaining the main subsumed activities or actions: research and information literacy; critical thinking,

problem solving and decision making; creativity and innovation; digital citizenship; communication and collaboration; technology operations and concepts. This framework is part of the university's revised curriculum, and is meant to be used by the teaching staff in class. By mastering the skills and knowledge herein, students can cope in the current technological world. The index has been adapted by the Ministry of Education after certain revisions.

3.1.14. CAUL Digital Dexterity Framework of Macquarie University, Australia

The Council of Australian University Librarians (CAUL) draws from the Jisc model from the UK and proposes a Digital Dexterity Framework, which comprises six major areas: digital identity and wellbeing; collaboration, communication and participation; digital creation, problem solving and innovation; ICT proficiency and productivity; digital learning and development; information literacy, media literacy and data literacy (Macquarie University, n.d.).

3.1.15. The CDL Digital Literacy Framework of the Centre for Digital Literacy (CDL), South Korea

The Centre for Digital Literacy is a non-profit organization based in Korea that conducts research, develops educational content, and operates educational programs. CDL Digital Literacy Framework consists of 9 competency categories, each containing 5 indexes, and has kept evolving since 2017. Based on this framework, CDL is developing digital literacy education content, conducting education programs, and providing DIQ (Digital Intelligence Quotient) system that measures one's digital literacy on the web. Instead of defining digital literacy as the ability to learn and use digital technologies and tools, the CDL framework comprehensively includes all the virtues and abilities necessary to live in a digital society. The framework is shown in Figure 1.

Figure 1. Digital Literacy Framework
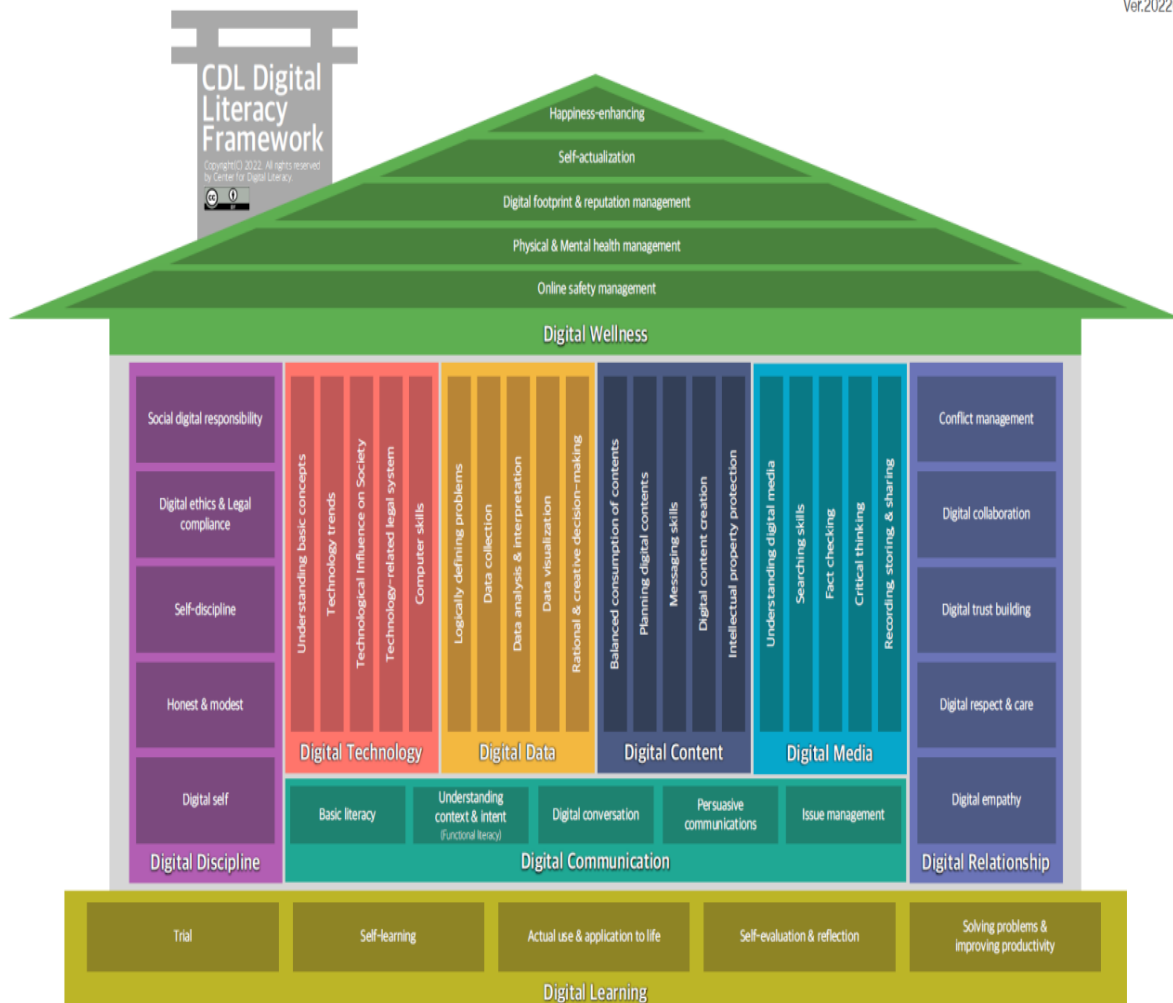
Source: Centre for Digital Literacy, Korea (2022)

3.2. An Inventory of Digital Literacy Components – Items and Categories Extracted from the Digital Literacy Frameworks under Investigation

Table 1 presents a synthesis of the fifteen digital literacy frameworks in order to understand how they were built and what categories have been used in their classifications.

Table 1. Synthesis of the analysed frameworks

1. UNESCO Digital Literacy Framework	
To increase the Percentage of youth/adults who have achieved at least a minimum level of proficiency in digital literacy skills	
7 Digital Literacy Skills	1. Fundamentals of Hardware and Software
	2. Information and Data Literacy
	3. Communication and Collaboration
	4. Digital Content Creation
	5. Safety
	6. Problem-solving
	7. Career-related Competence
2. The G20 Vision of Digital Literacy	
Initially focused on the digital divide and on how to address it across the countries via the infrastructure development, digital trade, and financial inclusion. But, the focus then shifted to address the gap from the perspective of digital literacy.	
5 Dimensions	1. Information (Digital Content)
	2. Computer (Hardware and Software)
	3. Media (Text, Sound, Image, Video, Social)
	4. Communication (Non-linear Interaction)
	5. Technology (Tools for life Situations)
3 Perspectives	Cognitive
	Technical
	Ethical
3. The European Digital Competence Framework	
To provide secure digital spaces and services, a level playing field in digital markets and digital sovereignty. The three objectives: 1) to provide better access for consumers and business to digital goods and services across Europe, 2) to create the right conditions for digital networks and services to flourish, 3) to maximize the growth potential of the digital economy.	
5 Competence Areas	1. Information and Data Literacy
	2. Communication and Collaboration
	3. Digital Contents Creation
	4. Safety
	5. Problem Solving
4. Digital Literacy in the ASEAN Countries	
Kusumastuti and Nuryani (2019) proposed the framework which is consisted of 5 levels and those levels are further broken down into items and description of their measurement.	
5 Level Indicators	1. Information Literacy
	2. Computer Literacy (Software and Hardware)
	3. Media Literacy (text, sound, image, video)

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	4. Communication Literacy (interaction)
	5. Technology Literacy (tools for life)
	1. Item Question
	2. Measurement Description

5. Proposal for a Digital Literacy Index (Rosa, 2013) Getulio Vargas Foundation

Rosa (2013) designed a digital literacy index using seven main pillars. Intends to shift the focus from the concern about access to information and communication technologies to concern about skills that enable people to use such technologies.

7 Pillars	1. Recognition (RT1-RT12)
	2. Use (UT1-UT17)
	3. Photo Visual (FI1-FI3)
	4. Reproduction (RI1-RI2)
	5. Branching (MI1-MI3)
	6. Information (II1-II4)
	7. Social Interaction (SI1-SI3)
2 Dimensions	1 Descriptor
	2. Detailing

6. An Index for Measuring Digital and Media Literacy by James L. Knight School of Communication

The index comprises five types of activities with two statements for each to measure the level of literacy

5 Type of Activities	1. Access and Share
	2. Analyse
	3. Create
	4. Reflect
	5. Take Action

7. COQS Index

Developed by Statistical Indicators Benchmarking the Information Society (SIBIS). It is meant to measure a digital literacy score, using the skills.

4 Skills	1. Communicating with others
	2. Obtaining and Installing Software on a Computer
	3. Questioning the Source of Information on the Internet
	4. Searching for the Required Information using Search Engines

8. The Global Standard for Digital Literacy, Skills, and Readiness of the Condition for Digital Intelligence

This coalition proposes a global standard for digital literacy, skills and readiness in 2019 to measure digital intelligence, DQ. It comprises 8 categories, each containing 3 items, being "a comprehensive set of technical, cognitive, metacognitive, and socio-emotional competencies".

8 Categories	1. Digital Identity
	2. Digital Right
	3. Digital Literacy
	4. Digital Communication
	5. Digital Emotional Intelligence
	6. Digital Security
	7. Digital Security
	8. Digital Safety
	9. Digital Use
3 Items for each	

9. Digital Literacy Framework of Edith Cowan University, Australia

It proposes a simple and supple five-category framework. Having a digital literacy framework is necessary in order to better equip students with digital literacy skills both for university purposes and for their future career.

5 Categories	1. Digital Technologies
	2. Information, Academic Media, and Data Literacy
	3. Digital Citizenship and Identity
	4. Digital Creation and Communication
	5. Digital Learning (Professional and Lifelong)

10. JISC Digital Capability Framework

It designed a digital capability framework to present the skills required in academia, administration and in different professional roles.

6 Skills	1. ICT Proficiency
	2. Digital Creation, Problem Solving and Innovation
	3. Digital Communication, Collaboration and Participation
	4. Digital Learning and Development
	5. Information, Data and Media Literacies
	6. Digital Identity and Wellbeing

11. The Digital literacy Framework of the National Council for Special Education in Ireland

The National Council for Special Education in Ireland has proposed a Digital Literacy Framework based on six competencies and three main objectives.

6 Competencies	1. Communicate
	2. Create
	3. Collaborate
	4. Integrate
	5. Manage
	6. Access
3 Objectives	1. Communication and Participation
	2. Making of Meaning
	3. Functional Digital Skills

12. Digital Literacy Model for Media Smarts, Canada

Media Smarts is a Canadian not-for-profit organization for Digital and Media Literacy. It designed a multi-layer model of digital literacy, which comprises skills and competencies and objectives in a hierarchical fashion.

3 Skills	1. ICT Innovation (In ITC/With ICT)
	2. Constructive Social Action
	3. Critical/Creative Thinking
4 Objective	1. Create
	2. Understand
	3. Use
	4. Access
Multiple Competences	

13. The BC Digital Literacy Framework, Canada

The British Columbia University developed a Digital Literacy Framework that has six main areas, each of them explaining the main subsumed activities or actions.

6 Main Areas	1. Research and Information Literacy

	2. Critical Thinking, Problem Solving, and Decision Making
	3. Creativity and Innovation
	4. Digital Citizenship
	5. Communication and Collaboration
	6. Technology Operations and Concepts
14. CAUL Digital Dexterity Framework of Macquarie University, Australia	
The Council of Australian University Librarians (CAUL) proposes a Digital Dexterity Framework, which comprises six major areas.	
6 Major Areas	1. Information Literacy, Media Literacy and Data Literacy
	2. Digital Learning and Development
	3. ICT Proficiency and Productivity
	4. Digital Creation, Problem Solving, and Innovation
	5, Collaboration, Communication, and Participation
	6. Digital Identity and Wellbeing
15. The CDL Digital Literacy Framework of Centre for Digital Literacy, South Korea	
The CDL Digital Literacy Framework consists of 9 competency categories, each containing 5 indexes. This framework is a comprehensive set of knowledge, skills and attitudes aspects, and the CDL provides educational programs developed by this framework and enables the measurement of digital literacy through the DIQ (Digital Intelligence Quotient) assessment system.	
9 Competencies	1. Digital Technology Literacy
	2. Digital Data Literacy
	3. Digital Content Literacy
	4. Digital Media Literacy
	5. Digital Communication Literacy
	6. Digital Relationship Literacy
	7. Digital Discipline Literacy
	8. Digital Learning Literacy
5 Index for each	9. Digital Wellness Literacy

Source: Authors' compilation based on the frameworks cited herein

Digital literacy has been detailed under the umbrella of various heterogeneous frameworks. These frameworks are titled using terms such as digital literacy, digital competence, digital capability, digital dexterity or even media literacy. The most frequent term used in the framework denomination is digital literacy. Within the framework, other types of literacies are found, such as information literacy, data literacy, computer literacy, communication literacy and technology literacy. Given the prevalence of digital literacy in the investigated frameworks, we conclude that the more general term that we can recommend for use is digital literacy, and the other types of literacies can be placed as its components.

