Theoretical and Practical Research in Economic Fields

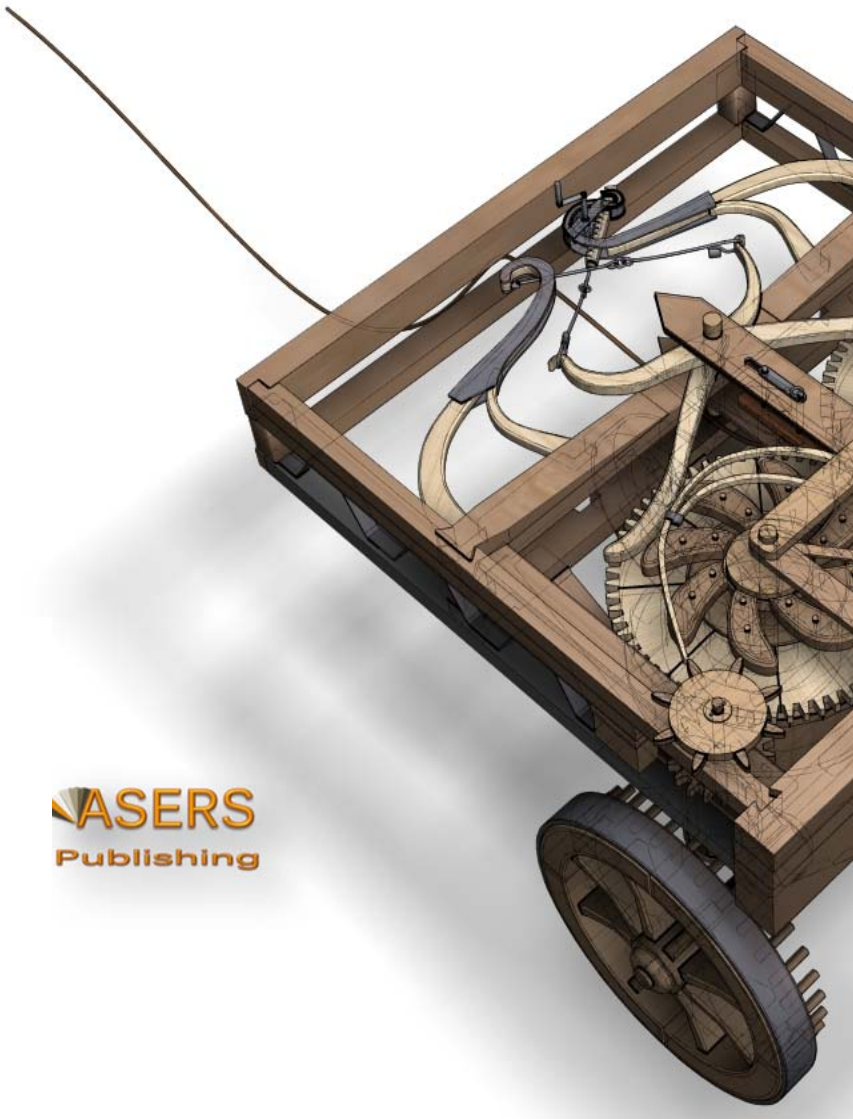

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Table of Contents:

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Theoretical and Practical Research in Economic Fields

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ECONOMIC DEVELOPMENT. A HISTORICAL - NEOINSTITUTIONAL APPROACH OVERVIEW

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Abstract: *This paper aims to investigate economic development through a historical-neoinstitutional approach, to improve the understanding of the process of economic change. It will try to demonstrate how the intervention of the institutions can trigger a virtuous circle able to reduce transaction costs, facilitate the dissemination of information, in order to make the functioning of the economy more efficient. In this sense, economic change is identified as an intentional process triggered by the combination of the beliefs and preferences of individuals. All this takes place through the intervention of rules, procedures and organizations. This scenario differs from that represented by the neoclassicists, both for the importance given to the market, to companies and other organizations linked to the institutional environment, and for the importance given to transaction costs. In this regard, the reasons for the existence of institutions such as companies and hierarchical organizations have been researched. The survey will therefore focus on the importance of the link between institutions and economic development, in order to achieve an improved understanding of the process of economic change.*

Keywords: beliefs; economic development; institutional change; uncertainty; institutionalism; game theory.

JEL Classification: B15; B25; B52.