The components of the analysed frameworks are also diverse. For instance, their detailing can be found on several layers, comprising: skills, dimensions and perspectives, competence areas, level indicators, pillars and dimensions, types of activities, categories, categories and items, competences and objectives. For a better illustration of the components of indexes, we recommend presentation on at least two layers, based on the best practice examples discussed above.

3.3. A Synoptic Comparative Analysis of Existing Digital Literacy Frameworks

Based on the inventory of digital literacy components identified above, we will compare in a synoptic manner all indexes – in the first column the digital literacy components are listed, and on the other columns all the fifteen frameworks in a chronological order. That is, we will check for each component and then count how many there are in each framework to identify the more comprehensive one.

Table 2. Synoptic comparative analysis of the analysed frameworks

Classification	COQS Index (2003)	Rosa from Getulio Vargas Foundation (2013)	The BC Digital Literacy Framework (2013)	The National Council (2014)	Media Smarts (2014?)	UNESCO Digital Literacy (2016)	G20 Vision of Digital Literacy (2016)	DigComp (2017)	Edith Cowan University (2017?)	Jisc (2017)	James L. Knight School of Communication (2018)	Digital Literacy in the ASEAN (2019)	The Coalition for Digital Intelligence (2019)	CAUL Digital Dexterity Framework (2019)	The CDL Digital Literacy Framework (2022)
Information searching	O	O	O	O	O	O	O	O	O	O		O	O	O	O
Computer skills	O	O	O	O	O	O	O		O	O	O	O		O	O
Content creation		O	O	O	+	O	O	O	O	O	O	+	O	O	O
Filtering and managing data	O	O	O	O		O	O	O	O	O		+	O		O
Information sharing		O	O	-	+	O		O	O	O	O		O	O	O
Communication	O	+	O	O		O	O	O	O	O		+	O	O	O
Data analysis		O		O		O		O	O	O			O	O	O
Media		O	+	-			O		O	O		O	O	O	O
Digital identity		+	-		O	O		O	O	O			O	O	O
Programming		O				O	O	O	O	O				O	O
Collaboration			O	O	+	O		O		O			O	O	O
Social participation			O	O	O					O	O		O	O	O
e-Safety			-		O	O		O				O	O		O
Citizenship			O		O	O		O	O				O		O
Problem-solving			O		O	O		O		O		+		O	O
Intellectual property protection			-			O		O						-	O
Privacy			-			O		O					O	O	O
Critical thinking		+	O		O		O					+		-	O
Digital learning			O			+			O	O				O	O
Digital well-being						O		O		O				O	O

Classification	COQS Index (2003)	Rosa from Getulio Vargas Foundation (2013)	The BC Digital Literacy Framework (2013)	The National Council (2014)	Media Smarts (2014?)	UNESCO Digital Literacy (2016)	G20 Vision of Digital Literacy (2016)	DigComp (2017)	Edith Cowan University (2017?)	Jisc (2017)	James L. Knight School of Communication (2018)	Digital Literacy in the ASEAN (2019)	The Coalition for Digital Intelligence (2019)	CAUL Digital Dexterity Framework (2019)	The CDL Digital Literacy Framework (2022)
Computational thinking						O		O					O		O
Decision-making			O			O								-	O
Netiquette			O			O		O							O
Social interaction		O			O	+		+				O			O
Innovation			O		O		+		O			+		O	
Self-reflection					O							O		-	O
Career-related competence						O			O				O		O
Digital health						O		O				+	+	-	O
Digital footprint management			O						-				O		O
Relationship management			O										O		O
Creativity			O		O	+								O	
Reputation management			-											-	O
Literacy						O				+		+			O
Understanding impacts of tech			O												O
Actual use			O												O
Fact checking											O	+			O
Empathy													O		O
Risk management													O		O
Productivity														O	O
Social Responsibilities					O	+		+							O
Trust building															O
Conflict management															O

Classification	COQS Index (2003)	Rosa from Getulio Vargas Foundation (2013)	The BC Digital Literacy Framework (2013)	The National Council (2014)	Media Smarts (2014?)	UNESCO Digital Literacy (2016)	G20 Vision of Digital Literacy (2016)	DigComp (2017)	Edith Cowan University (2017?)	Jisc (2017)	James L. Knight School of Communication (2018)	Digital Literacy in the ASEAN (2019)	The Coalition for Digital Intelligence (2019)	CAUL Digital Dexterity Framework (2019)	The CDL Digital Literacy Framework (2022)
Happiness															O
	4	10 (12)	25 (21)	10 (8)	15 (18)	20 (24)	8 (9)	18 (20)	14 (13)	16 (17)	7	5 (14)	20 (21)	23 (17)	41
Consensus	4	12	21	10	18	24	9	20	13	17	7	14	21	17	41

Source: Authors' compilation based on the frameworks cited herein

4. Discussions

In order to compare the fifteen identified digital literacy frameworks, the authors developed Table 2. First, the authors listed digital literacy frameworks in a chronological order in the first row and the items identified from the most comprehensive framework from the first round of review process on the first column. Whenever a new item was identified, the researchers added it to the list. Second, two researchers independently reviewed all the frameworks and put a mark in each cell by using three different kinds of symbols such as circle, plus, and minus. Each researcher put a circle mark in the cell whenever the item was identified from each of framework. Finally, an additional researcher compared the results from two researchers and put a '+' mark when a researcher identified additional items and '-' mark when one of the researchers claimed that they could not find it. Then, the researcher counted the number of items that was identified from each researcher as can be seen from the 2nd last row and reviewed the framework to make the final decision. The number in the last row presents the confirmed one by all three researchers. The main reason of the big difference between the numbers from two reviewers was caused by the fact that they looked at different sources. For example, one only looked at the table or figure, but the other one reviewed the text contents that carry more detail description of the table or figure.

As shown in Table 2 above, from 2003 to 2022, we can notice that the scope of the frameworks expanded and included more and more items in most of the cases. From simply listing computer skills, managing data, communication or information searching, they became more and more sophisticated and went as far as to include citizenship, digital well-being, e-safety, empathy, trust building, conflict management, and so on. Computers and the web have first served as primitive tools to make our tasks easier; as of now, they have enriched the ways of doing things and provided new types of capabilities.

The authors have independently compared the above digital literacy frameworks and models and have reached the conclusion that, although differently phrased, most categories and items are to be found in the Digital Literacy Framework of CDL, with very few exceptions. Moreover, it is one of the most comprehensive, if not the richest framework proposed for digital literacy. Some of the items it suggests do not exist in other frameworks as such or similarly (e.g., self-realization, consistency, self-motivation, pros and cons of technology, technology-related legal system, digital content planning, understanding media, conflict resolution in cyberspace, digital humanism, trust building, self-learning, digital distraction management). We therefore posit that the Korean Digital Literacy Framework of CDL is one of the most recent and comprehensive of those identified.

Conclusions and Further Research

The dynamics of digital literacy framework design and scope is a clear indication that digital skills have come at the fore of educational concerns in recent years and of the weight gained by new digital technologies in practically all areas of activity. As a result, those economies that successfully adopt and utilize digital technology would grow super linearly because of the network effects while the other economies grow linearly at most if they do well. The

gap between those two groups will be bigger and bigger as time goes by. We could also estimate and foresee that, with the advent of artificial intelligence, these frameworks will further develop and become broader and inclusive of more domains and fields, which until recently knew little or no digital interference, such as sports or the art. It is highly important to understand the development of digital literacy frameworks for various reasons, such as a comprehensive and reality-anchored education, technological transfer, enhanced work capabilities, etc. The main implications of the study are presented below.

Implications

From a research point of view, this paper is useful in that, to the best of the authors' knowledge, it brings together all existing digital literacy frameworks both in a synthetic approach and in a comparative synoptic approach. This synoptic presentation reflects the swift pace at which the digital world has amplified and protruded in all aspects of life. From a policy perspective, accounting for all digital skills and competencies can be of use in terms of educational policy design. Therefore, the most comprehensive digital literacy framework that was identified needs to be checked by policymakers in the field of education as they can have the whole picture in front of their eyes when designing curricula and policy to upgrade digital literacy among various populations and countrywide. Also, digital literacy frameworks stemming from practitioners keep educational agents abreast with the newest technologies. From a practical perspective, knowledge of digital literacy scope and coverage can represent a basis for evaluation of such skills and identifying and using the most comprehensive framework will help diversify learning, education and assessment of digital skills. Moreover, the progression of digital skills from very simple to very complex ones reflect the need to ensure more types of digital capabilities to cope in today's very complex world, which is faced both with growing opportunities and with increasing risks.

Limitation and Future Direction

Due to the nature of the exploratory research, it is required to pay extra attention to the interpretation of the result. First, the initial search of the digital literacy frameworks was limited to the World Wide Web, Web of Science and SCOPUS. There might be more frameworks that can be found from other sources. Second, the review process of digital literacy frameworks was limited to the second level of each framework. Since some frameworks might contain more information at the lower level, it is required to obtain the official document of each framework that contains the detailed information for more comprehensive analysis. Finally, more structured analysis rather than manual review of frameworks is required. This is because each framework uses different terminologies and has different levels.

Future research can be based on the current synoptic presentation to provide useful insights to educational professionals in their attempt to enrich digital literacy curriculum in schools and universities with currently missing items. As mainstream literature shows it, it is high time artificial intelligence was included in such frameworks, too. However, this step needs to be carefully considered due to the risks it comes with. None of the investigated frameworks includes artificial intelligence, and an update is required in this sense.

Credit Authorship Contribution Statement

Yoo-Taek Lee: Conceptualization, Investigation, Methodology, Project administration, Formal analysis, Supervision, Validation, Writing – review and editing, Visualization.
Mina Fanea - Ivanovici: Conceptualization, Investigation, Methodology, Project administration, Formal analysis, Writing – original draft, Supervision, Validation, Writing – review and editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Management Accounting of Payment Risks of Online Trade during Military Operations

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Abstract: *The rapid development of technologies and intensifying military operations have caused several challenges for online trade, in particular, in terms of payment risks. In this context, management accounting as a key means of monitoring and controlling these risks is assigned a special role. The aim of the article is to identify the key peculiarities of the influence of management accounting on the payment risks of online trade in the area of fraudulent operations during active military operations. The study employed a number of economic and statistical method: an in-depth semi-structured interview using the author's questionnaire, as well as an economic analysis of losses from fraud according to the methodical approaches of auditing KPMG and Crowe. The practice of identifying fast recurring transactions (78% of respondents) when working with payment risks was distinguished as a result of the research by interviewing respondents from a sample of management accounting specialists. The importance of estimating losses from fraudulent transactions (78% of respondents) in the management accounting system of payment risks is emphasized. Analysis of the results of interviewing respondents showed a positive effect of the systematic application of management accounting tools on reducing the risks of fraud in online trade. Thanks to adequate management accounting, the fraud losses is reduced by an average of 12% compared to the 2022 average industry loss rate. The obtained results revealed the key role of management accounting in overcoming the negative consequences of payment risks, namely in reducing losses from fraudulent transactions. These results can be applied to improve the financial and operational management of online trade in wartime and other crisis situations. Prospects for further research are in-depth analysis of artificial intelligence tools and machine learning in identifying payment risks of online trade.*

Keywords: fraudulent transactions; fraud losses; transaction monitoring; payment system functionality; loss assessment.

JEL Classification: M20; M40; M41.

Introduction

Online commerce has become an integral part of business operations in the current rapidly developing digital environment. Along with numerous advantages, online trading also presents several difficulties, especially in terms of payment risks. These risks, which cover such issues as fraudulent transactions, chargebacks, and payment disputes, not only have financial implications, but also affect the overall operations and reputation of companies. For this reason, it is extremely important for businesses to adopt effective strategies to mitigate these payment risks. In this context, management accounting has become a valuable tool for business in the field of online trade. These strategies involve the application of management accounting principles and methods to improve decision-making processes, as well as to mitigate potential risks. Companies can proactively identify and overcome payment risks, thereby protecting their financial stability and business reputation by implementing an adequate management accounting system. However, the effectiveness of these measures may vary depending on stronger circumstances, especially in the context of hostilities. Companies face additional complications during such periods, such as volatile market conditions and growing security concerns. So, it is important to identify appropriate management accounting measures designed to mitigate payment risks during hostilities.

The aim of the study is to determine the main features of the impact of management accounting on the payment risks of online trade during military operations in terms of fraudulent transactions. The aim involved the fulfilment of a number of research objectives:

1. Identify the key factors of the impact of management accounting on the payment risks of online trade, in particular, in terms of fraudulent transactions;

2. Carry out an analysis of the main measures of management accounting for detecting fraudulent transactions during military operations;

3. Estimate the rate of reduction of fraud losses of companies in the field of online trade during military operations.

1. Literature Review

Some studies deal with the theoretical and practical experience and features of the management accounting of payment risks of online trade. Affia et al. (2020) presented a threat-based approach to managing security risks in online trading systems. Their research emphasises the importance of proactively addressing risk by identifying potential threats before they manifest. It is emphasized that a holistic view of the online trading system is important, considering both technical and non-technical elements. This research plays an important role in understanding the nuances of security risk management and provides a comprehensive framework for enterprises to strengthen their online commerce platforms. Grüschow and Brettel (2018) study the costs of payment transactions incurred by international online traders. The study outlines the difficulties these companies face, especially when operating in multiple jurisdictions with different transaction fee structures. Strategic cost management methods are offered to optimize profits and ensure uninterrupted operations. This understanding can help international online merchants develop cost-effective strategies for their payment systems. Nasr and Farrag (2020) present a comprehensive analysis of electronic payment systems by examining the associated risks, opportunities, and challenges. The study identifies common threats such as cyber-attacks, fraud, and system failures. The need for reliable risk management strategies to ensure the realization of the potential of electronic payment systems without compromising security systems is emphasized.

Wang (2020) focuses on the specific international payment niche of online commerce, which identifies the unique risks associated with international transactions. The study provides effective countermeasures to mitigate these risks – from improving cyber security infrastructure to the use of international norms and standards. Lin (2021) studies the risks and development research related to international online trade payments. The changing nature of risks is emphasized as online trading integrates with online financing platforms. It is assumed that companies must constantly update their risk assessment tools and strategies to stay ahead of potential threats in this changing environment. Zhang (2021) examines the transformations in accounting theory and practice due to the surge in online commerce. With the integration of online commerce into the core business, traditional management accounting methods have undergone changes. The work identifies new practices and theories that are better aligned with the digital environment, which emphasizes the need for continuous development of management accounting (Bondarenko et al. 2018).

Zhou and Chai (2020) conducted a comprehensive study of online payment risk control. Advances in technology have created favourable conditions for various innovative payment methods. However, these changes also create new risks. The relevance of adaptive risk management systems in the field of retail payments is emphasized separately. Zhang (2023) analyses the features of risk control for international online trade with a focus on the role of internal audit. It is emphasized that the international nature of these transactions makes them more vulnerable to risks. Accordingly, internal audit systems are becoming indispensable for ensuring the companies' compliance and sustainability. Online traders can create reliable control mechanisms to reduce potential threats by adopting a structured internal audit system. Wang (2021) examines financial management practices in the context of an online trading environment. The study emphasizes that the dynamic nature of online commerce requires companies to regularly improve their risk management strategies. Recommended countermeasures that companies in the field of online trade can implement to increase the efficiency of management accounting are distinguished.

Chun (2019) focuses on the growing concern regarding liability and security breaches in mobile payment systems. As online commerce increasingly tends to mobile platforms, the security of mobile payments has become a critical factor. Accordingly, companies should focus not only on the ease of transactions, but also on ensuring the security and reliability of these payments against potential breaches. Wang et al. (2022a) deal with the credit risks faced by international online traders in China. Companies face increasing credit risks with the growing integration of the world market. The researchers advocate a comprehensive assessment of these risks and emphasize the development of countermeasures adapted to the specific challenges of the Chinese context of international online trade. Yu (2021) focuses on international online trade payments in China, examines the related risks and oversight systems. It is emphasized that oversight mechanisms are becoming paramount to ensure uninterrupted and secure transactions. Such mechanisms are crucial not only for the protection of financial transactions, but also for strengthening trust among users.

Yomas and Kiran (2018) study the relationship between the development of electronic payment systems, online trading platforms, and cyber security risks. An increasing risk of cyber threats with technological progress is emphasized. Hassan et al. (2020) emphasizes the importance of an efficient and secure electronic payment system. The need for constant adaptation to cyber threats and the introduction of innovations in electronic payment systems for secure online trade transactions is emphasized. Wang and Li (2022) study the relationship between online commerce transactions and cloud technologies. The study shows that cloud technologies can offer optimized decision-making processes for online commerce in terms of funds transfer. Sharma and Prashanth (2021, 845–859) deals with the issue of secure payment methods developed for online commerce applications. The importance of ensuring the end-to-end security of transactions due to the appropriate selection of a secure payment mode is emphasized. In this context, Ogbanufe and Kim (2018) compared fingerprint-based biometric authentication with traditional authentication methods. Accordingly, biometric methods, in particular fingerprints, can become the next stage of development for electronic payment systems. Such methods not only provide increased security, but also a convenient transaction experience.

Park et al. (2018) emphasized the importance of understanding user needs in mobile payment services for online commerce. Trust plays a key role in user perception, which emphasizes the importance of building and maintaining user trust for the successful implementation of a mobile payment service. Yali et al. (2021) applied a technological approach to the risk management of online trading companies. The potential of advanced analytical models in identifying complex cases is emphasized, which can potentially fundamentally change the practice of financial risk management in online trading. Yang and Yin (2023) covers the integration of management accounting practices with cyber security for online commerce companies. It is emphasized that with the growth of cyber-threats, traditional management accounting practices require significant improvement in the management accounting system.

Byelozertsev and Prokhvatylo (2018) studied the complex aspects of accounting for payments with online store buyers. The study identifies the complexities inherent in accounting for online trade. The need for standardized processes and innovative solutions to work in the changing environment of digital transactions is emphasized. Dutta et al. (2019) offer a focused view of risk management in online commerce supply chains. The supply chain is becoming more complex because of the rapid growth of online commerce. The study identifies potential risk points and suggests strategies for effective risk management. The importance of a pro-active approach in ensuring smooth operation of the supply chain is emphasized.

Ady et al. (2022) study the context of online trade risks from a legal perspective. The study indicates the relevance of legislation in the investigation of cybercrimes in online trade transactions. The work analyses gaps in the legal framework and provides recommendations for strengthening legal measures against cyber threats.

Wang et al. (2022b) combine technological advances with financial market strategies in online trading. The study focuses on the potential of using cloud technologies to prevent financial risks in the supply chain of online commerce.

However, the issues of the development and application of effective measures of management accounting of payment risks of online trade in the course of intensifying military operations have been poorly studied.

2. Method

2.1. Research Design

The first stage is to collect data on the state of management accounting of payment risks of online trade for their further processing within the scope of this study. The second stage of the research involves studying the key areas of application of management accounting of payment risks to reduce the fraud losses rate during military operations. The method of trend analysis was used to identify the main trends in online trade payments in Ukraine before and after the intensification of military operations in February 2022. It was followed by a study using the method of in-depth semi-structured interviews of management accounting specialists in order to identify the results of the influence of management accounting on payments risks reducing the fraud loss rates of online trading companies during military operations. The reduction in the fraud loss rates during military operations was assessed based on the survey data as part of the analysis of the effectiveness of management accounting of payment risks. The final stage of the study involves the identification of limitations in terms of methodology and implementation of the conducted research on the impact of management accounting of payment risks on reducing the fraud loss rates during military operations. The conclusions of the conducted research were drawn.

2.2. Sample

A survey of a sample of management accounting specialists of online trading companies was conducted in this study in order to identify the specifics of the impact of management accounting of payment risks on reducing the fraud loss rates during military operations. The sample consisted of 180 management accounting specialists from the field working in Ukrainian companies engaged in online trade. The general set of companies in which the surveyed management accounting specialists work is represented by Ukrainian online trade companies that operate in Ukraine. The selection criteria are business activities for at least the last 3 years and the continuation of work after the intensification of hostilities in February 2022. The companies are determined by the method of simple random sampling. The questionnaire used in this study is developed by the author and consists of 15 questions: 12 closed-ended questions and 3 open-ended questions.

The sample includes respondents with different levels of professional experience in the field of management accounting - 1-2 years, 3-5 years, and more than 5 years. The respondents have higher or incomplete higher education. The structure of the studied sample is presented in Table 1. The researched sample was formed by the purposive sampling method. This method contributes to the fact that the studied sample of specialists has a diverse representation of the experience of the impact of management accounting of payment risks on reducing the fraud loss rates during military operations. The respondents were selected based on their level of professional experience, level of education, as well as belonging to the field of online trade.

Table 1. The structure of the researched sample of specialists in management accounting of companies in the field of online trade

Years of experience of specialists	Number of respondents	Educational level	Geographic affiliation
1-2 years	60	Incomplete higher education, Higher Education	Ukraine
3-5 years	60	Higher Education	Ukraine
More than 5 years	60	Higher Education	Ukraine

Source: created by the author

Criteria of the studied sample:
1. Geographical distribution (Ukraine);
2. Level of professional experience (Junior specialists: 1-2 years of experience, Mid-level specialists: 3-5 years of experience; Senior specialists: more than 5 years of experience).
3. Level of education (Higher; Incomplete higher education).
The sampling procedure:

1. Identification of potential candidates: a list of management accounting specialists who meet the research criteria was obtained in cooperation with companies in the field of online trade and industry associations. An additional applied tool for identifying potential candidates was personal recommendations in the professional circle of researchers.

2. Segmentation: Potential candidates are segmented based on their professional experience and education level. Representation of each relevant level of professional experience in the selected groups was ensured.

3. Random selection of candidates: specialists are randomly selected from each segment, which ensures representativeness in terms of professional experience and educational level.

4. Contacting the candidates: the researchers contacted the selected candidates using official communication channels to explain the purpose, scope, content of the survey.

5. Consent to participate in the survey was received from the candidates.

The data were collected through semi-structured interviews, which allowed for a controlled and flexible survey process. Interview questions covered the use of online transaction monitoring and analysis tools, payment risk forecasting approaches, regular updates of risk management accounting approaches. The interview lasted approximately 15 minutes and was conducted using a secure online video conferencing service. The research was conducted in strict accordance with ethical standards and ensured the anonymity of respondents.

2.3. Methods

Economic and statistical methods (trend analysis, in-depth semi-structured interview, economic analysis in terms of fraud losses) were applied in order to determine the specifics of the influence of management accounting on losses caused by fraudulent transactions in wartime. The study involved a survey of management accounting specialists, which was designed to identify the peculiarities of the impact of management accounting on fraud losses. The survey was conducted using the method of qualitative research, namely an in-depth semi-structured interview of 180 management accounting specialists of companies from the sphere of online trade in Ukraine.

The structure and features of the formation of the studied sample of management accounting specialists are presented in greater detail in the previous block - Sample.

The results of the interview are represented by the following indicators: 1. Application of tools for monitoring and analysing online transactions; 2. Application of approaches to predicting payment risks; 3. Applying regular updates of risk management accounting approaches. Table 2 provides a description of the indicators. The selection of selected indicators for the sample is based on best practices in terms of scientific and practical issues of using management accounting to limit fraudulent online trade transactions. The selection of these indicators is based on the methodology of a number of leading financial institutions, consulting companies, and research centres, in particular, Juniper Research (2023), KPMG (2022), Deutsche Bank (2022), Crowe (2019).

Table 2. Indicators used as part of the economic statistical analysis of key measures of management accounting of online trade payment risks

| Indicator	Comment
Application of tools for monitoring and analysis of online transactions	Availability of tools to detect suspicious transactions (rapid repeat transactions; numerous disparate delivery addresses associated with a single payment card; discrepancies between IP address location and delivery location), % of respondents
Application of approaches to predicting payment risks	Availability of assessment tools and consideration of potential losses due to the realization of payment risk, % of respondents
Application of regular updates of approaches to management accounting of risks	Regular updates of internal regulatory documents regarding management accounting of risks (in terms of identifying fraudulent transactions; regular reconciliation of accounts and transactions; tracking the level of fraud losses), % of respondents

Source: created by the author

MS Excel was used as part of research to analyse sample data. Limitations of this study include potential errors or interviewer biases, as well as respondent recall mistakes. The purposive sampling method was implemented, and attention was focused on management accounting specialists of Ukrainian online trading companies in order to eliminate the shortcomings of the study. The steps were taken to generalize and discuss the results with other researchers, as well as participant checking measures to increase the validity and reliability of this study. Consolidating the results in an extended circle of researchers involves discussing the research process and the

results obtained. The respondents are checked through the presentation of findings to ensure their correctness and relevance.

3. Research Results

The state of online trade and payment risks in Ukraine are influenced by exogenous and endogenous drivers, in particular, the intensification of military operations, the development of technologies, and the expansion of cyber threats. According to the National Bank of Ukraine (2022), transactions for payment of goods and services on the Internet accounted for more than a quarter (27.0% as of May 2022) of the total volume in the structure of non-cash transactions using payment cards after the intensification of hostilities in February 2022. There has been a total of 588 million transfer transactions amounting to $12.2 milliard in the 3-month period since the beginning of the full-scale invasion in February 2022. As of May 2022, the average amount of transactions for payment of goods and services on the Internet was $13. The data is presented in Figure 1.

Figure 1. Structure of non-cash transactions using payment cards in Ukraine, % of the number of transactions, May 2022
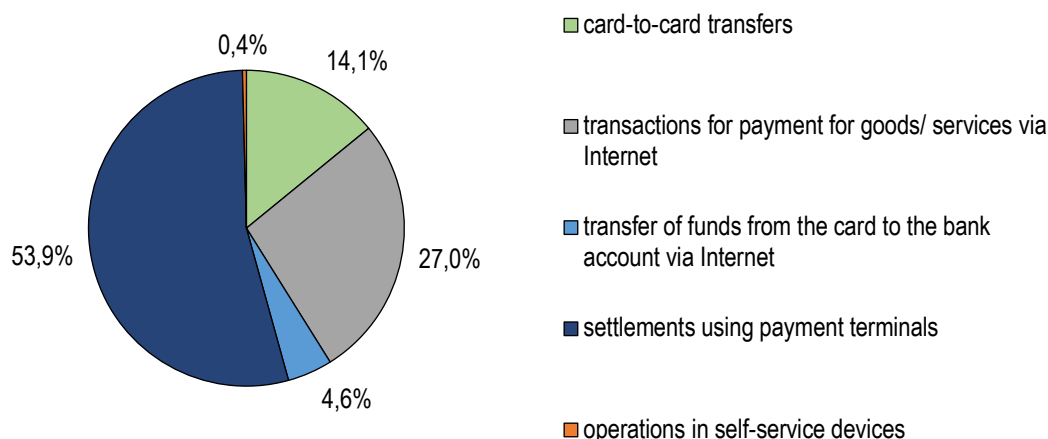
Source: created by the author based on the National Bank of Ukraine (2022) data

The vast majority of money transfer systems functioned adequately despite active military operations in Ukraine. As of October 2022, 35 money transfer systems were operating in Ukraine, 28 of which were created by residents. According to the results of Q1-Q3 of 2022, 162 million transfers in the amount of $2,848 million were made within Ukraine using payment systems (in equivalent); to Ukraine - 3 million transfers in the amount of $747 million (in equivalent). The dynamics of these transfers did not experience a significant drop because of the intensification of hostilities from February 2022. The data are presented in Figure 2.

Figure 2. The number of transfers made through payment systems, USD million (equivalent), Q3 2020-2022
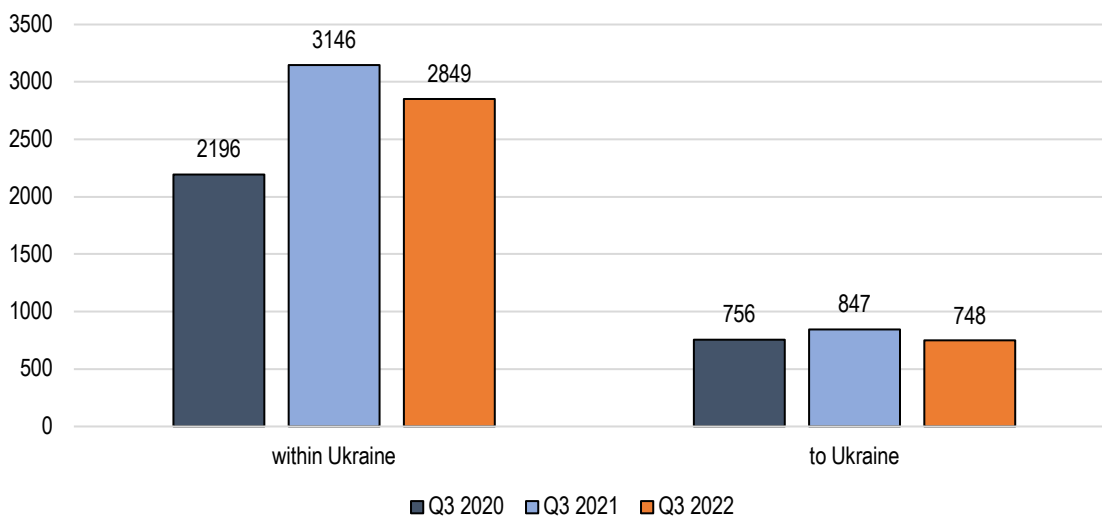
Source: created by the author based on the National Bank of Ukraine (2022) data

We also note the activity of payment systems in Ukraine during acute hostilities. According to the National Bank of Ukraine (2022), there were 7 payment systems of Ukrainian banks provided services in Ukraine; 17 payment systems of Ukrainian non-bank institutions; 4 intrabank transfer systems; 1 payment system of non-Ukrainian origin for 9 months of 2022. This situation reflects the high stability of the online payment system in Ukraine during active military operations. Almost half of transfers in Ukraine for Q1-Q3 2022 falls on the NovaPay service of Nova Poshta, the leading operator of the national transport delivery market. This emphasizes the importance of adequate functioning of payment systems for online trade during military operations. The data are presented in Figure 3.

Figure 3. Distribution of transfer amounts by money transfer systems created by banking and non-banking institutions within Ukraine by participants, %
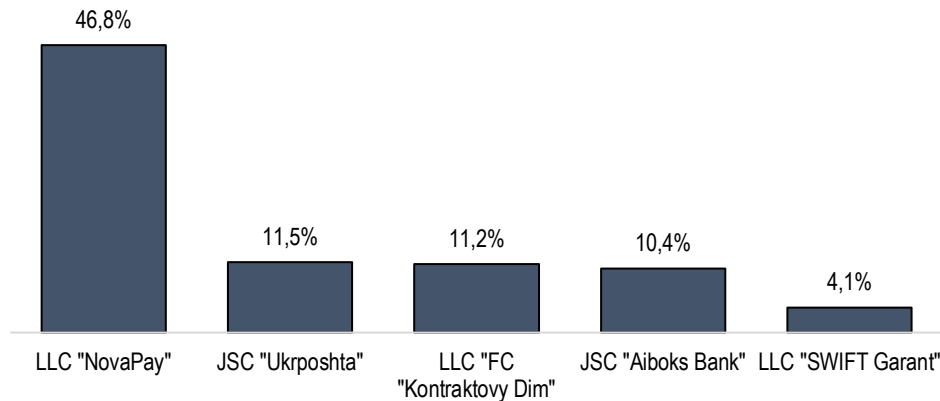
Source: created by the author based on the National Bank of Ukraine (2022) data.

In the context of online payments in 2022, banks, traders and customers suffered a total loss of more than $14.9 million because of illegal transactions with payment cards (National Bank of Ukraine 2022). This is 46% more than in 2021 before the intensification of hostilities. The number of illegal transactions using payment cards that entailed losses increased by 8%. The average amount of a single fraudulent transaction in 2022 was approximately $68, a third more than in 2021 ($52). At the same time, 86% of all payment fraud cases occurred online, while only 14% occurred through physical devices (retail network, ATMs, self-service devices) in 2022.

The development of the technological trend of Ukrainian online trade is noticeable. In 2022, traders expanded the payment functionality during active military operations, which is convenient for users. In particular, according to the results of the study (UAFIC, National Bank of Ukraine 2022), 53% of retailers reported an increase in the range of digital payments in 2022 compared to 38% in 2021, which is an increase of +15 pp. Electronic wallets, QR code payments, and digital invoices stand out among the innovative strategies initiated by retailers. The data are presented in Figure 4. The development of the online trade ecosystem necessitates the improvement of the management accounting system for adequate management of the extended technological functionality of online payments.

Figure 4. Areas of expansion of the payment functionality of online trading platforms in Ukraine, % of respondents, 2022
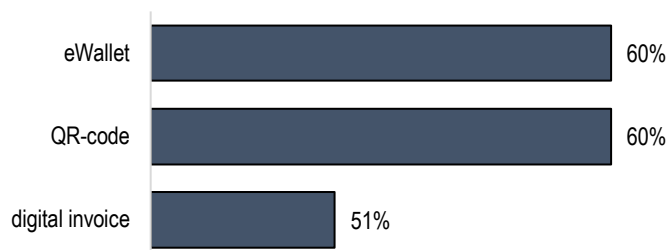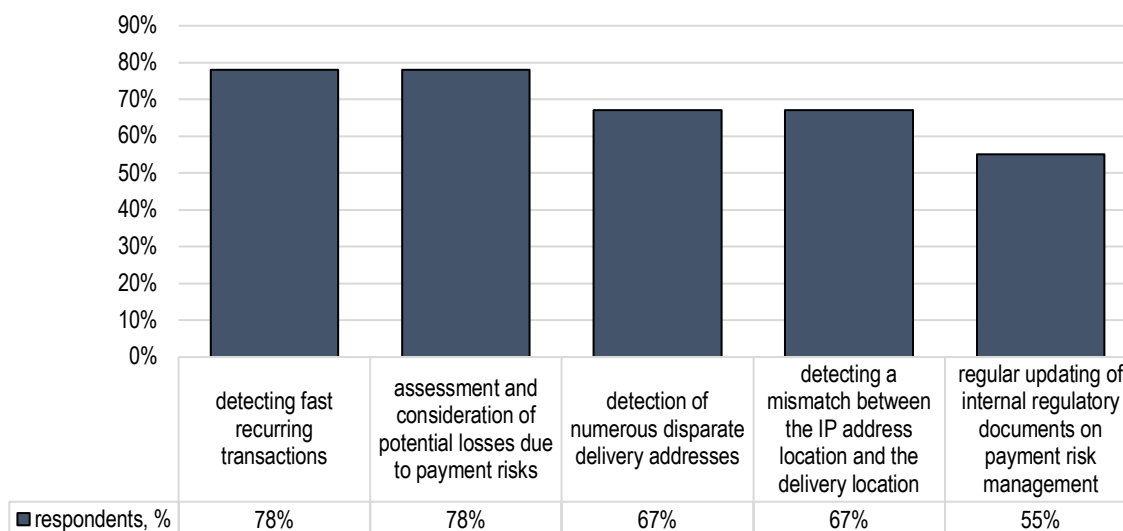

Source: created by the author based on the UAFIC, National Bank of Ukraine (2022) data.

The key directions of management accounting of payment risks of online trade during military operations were studied considering the selected trends of online payments. Interviewing a sample of management accounting specialists established that the detection of suspicious transactions is the most widespread tool in this context.

The management accounting tools identify fast recurring transactions; numerous separate delivery addresses associated with a single payment card; mismatch between the IP address location and the delivery location. Besides, measures are widely taken to regularly update internal regulatory documents of management accounting of risks. The priority directions in this field are identification of fraudulent transactions, regular reconciliation of accounts and transactions, monitoring of the fraud loss rates. The results are presented in Figure 5. This complex of solutions for management accounting of payment risks of online trade is quite effective in the turbulent period of military operations, including for fraud prevention.

Figure 5. Key priorities in management accounting for fraud transaction in online trade, % of respondents, 2022

	detecting fast recurring transactions	assessment and consideration of potential losses due to payment risks	detection of numerous disparate delivery addresses	detecting a mismatch between the IP address location and the delivery location	regular updating of internal regulatory documents on payment risk management
■ respondents, %	78%	78%	67%	67%	55%

Source: created by the author based on studied sample data.

Analysis of the studied sample of management accounting specialists also showed that companies engaged in online trade, which widely used the tools of management accounting of payment risks, achieved a reduction in the fraud loss rate. According to National Bank of Ukraine (2022), this reduction was 12% of the industry average for 2022. This reduction in the fraud loss rate improves the financial results of companies, supports their operational and financial stability, improves business reputation, and demonstrates the effectiveness of adequate managerial accounting of payment risks.

4. Discussions

So, the peculiarities of management accounting of payment risks during active military operations are established. The obtained results will be described in greater detail below.

This study accumulates and synthesizes critical findings from a wide range of sources and identifies current trends in online commerce and online payments in Ukraine during hostilities. Managing the payment risks of online commerce is critical, especially in view of the spreading vulnerabilities in the digital environment, including fraudulent transactions. Earlier work by Affia et al. (2020) emphasize the need for a threat-based approach to risk management in online trading systems. This thesis is supported by an earlier study by Wang (2020) on means of protection against the risks of international payments in online trade and points to the global nature of the dangers faced by online trading companies. Earlier work by Grüschow and Brettel (2018) deals with the payment aspect of online commerce, particularly the challenges faced by international online traders. In particular, the focus on transaction costs reveals another layer of complexity that online commerce companies must manage to streamline operations and improve the consumer experience. This result is related to an earlier study by Nasr and Farrag (2020) in terms of emphasis on the broader context of electronic payment systems, which combines both opportunities and challenges for online commerce. Understanding and managing these difficulties is critical for e-commerce businesses seeking to make the most of digitization.

This study determined that the development of the online trade ecosystem necessitates the improvement of the management accounting system for adequate management of the extended technological functionality of online payments. This thesis is supported by an earlier study by Lin (2021) on international online trade payments in the context of online financing platforms, which demonstrates the relationship between digital finance and online trade. Earlier work by Yang and Yin (2023) examines the implications for management accounting in the context

of the interaction between online trading platforms and cyber security tools. Additional confirmation of this thesis can be found in the earlier work of Byelozertsev and Prokhvatylo (2018), which provides a comprehensive view of the issue of management accounting of online trade as part of a dense network of factors that must be considered in the digital environment. This result also confirms the earlier work of Dutta et al. (2019), which identifies the relationship between the mechanics of online commerce – especially its supply chain – and business environment risks that need to be carefully managed. This line is also supported by the earlier work of Wang et al. (2022a) with a focus on avoiding risks of online commerce supply chains, especially when combined with advanced analytics tools. In this context, an earlier study by Ady et al. (2022) emphasize the need to take into account regulatory aspects in the fight against cybercrime in online trading operations to achieve sustainable results in the market.

In contrast to the existing studies, the results of this study emphasize the need for a more detailed and in-depth study of the complex of management accounting of payment risks of online trade in the context of intensifying military operations. This study emphasizes the importance of assessing the potential for reducing fraud losses through a systemic approach to the management of payment risks during military operations. Moreover, this study emphasizes the need for regular updating of internal regulatory documents on risk management accounting with a focus on fraudulent transactions, which can contribute to improving the state of payment risk management in a turbulent period.

Conclusions and Further Research

So, the key directions of impact of management accounting on payment risks in terms of fraudulent transactions during military operations are determined. This task is difficult because of the intensification of military operations in Ukraine and, accordingly, the aggravation of exogenous and endogenous challenges in terms of users, companies, and payment infrastructure.

A study of the online trade payment risk management system in the context of military operations showed that the detection of suspicious transactions is the most common tool. This is, in particular, the detection of fast recurring transactions (78% of respondents); identification of the multiple delivery locations associated with one payment card (67% of respondents); distinguishing between the IP address and the place of delivery (67% of respondents). Practices of regularly reviewing internal regulatory documentation on management accounting for payment risks are less common (55% of respondents) in this context. These measures include updating the methodology for detecting fraudulent transactions, regularly reconciling accounts and transactions, and monitoring fraud losses. The study showed that e-commerce companies that systematically used payment risk management solutions achieved an average reduction in fraud losses of 12%, compared to the industry average loss rate for 2022. Such a reduction in losses improves the companies' financial results, preserves their operational and financial stability, strengthens their reputation. The obtained results demonstrated that management accounting plays a decisive role during turbulent situations in mitigating the negative consequences of payment risks, namely in reducing fraud losses. These results can be used to improve online trading management practices in financial and operational units, both during military operations and in other crisis situations.

Prospects for further research in this area include the analysis of the management accounting system considering the potential of artificial intelligence and machine learning to detect fraud. An additional direction of research in this field is the issue of digitization of the analysis of payment risks in the management accounting system.

Credit Authorship Contribution Statement

The authors equally contributed to the present research, at all stages from the formulation of the problem to the final findings and solution.

Declaration of Competing

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Did Russia's Invasion of Ukraine Induce Herding Behavior in the Indian Stock Market?

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Abstract: *This study empirically examines the herding behavior of the Indian stock market investors during the heightened geopolitical tensions between Russia and Ukraine in 2022.*

An intensified Russia-Ukraine geopolitical event window was constructed, and the high-frequency trading data (intraday) of the Nifty index was analyzed using Multifractal Detrended Fluctuation Analysis (MFDFA) to compute the 5th-order Hurst exponent (Hq (5)) that detects herding behavior.

The study's empirical results revealed the presence of profound herding behavior during the intensified Russia-Ukraine geopolitical event window. The study contributes to the existing literature on herding behavior by examining the impact of a geopolitical event on the Indian stock market. Additionally, the study utilizes MFDFA to compute Hurst exponents, a relatively new approach to detecting herding behavior in financial markets.

The findings of this study may assist investors and policymakers in understanding the impact of geopolitical events on financial markets and the potential for herding behavior among investors during times of heightened uncertainty. The study's results demonstrate the interconnectedness of global events and financial markets, highlighting the need for policymakers to consider the potential social and economic consequences of geopolitical events.

Introduction

Economies and financial markets are more interconnected than ever because of increased cross-border trade and access to financial markets. Market turbulence in one market can have ripple effects on many other financial assets and markets, impacting many global economies. The Contagion effect explains where a shock in one economy, region, or market spreads and affects different regions, economies, and markets. The stock market price changes show a robust response to such market shocks, causing panic among investors. Investors usually imitate others' actions when presented with such uncertainty. This is known as Herding behavior. Shock-based herding is common during various shocks, including economic collapse, currency and commodity devaluations, geopolitical issues, the Central Bank's decision about liquidity management, and pandemics (Khan and Suresh 2022).

Geopolitical conflicts are one of the most striking contemporary issues that nations across the globe are battling during recent times. Some of the most significant geopolitical conflicts witnessed by the world, particularly post-COVID-19, include the India-Pakistan airstrikes of 2019, India-China boundary skirmishes of 2020, Ethiopian-Sudanese clashes of 2020, Afghanistan-Iran clashes of 2021, Israeli-Palestine conflicts of 2021, and the ongoing Russia-Ukraine conflicts of 2022. These events are otherwise termed extreme events as they significantly disturb the performance of the financial markets by inducing abnormal volatility that eventually instigates investors to follow herding behavior to make their investing decisions (Mertzanis and Allam 2018; Dhall and Singh 2020).

The ongoing Russian invasion of Ukraine is not just a geopolitical conflict but an intensified war. Their tensions have prevailed for a long time but intensified out of control only in early 2021. However, amidst their tensions, the President of Ukraine hinted to the President of the US that Ukraine wanted to be a member of NATO in January 2021. NATO, too, agreed to make Ukraine its member. This instantaneously irked Russia as it did not want NATO to permit Ukraine to be a member. The reasons Russia opposed Ukraine's entry into NATO are twofold. Firstly, if Ukraine is given NATO membership, it would enlarge its grouping's footprint to its boundary. Secondly, any member nation of NATO will be entitled to united support by all members in case of any attacks from external countries(BBC 2023). Kyiv, a city in Ukraine, qualms against aggression by Russia as the latter previously invaded Crimea from Ukraine. Being extremely infuriated in this regard, Russia started indulging in massive military expansion activities by deploying its troops across its boundaries with Ukraine. Russia maintained that its military exercises in Eastern Europe aimed to safeguard its security considerations. Nevertheless, Russia deployed close to 1 lakh troops on its boundary with Ukraine. This eventually escalated into a full-scale attack from Russia on Ukraine on February 24, 2022, that caused devastating and disastrous consequences on the performance of the financial markets worldwide.

In this regard, several developed and emerging stock markets across the globe experienced a considerable fall immediately as the President of Russia officially declared war against Ukraine(The Economic Times 2022a). For instance, on February 24, 2022, leading global indices, including the S&P 500 and the American DJIA, recorded an intraday low of 4114.65 and 32,272.64 (a fall of 180 and 997 points), respectively, from its intraday high. Besides, the composite European index, such as the STOXX 600, fell by 3%(Balbaa, Eshov, and Ismailova 2022). In addition, major indices in the Asian markets fell from their intraday open, including Singapore's STI by 2.29%, Hong Kong's Hang Seng index by 1.61%, and the Chinese Shanghai Composite index by 1.30%(The Economic Times 2022b). Moving on to one of the largest emerging Asian stock markets like India, Nifty 50, also significantly fell by 1.80% respectively from its intraday open. The substantial volatility in the global market indices, including the National Stock Exchange, India, during the Russia-Ukraine war of 2022 provides us with an eminent ground to examine the traces of herding behavior in the Indian stock markets.

India's macroeconomic fundamentals were disrupted by geopolitical tensions as prices for food, metals, and crude oil rose significantly after the declaration of the war. The Russia-Ukraine conflict severely damaged the world's supply chain, leading to a global food shortage and, as a result, rising inflation. In April 2022, inflation in India reached a high of 7.8%(The Indian Express 2023). Economic growth will be impacted if inflation stays high. According to the Indian Ministry of Commerce and Industry, as of December 2022, imports and exports from Ukraine have decreased by 83.25% and 69.65% in a single year. Essential imports from Ukraine, such as vegetable oils (-91.91%), iron and steel (-76.22%), chemical products (-97.26%), and electrical machinery and equipment (-97.99%), have been affected. Significant exports to Russia are predicted to suffer due to the conflict. Exports to Russia from India like rubber (-96.83%), plastic (-86.18%), leather(-93.93%) wood(-72.05%) and organic chemicals(-60.45%) have been reduced. This is due to the ongoing war between Russia and Ukraine.

As a result, the respective sector stocks will be impacted. Another impact of the war is on the supply of crude oil. India is one of the Asian countries to which Russia has been exporting crude oil at a discount because of Western sanctions. India's crude imports from Russia increased 9.2% monthly to 1.4 million barrels daily in January 2023, making Russia India's biggest crude oil supplier. The massive trade relations with Russia and Ukraine and the macroeconomic effect of the war drastically impacted the behavior of investors and industries in the Indian stock market. Therefore, this study examines the traces of herding behavior in the Nifty index.

This study tries to investigate the herding behavior of investors when Russia announced the invasion of Ukraine, as investors tend to be more sensitive to such announcements in the initial stages of an event. The study will test if Indian stock market investors demonstrated meaningful herding tendencies attributable to the uncertainty from the Russia-Ukraine conflict. Although few studies have been done on the conflict between Russia and Ukraine, no study analyses investor behavior in the Indian market. This study is unique because it tries to investigate traces of herding behavior using the econophyiscs tool, the Hurst Exponent using MFDFA analysis. The study's findings and outcomes will have far-reaching repercussions for market players such as traders, investors, analysts, and regulatory authorities.

The paper is divided into five sections. The appropriate literature review is examined after the introduction. The data and methodology are presented in the second section. Results are presented in the third section. Discussion and interpretation are the fourth section, and the fifth section gives the conclusion.

1. Literature Review

1.1 Herding Behavior in Financial Markets

When investors imitate other people's actions in response to extreme events, this is herding behavior(Cont and Bouchaud 2000; Sornette 2003). Herding is a process in which investors trade in the same way simultaneously, either because they are imitating one another or because they have converted to the market average. Hwang & Salmon (2004) define herding as the circumstance in which investors disregard their expectations and convictions and imitate the choices made by their peers or market movements. A group of investors engage in herding behavior when they purposefully mimic the actions of other investors they perceive to be more informed rather than acting on their convictions and making their predictions while buying or selling comparable equities over a set period (Chen et al. 2018; Chang et al. 2018). This could result from several factors, including the global economic meltdown, devaluations of currencies and commodities, the Central Bank's choice to manage liquidity, pandemics(Ghosh et al. 2023; Espinosa-Méndez and Arias 2020a; 2020b; Dhall and Singh 2020) and geopolitical concerns(Bougatef and Nejah 2023; Sohag et al. 2022; Krishna and Suresha 2022). In recent years, the geopolitical tensions between the nations have significantly increased. After being battered throughout 2021 by the COVID-19 pandemic, supply chain and logistics disruptions, elevated inflation, and financial market turbulence, the escalation of geopolitical tensions into war from late February 2022 between Russia and Ukraine has given a devastating blow to the global economy. Such warfare impacts not only the participating developed economies but also other countries across the globe. Despite simply being spectators, emerging markets and developing economies suffer the most from such a geopolitical conflict because of their economic integration and trade dependence on developed countries. This has several effects, including sudden, abrupt fluctuations in the financial markets.

1.2 Geopolitical Influence on Financial Markets

Geopolitical conflicts impact the financial markets. Currency spot markets often react fast to adverse events, losing, on average, as much value in two days as they would ordinarily lose over a month. In contrast, equities markets react more evenly to good and bad news (Petrov, Hentov, and Zumbo 2018). Research also indicates that geopolitical developments significantly impact the volatility of oil and commodity markets(Gopal and Munusamy 2016; P. Gong and Dai 2017). Invasions and wars impact stock markets, although the impacts vary by country, and this is well documented in the literature. Hudson and Urquhart (2014) investigated how World War II affected the British stock market. They examined whether severe occurrences, such as wars, significantly impacted stock returns and concluded that such events result in high market volatility and unfavorable market reactions. He et al. (2017) study the financial impact of non-violent diplomatic conflicts between Taiwan and mainland China and demonstrate how political stress is linked to a considerable reduction in stock market return. The MENA (the Middle East and North Africa) area is known for its ongoing conflict and instability. Geopolitical tensions have been shown to negatively impact MENA economies' expansion and hinder financial development and economic growth(Talbi, Chaibi, and Maoueti 2021; Soltani et al. 2021). The diplomatic and economic sanctions against Qatar significantly affected the stock market volatility in Qatar and other Gulf Cooperation

Council nations (Selmi and Bouoiyour 2020). The impact was different across various industries and nations. Arin et al. (2008) explore six different financial markets and demonstrate that conflicts considerably impact stock markets and stock market volatility, with the scale of these effects being more significant in emerging markets. In contrast, Sohag et al. (2022) claimed that geopolitical events in emerging countries have little impact on the global economy since their effects on the assets under examination are mainly temporary and of local importance. Therefore, geopolitical conflicts are perceived to impact returns and volatility in the stock markets worldwide. Furthermore, studies have been conducted to examine the effects of geopolitical risk (GPR) on the economy. The adverse effects on investment, employment, return on equity and bond spread, and stock market volatility indicate that GPR significantly impacts businesses and financial markets. According to a study of the BRICS countries, Russia has the highest risk exposure to Geopolitical risks. At the same time, India was found to have the most negligible impact on geopolitical risks among the BRICS (Balcilar et al. 2017).It was also observed that some sectors and companies see more significant growth because war may increase revenues. Liu et al. (2021) find that geopolitical unpredictability positively affects energy commodities like crude oil and natural gas. Schneider Troeger (2006) states that international markets often react negatively to war rather than positively, but occasionally, "war rallies" are also seen at stock exchanges. Most likely, war rallies are a phenomenon that can be seen in nations whose economies are only slightly affected by intensifying warfare. Guidolin and la Ferrara (2010) examine the effects of conflict commencement on asset markets and discover that conflicts greatly affected stock market indices, currency rates, oil, and commodity prices, with national stock markets exhibiting more positive than adverse reactions to conflict commencement.

1.3 Geopolitics and Herding Behavior in India

Geopolitical events create investor anxiety in India about secondary impacts, even when India is not directly involved(Das, Kannadhasan, and Bhattacharyya 2019). For example, The 1990 Gulf War, despite India's neutrality, shook India's economy and commodity markets due to rising oil prices and trade flows in the Gulf region employing many Indian migrants(Barsky and Kilian 2004). The 2018-20 China-US trade war raised fears among Indian investors about India's export competitiveness with a key trade partner(Fajgelbaum and Khandelwal 2021). Similarly, the 2022 Ukraine-Russia war, increased global uncertainty including inflation and interest rates, spurring investor herding in India(Sanjeev Kumar et al. 2023). Geopolitical uncertainties trigger herding behavior among Indian investors, causing them to mimic others' actions despite limited independent analysis. Increased media focus and social media echo chambers amplify dominant narratives(Fan, Talavera, and Tran 2020), while fear and risk aversion drive investors to imitate established players or follow perceived market trends. This results in correlated investment decisions regardless of individual assessments, as observed during the 2020 India-China border tensions(Krishna and Suresha 2021) and the 2008 Global Financial Crisis(Ferreruela and Mallor 2021).

1.4 Effect of Russia-Ukraine War on Global Economy and India

Whatever the effect of war on financial markets, positive or negative, it is bound to affect the behavior of investors and their investment decisions. Investors begin acting irrationally in such extreme circumstances(Loang and Ahmad 2023). It is well documented that investor sentiment is affected when such news announcements on conflicts between nations are made (Akhtar et al., 2011; Białkowski et al., 2008; Makololo & Seetharam, 2020; Plakandaras et al., 2019). Market participants' tendency to act in groups may cause significant market rallies and sell-offs. Some investors seek safer havens during extreme political and geopolitical unrest, such as buying gold (Akhtaruzzaman et al. 2021), while some imitate investment activities, which is riding behavior. Herding behavior in financial markets is related to behavioral finance (Ricciardi and Simon 2000). Studies in behavioral finance investigate why investors make judgments about their investments that defy the expectations of rational investors (Huang, Shieh, and Kao 2016). There may be various instances of why investors act irrationally in the financial markets. Reputational concerns (Popescu and Xu 2018), political reasons (Białkowski, Gottschalk, and Wisniewski 2008; Mertzanis and Allam 2018), economic reasons (Makololo and Seetharam 2020), or geopolitical reasons like wars(Boubaker et al. 2022) may affect the investment decisions of investors and lead to herding behavior.

While there are numerous existing studies analysing the economic and financial impacts of geopolitical conflicts, as well as some research on investor herding behaviors in general, there remains a significant gap in specifically examining Indian investor herding resulting from the current Russia-Ukraine conflict. This is concerning given both Russia and Ukraine's position as crucial trade partners and sources of resources for the Indian economy. The invasion of Ukraine by Russia in 2022 is believed to be the result of the big powers'

geopolitical rivalry reemerging, which escalates the geopolitical dangers. Pandemic. Such a war could challenge an emerging economy like India's economic prospects, resulting in uncertainty. Wars are primarily perceived as adverse events that surge market volatility (Manela and Moreira 2017; Naimy et al. 2020). They adversely impact the investor's behavior, eventually inducing them to follow the crowd/herd behavior. Therefore, this study examines how the Russia-Ukraine war impacted the herding behavior of investors in the Indian stock markets. For this purpose, the study aimed to identify the patterns of the herding behavior in Nifty 50 of the National Stock Exchange, during the heightened geopolitical tensions between Russia and Ukraine, 2022.

2. Methodology

2.1 Event Date and Event Window

Although the Russian troops conducted their military exercises in the borders of eastern Europe and began inching toward Ukraine in early February 2022, the President of Russia, Vladimir Putin, openly declared war on Ukraine only on February 24, 2022. Therefore, February 24, 2022, is deemed the event day, denoted as (t = 0). Thus, to examine the impact of this extreme event on herding behavior in the Indian stock markets, an event window of 15 trading days prior to and post the event day is employed in this study (Krishna and Suresha 2021). Further, the trading dates indicated from (t = -15) to (t = -01) and from (t = +01) to (t = +15) are set as Pre- and Post-event windows, respectively. A detailed description of the event window of intensified Russia-Ukraine tensions in 2022 is presented in Table 1.

Table 1. The intensified Russia-Ukraine Tensions 2022 event window

Dates	Event window (t)	Event Description
03-Feb-22	-15	Russia continued its military exercises with 6,000 troops and 60 jets near Crimea and Ukraine.
10-Feb-22	-10	Military training for ten days began in Russia and Belarus.
17-Feb-22	-5	The rebel-held areas of eastern Ukraine saw an increase in fighting.
18-Feb-22	-4	After weeks of warnings that a Russian assault on Ukraine was possible, the Biden administration concluded that Putin had decided to invade. The American Defence Secretary claimed Russian forces were "uncoiling and prepared to attack."
21-Feb-22	-3	Tensions increased when Vladimir Putin publicly recognized the independence of Ukraine's two pro-Russia regions (Donetsk and Luhansk).
22-Feb-22	-2	The Russian parliament permitted Putin to use force. Full blockade sanctions were in place from the US against the Kremlin-controlled VEB and PSB banks. Germany unexpectedly halted the approval of the Nord Stream 2 pipeline.
23-Feb-22	-1	The European Union froze the assets of 351 Duma members.
24-Feb-22	0	Vladimir Putin declares war on Ukraine, launching a three-front assault with the Russian army. According to the Russian President, the invasion is a "special military operation" aimed at "demilitarising and denazifying" Ukraine. Volodymyr Zelensky, the President of Ukraine, writes on Twitter that "Russia has chosen a road of evil, but Ukraine is defending itself."
25-Feb-22	+1	Russian forces advanced on Kyiv while blocking a United Nations Security Council resolution calling for their departure from Ukraine.
28-Feb-22	+2	The first negotiations between Ukrainian and Russian officials ended without a resolution.
02-Mar-22	+3	The United Nations General Assembly voted on a non-binding resolution denouncing Russia's invasion of Ukraine and calling for a total withdrawal. India and China both choose not to cast a ballot.
03-Mar-22	+4	Russia and Ukraine agreed to provide humanitarian channels to evacuate civilians during the second round of negotiations.
04-Mar-22	+5	The largest nuclear power facility in Europe, located in Zaporizhzhia, was seized by Russian soldiers. NATO declined Ukraine's request for no-fly zones because of concern that the crisis may worsen.
07-Mar-22	+6	Russian forces reportedly took Vasylivka, Tokmak, and Polohy, according to Ukrainian military forces. The Russian Defence Ministry announced the opening of six humanitarian corridors. The Ukrainian Government questioned the statement since only two links went to Ukrainian territory; the others all went to Russia or Belarus.

08-Mar-22	+7	Numerous international companies, including McDonald's, Visa, MasterCard, and Starbucks, suspended their activities in Russia in response to the United States of America's total prohibition on all imports of Russian energy.
09-Mar-22	+8	Russia denies attacking a maternity facility in Mariupol as claimed by Ukraine, who claimed Ukrainian fighters had taken over the structure.
10-Mar-22	+9	According to the Russian Defence Ministry, Russian soldiers will begin opening daily humanitarian corridors at 10:00
11-Mar-22	+10	Russia requests a cease-fire so that residents of Kyiv, Kharkiv, Mariupol, Chernihiv, and Sumy can evacuate. Nevertheless, the West and Ukraine accuse Russia of breaking the cease-fire deal.
14-Mar-22	+11	According to the Russian Defence Ministry, 23 persons were allegedly killed. The Ukrainian military, however, claims that Russian troops were behind the assault.
15-Mar-22	+12	Czech, Polish, and Slovenian Prime Ministers head to Kyiv to meet Volodymyr Zelensky. Furthermore, according to Zelensky, Ukraine should not join NATO.
16-Mar-22	+13	Russia accused Ukraine of bombing a Mariupol theatre where hundreds of civilians sought refuge.
17-Mar-22	+14	Russia captured the eastern Ukrainian cities of Izium and Rubizhne.
21-Mar-22	+15	The chemical plant Sumykhimprom in Sumy, Ukraine, had an ammonia leak.

Source: Authors' Construction.

2.2 Data and Sources

The study considered the major stock exchange Nifty 50 of the National Stock Exchange, India, to examine the traces of herding behavior under the impact of the Russia-Ukraine geopolitical conflicts. The high-frequency trading data (intraday data), called the tick-by-tick data during their regular trading timings, i.e., between 09:15 am and 3:30 pm, was obtained from the Bloomberg terminal. The list of the trading days and the respective number of observations for the Nifty index as per the Russia-Ukraine geopolitical event window is presented in the upcoming sections of the study.

2.3 Model Description

The study aims to examine the traces of herding behavior in the Indian stock market during the Russia-Ukraine geopolitical tensions in 2022. Conventional models frequently undervalue the multifractal characteristics of financial time series. For example, the CSSD method is more conservative, and herding behavior is occasionally overestimated in CSAD method (W. Gong, Li, and Yu 2022). The multifractal analysis is regarded as a reliable and standard technique to study complex systems, such as financial markets(Ghosh et al. 2018; Ghosh and Kozarevic 2019; Ghosh et al. 2020;Thompson and Wilson 2016). Therefore, to examine and measure the level of herding behavior in the Russia-Ukraine geopolitical event window, 2022, the Multifractal Detrended Fluctuation Analysis, also known as the MFDFA model, is employed in the study. The Kantelhardt et al. (2002) model of MFDFA is the most established, influential and prominent technique that computes and generates the values of the Hurst exponent (H_q), (Hurst 1951), in a non-stationary financial time series. Furthermore, the Hurst exponent (H_q) enables to examine the presence and measure the level of herding behaviour in the stock market time series (Sunil Kumar and Deo 2009), (Aslam, Mohti, and Ferreira 2020) and (Ghosh, Le Roux, and Verma 2020). The steps in the MFDFA approach are as follows:

The normal log returns for the Nifty broad index prices are computed in tick-by-tick frequency as follows:

$$T(i)= Ln(R_t/R_{t-1}) \tag{1}$$

T(i) denotes the tick-by-tick time series returns. Of the sectoral indices, which are non-stationary by nature, R_t represents the sectoral index price on tick t while R_{t-1} represents the sectoral index price at tick t-1. The following are the primary formulas for the Kantelhardt et al. (2002) model of MFDFA analysis:

Step 1: Construction of the Profile, $Y(p)$:

$$Y(p) \equiv \sum_{i=1}^{P} [T(i) - \bar{T}], i = 1, \dots, N \tag{2}$$

In the equation, $T(i)$ for $i = 1..., N$ denotes the possible non-stationary time series that resulted from the sectoral index returns of equation (1), where N represents the series length and $\bar{T}$ its mean.

Step 2: The second step in the MFDFA analysis is to divide the previously built profile $Y(p)$ into overlapping segments. In this step, $N_s \equiv$ int (N/s) i.e., non-overlapping segments of equal length s. Because the total length of the series N is usually not a multiple of the considered length s. As a result, a brief section of the profile $Y(p)$ is ignored, and the sub-division is realised from the opposite end as a result of this step, a total of $2N_s$ segments are obtained.

Step 3: The third step in the methodology section is to compute the local trend for each separately generated $2N_s$ segment using a least-square fit of the series. This is accomplished by estimating the profile in each window using a polynomial of degree *m*. Furthermore, the variance is calculated using the following formulas:

$$F^2(s,v) \equiv \frac{1}{s}\sum_{p=1}^{s}\{Y[(v-1)s+p] - y_{v(p)}\}^2 \tag{3}$$

For each segment v, v = 1, ..., N_s and

$$F^2(s,v) \equiv \frac{1}{s}\sum_{p=1}^{s}\{Y[(v-N_s)s+p] - y_{v(p)}\}^2 \tag{4}$$

For $v=N_{s+1},..., 2N_s$. Here, y_v(p) is the polynomial fit in segment *v*.

Step 4: The fourth step in the analysis involves averaging all segments from step (2) to obtain the qth -order fluctuation functions.

$$F_q(s) \equiv \{\frac{1}{2N_s}\sum_{v=1}^{2N_s}[F^2(S,V)]^{q/2}\}^{1/q} \tag{5}$$

In this case, the variable *q* can have any real value other than zero.

Step 5: The fifth and last stage in the MFDFA model is to find the scaling exponent of the fluctuation function for each *q* in order to obtain the relationship between F_q(s) and *s*. If f_q(s) is power-law correlated, the series for that *q* is in the log-log scale.

$$f_q(s) \sim s^{h(q)} \tag{6}$$

Table 2. Range of Hurst values H_q(5) and their respective interpretation

Hurst range	*Interpretation for the level of herding behavior*
0 < H < 0.5	Absence of herding behavior
H = 0.5	Markets follow random-walk behavior
0.5 < H < 0.64	Mild herding
0.65 < H < 0.71	High level of herding behavior
0.72 < H < 1.00	Higher level of herding behavior

Source: Ghosh, Le Roux, and Verma 2020

In equation (6), $h_{(q)}$ is regarded as the generalized form of Hurst exponent (Hurst 1951). Hurst values usually vary between 0.5 and 1.00. In the time series, the same is used to measure herding behaviour. The 5th-order Hurst exponent, i.e., $H_q(5)$, is calculated through the MFDFA analysis for each broad market index for tin he intensified Russia-Ukraine geopolitical event window, 2022. Further, the MFDFA codes established by Ihlen (2012) were used in the MATLAB software and ran to obtain the Hurst values ,i.e. $H_q(5)$. Table 3 depicts the Hurst exponent value range and its interpretation for herding behaviour.

3. Research Results

This section of the study presents the empirical results obtained from the Multifractal detrended fluctuation analysis. The values of the 5th-order generalised Hurst exponent, i.e., $H_q(5)$ for Nifty 50 are computed. The results are displayed appropriately for each trading day in the intensified Russia-Ukraine tensions event window, 2022.

Table 3: Depicting the 5th-order Hurst exponent, i.e., $H_q(5)$ for the Nifty 50 index

| Date	Event Window (t)	No. of observations	Hurst values $H_q(5)$
03-Feb-22	-15	4092	0.67888
04-Feb-22	-14	2780	0.59660
07-Feb-22	-13	6031	0.56562
08-Feb-22	-12	4615	0.66674
09-Feb-22	-11	2074	0.58066
10-Feb-22	-10	3433	0.57028
11-Feb-22	-9	2776	0.58891
14-Feb-22	-8	4516	0.28278
15-Feb-22	-7	7697	0.47579
16-Feb-22	-6	4246	0.52214
17-Feb-22	-5	3381	0.65125
18-Feb-22	-4	2679	0.50605
21-Feb-22	-3	4838	0.75296
22-Feb-22	-2	4681	0.54284
23-Feb-22	-1	2915	0.63762
24-Feb-22	**0**	**7001**	**0.72917**
25-Feb-22	+1	3624	0.63785
28-Feb-22	+2	6427	0.46614
02-Mar-22	+3	3553	0.65182
03-Mar-22	+4	4525	0.67098
04-Mar-22	+5	5776	0.62871
07-Mar-22	+6	4018	0.33802
08-Mar-22	+7	5749	0.71770
09-Mar-22	+8	5942	0.68807
10-Mar-22	+9	4878	0.60294
11-Mar-22	+10	2997	0.59314
14-Mar-22	+11	4628	0.64605
15-Mar-22	+12	5712	0.50622
16-Mar-22	+13	2244	0.57339
17-Mar-22	+14	2755	0.50622
21-Mar-22	+15	3927	0.41506

Source: Authors' Calculations using MATLAB software

Figure 1: The MFDFA output depicting the $H_q(5)$ for the Nifty 50 index on t = 0
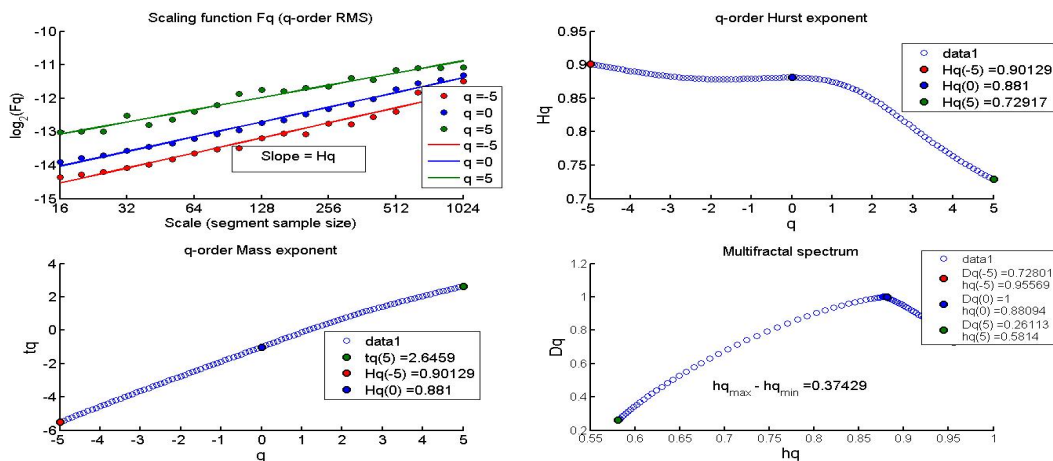
Source: From Author's using MATLAB software

Figure 2: The $H_q(5)$ values for Nifty 50 throughout the event window
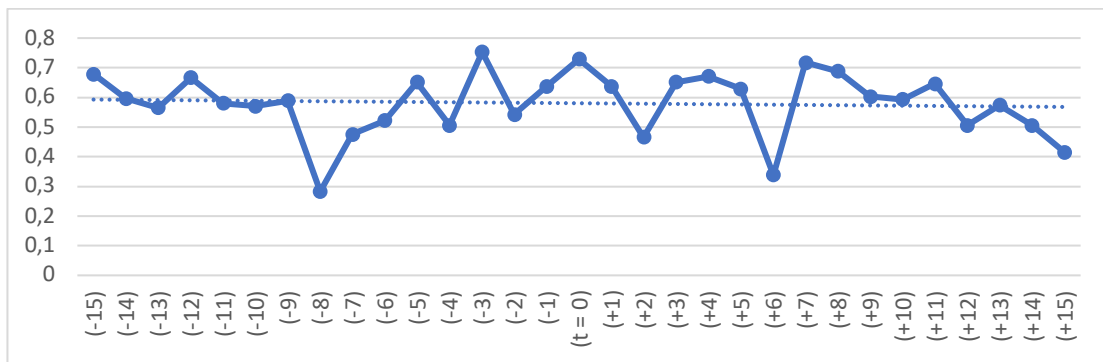
Source: Authors' Construction

Table 3 exhibits the $H_q(5)$ Nifty 50 broad index values for each trading day in the event window during the intensified Russia-Ukraine tensions, in 2022. It can be observed from Figure 2 that the $H_q(5)$ values recorded more than 0.5 most days in the intensified Russia-Ukraine geopolitical event window. This indicates a profound presence of herding behavior traces in the Nifty 50 broad index. The index recorded the highest Hurst value of 0.75296 on (t = -3) in the pre-event window, signifying the higher level of herding by the investors. Subsequently, on the event day, i.e., on (t = 0), the hurst value $H_q(5)$, clocked at 0.72917, as depicted in Figure 1, demonstrates higher herding levels in the Nifty 50 index. In addition, the overall average Hurst value traced in the index during the pre-and post-event windows of the intensified Russia-Ukraine tensions, 2022 being 0.574608 and 0.576154, respectively, confirms the existence of significant herding behavior.

4. Discussion

The findings of the empirical investigation carried out through the MFDFA analysis for Nifty 50 during the intensified geopolitical event window are discussed in this section.

The Nifty 50 index comprises companies from 13 crucial sectors of the Indian economy, and they provide a suitable representation for effective equity market analysis. (Bharti and Kumar 2021). The impact of Russia's invasion of Ukraine was evident in the major sectors of the Indian economy. A total of $177 billion was wiped out from the Indian stock market in the first hour of trade when Russian President Vladimir Putin officially declared war on Ukraine, i.e., on the event day(Business Insider 2022). Generally, in such times of uncertainty, investors enter into a state of panic. This negative market sentiment eventually contributed to a decline in the performance of the Indian index. This study unveiled the presence of the herding behavior traces among the investors of the Nifty index during the intensified Russia-Ukraine tensions in 2022. The appearance of herding behavior among the investors of Nifty can be for several reasons, including heightened geopolitical uncertainty,

disturbances in trade relations, supply chain disruptions, and anticipated increases in the cost of the commodities. An important trade partner, India has active trade relations with both nations. India exports commodities worth $2.5 billion to Russia(The Economic Times 2022c). India also imports several commodities from Russia, including mineral fuels, accounting for 34% of all imports, along with natural pearls and semi-precious stones (14%), fertilizers (10% of all imports), petroleum oils, and crude (5.6%). 84% of India's sunflower oil comes from Russia(Middle East Business 2022).

Furthermore, the trade relationship between India and Ukraine is also non-negligible. The international trade between India and Ukraine amounted to $2.35 billion between April 2021 and December 2022(Fortune India 2022). Such considerable trade dependency of India on Russia and Ukraine is bound to impact the Indian economy during the uncertain period of Russia-Ukraine geopolitical tensions. In addition, Russia and Ukraine are also major wheat producers worldwide, accounting for more than 18% of global exports(The Economic Times 2022d). As a result, the geopolitical conflict has harmed the Indian agro-based industries, impacting its sector stocks. One of the major suppliers of generic medicines to Russia is India. Due to a general market slowdown brought on by the war, the growth of branded generic markets was hindered in Russia. Pharmaceutical companies in several Indian states claimed they were not paid for the medicines exported to Russia. Shipment to Russia and Ukraine was halted at Indian ports. Payment delays prevented manufacturers from having enough money for regular operations, which disrupted production cycles. The Indian pharmaceutical sector relies on raw materials like crude oil, natural gas, etc., which directly affect transportation costs and reduce the competitiveness of Indian exports. As a result, the geopolitical crisis's effects on several other businesses, such as the oil and gas sector, could indirectly affect the pharmaceutical sector.

The auto industry's operating earnings significantly decreased. Stocks in the automotive industry fell once the war was declared. The cost of raw materials for construction, particularly cement supplies, also increased due to a spike in crude oil prices. Stocks in the real estate sector experienced notable drops after the announcement. The conflict also had an impact on the financial sector. The State Bank of India (SBI) ceased processing transactions from Russian firms under sanctions from Western nations. Concerning the metals industry, as most metals are either produced or refined in Russia or Ukraine, the war has significantly impacted the price of metal commodities(Business Standard 2022). The global electronic economy has suffered greatly due to the chip crunch. Sanctions on Russia contributed to the issue because of its significant involvement in the chip-making business. Electronic goods can become more expensive in India if the world economy keeps contracting and global supply chains come under more pressure. Hindrances in the supply chain have raised the manufacturing industry's input cost, caused unexpected production delays, and decreased industry profits. The interdependence of nations' export and import industries brought the fear of supply chain disruptions and shortages. No industry appears unaffected due to the tensions between Russia and Ukraine.

Petrol and diesel costs reached their high due to this ongoing conflict. The cost of transportation and logistics also increased along with the price of petrol and diesel, raising the cost of local and imported commodities. As India imports over 80% of its oil requirements, it will hugely impact the Indian economy. It is well known that inflation occurs due to rising fuel costs. The anticipated increase in the inflation rates is also one of the prominent factors that increased market volatility, causing panic among Indian investors. As a result, considerable traces of herding behavior were evident throughout this period of escalated geopolitical tensions in the Indian broad indices. Even before Russia attacked Ukraine, some previous incidents, such as Joe Biden's warning about the possibility of war and Vladimir Putin's recognition of the independence of Ukraine's states, had already created anxiety and uncertainty among the investors in the Indian stock market. This is substantiated by the high Hurst values on February 21, i.e., (t = -3), and February 23, i.e., (t = -1) in the pre-event window. The Hurst values recorded 0.75296 and 0.63762, respectively, depicting a higher-level herding behavior. On the event day, i.e., (t = 0), when the Russian forces invaded Ukraine, a higher Hurst value of 0.72917 was observed, which also depicted a high-level herding behavior. Russian forces attacked the Ukrainian capital city of Kyiv the following day. The investors of Nifty anticipated the war would continue for an extended period and were panic-stricken. It is difficult for investors to demonstrate their rational investment behavior during heightened geopolitical uncertainty. Consequently, this encourages them to behave in a panicked herding manner to protect their financial investments from losses caused by increasing geopolitical tension. This is evident by the high Hurst values on the same day (t = 2). This shows clear evidence of herding behavior among the investors during the Russian invasion of Ukraine.

The Government can take prudent measures to reduce the uncertainty in the market during such times. The Indian foreign trade policymakers should take preventive measures to de-risk the supply chain disruptions and curb inflation rates to reduce the panic and uncertainty among investors, eventually helping the markets

regain normalcy. The study is limited in terms of its focus on a single geopolitical event and using a specific method to detect herding behavior. The results may not be generalizable to other events or markets and may differ if alternative methods were used.

5. Conclusion and Further Research

This study investigated herding behavior in the Nifty 50 index of the Indian Stock market during the intensified Russia-Ukraine geopolitical conflict in 2022. An intensified Russia-Ukraine geopolitical event window was constructed, and the high-frequency trading data of the Nifty index was considered. Multifractal detrended fluctuation analysis (MFDFA) was employed to compute the 5th-order Hurst exponents, i.e., the $H_q(5)$ values to detect and measure herding behavior levels during the intensified Russia-Ukraine geopolitical conflict. The study revealed significant herding behavior in the examined Nifty index throughout the intensified Russia-Ukraine geopolitical event window, 2022. The findings of this study have some practical implications for investors, the Government, regulatory bodies, and policymakers. Herding causes the assets to be mispriced and the markets inefficient, creating market bubbles. Investors should be highly cautious when making investment decisions during such geopolitical unpredictability. Investor education programs can be conducted to make decisions based on long-term fundamentals over emotions. Additionally, financial regulators could enact transparent mechanisms like warning systems and trading limits during conflicts to improve stability. Furthermore, policymakers' clear communication of economic trajectories, regardless of uncertainties, can reassure markets. Using collaboration with finance experts, specific actions for informing retail investors, empowering regulators to enact preventative frameworks, and aligning state policies to stability can mitigate risks of tension-fuelled herding in Indian capital markets. The Indian Government must closely watch, assess, and react to the current situation for this ongoing conflict to potentially have a favorable conclusion in many sectors. The war is also impacting the flow of commodities, and hence the Indian Government must carefully control exports and the country's overall domestic stock availability. This study has mainly emphasized herding behavior during the Russia-Ukraine geopolitical tensions 2022 of the Indian stock market. Further studies can be conducted to examine herding behavior across different Nifty sectoral indices of the Indian stock market and stock market indices of emerging economies. Researchers can also consider examining herding behavior while considering the size and liquidity of stocks.

Credit Authorship Contribution Statement

Tabassum Khan: (Conceptualization, Investigation, Project administration, Software, Formal analysis, Writing – original draft, Data curation, Validation, Writing – review and editing, Visualization).
Natchimuthu Natchimuthu: (Conceptualization Investigation, Project administration, Software, Supervision, Validation, Writing – review and editing, Visualization).
Krishna TA: (Conceptualization, Investigation, Methodology, Project administration, Software, Formal analysis, Writing – original draft, Writing – review and editing, Visualization

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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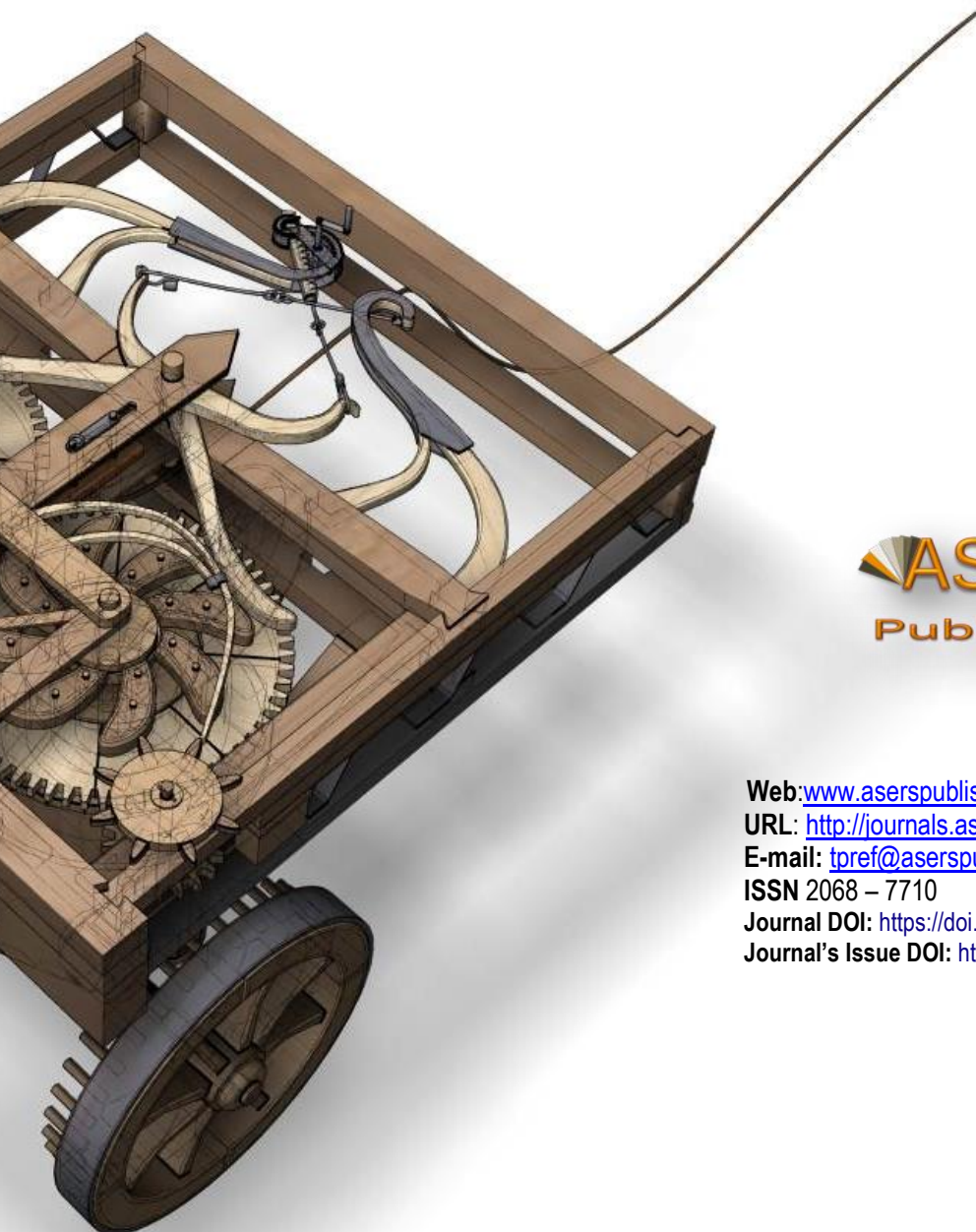
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