1. Introduction

The study of development economics can be undertaken following different approaches, one of which is that of neo-institutionalism[1]. In this approach, within development economics, and as comparative economic history shows, contexts of underdevelopment are accompanied by high transaction costs and difficulties in transmitting information. Therefore, in order to create a development scenario, the intervention of all the institutions that are able to reduce high transaction costs and facilitate the transmission of information is necessary (Libecap 1998). This also enables us to improve our understanding of the process of economic change and explain the different behavior of economic systems in terms of growth.

Looking at a fairly developed economy, such as America for example, North (1984) highlighted the key role that the evolution of institutions has played in reducing transaction costs and, therefore, in increasing both production and income. On the contrary, if we consider the South of Italy, "institutions and norms" play a crucial role, as they orient and regulate the life of individuals, communities and nations; if it is insufficient, it hinders cooperative and efficient behavior. If we take a poorly developed country as a reference, the deficiencies of

[1] Oliver Williamson was the first to introduce the expression "new institutional economics", which, since the 1990s, has become the benchmark for different theoretical currents, united by the thought that institutions 'matter', and their analysis can be carried out through the tools of standard economic theory, making adjustments for the incompleteness it features (Williamson 1973). However, the origin of the 'new institutional economics' is to be found in Coase (1937).

institutions and rules imply a series of negative consequences, ranging from an increase in uncertainty to high transaction costs, resulting in a malfunction of the markets. In addition to these, there are other critical issues, such as the absence (or almost absence) of specialized labour and venture capital, which hinder the creation of new businesses, leading to processes that are both demultiplicative and decelerating (Marzano 2011, 60-63).

In this regard Coase (1998) argues that if the productivity of economic systems depends on specialization, and that it is not reflected in the absence of exchange, the lower the exchange costs are, the higher the productivity of the economic system will be. He adds that market transactions generate costs, which are reflected in the search for appropriate prices and the negotiation of separate contracts. When transaction costs become excessively high, one can, alternatively, rely on the company, which presents itself as a centralized institution marked by hierarchical principles. For example, an individual, rather than selling his own products or services in the marketplace, may choose to work in a company, voluntarily subjecting himself to the authority of an entrepreneur. In this way, within a company these transactions are eliminated, and the complex structure of market transactions is replaced by the entrepreneur, who can coordinate production. It is clear that in this specific case the company replaces the market, thereby reducing the costs of the pricing process.

Coase (1992) thinks that the performance of an economy is linked to what happens inside the enterprises, and the entrepreneur must do everything possible to produce at a lower cost than the purchase cost on the market. He explains that reality is different from the zero negotiable costs represented by neoclassical theory (Coase 1960). Coase thinks of a different economy from the one imagined by the neoclassicists, both for the importance given to the market, to companies and other organizations linked to the institutional environment, and for the importance given to transaction costs.

Individuals are constantly searching for rules to build an environment as predictable as possible. Beliefs and institutions developed by individuals help to reduce the various levels of uncertainty to create a more predictable economic and social environment (Morselli 2018*b*).

According to Acemoglu *et al.* (2001), it is quite clear that with neo-institutionalism the role of institutions in economic development is crucial[2]. This paper will attempt to investigate the relationship between institutions and economic development in order to improve the understanding of the process of economic change.

2. Transformation and Uncertainty

The increase in information on the characteristics of a specific activity has led to an improvement in forecasting capacity. For example, in the 15th century, the introduction of marine insurance, which concerned the collection and comparison of information about ships, their cargoes, destinations, journey times, shipwrecks and related compensation, allowed uncertainty to become a risk, and was an important factor in the growth of European trade in the early modern age (North 2005).

The change in the institutional framework, a key factor in reducing environmental uncertainties over time, implies changes in the structure of incentives. This is the main tool used by individuals to transform their own environment. Historically, institutional change has changed the benefits obtained from cooperative activities (*e.g.* the introduction of mandatory contracts), developed incentives for innovation (patent laws) and reduced transaction costs in the markets (introduction of laws to reduce contract enforcement costs) (Morselli 2017).

According to Greif (2006), the response of individuals to new scenarios depends on how new they are and on the cultural heritage of the actors. If they are well equipped with this heritage to cope with the new contexts, they are able to implement responses that make the environment more predictable.

Although the uncertainty of the natural environment has diminished over time, the remaining part that defines non-rational beliefs still plays a major role nowadays, as well as throughout human history. Secularized beliefs and ideologies are the two most important factors in changing society, one example being the history of the rise and fall of the Soviet Union (Morselli 2015).

So, we have analyzed the different degrees of uncertainty highlighted in the introduction, trying to trace a path that can produce a more predictable environment. Changes in the environment will inevitably produce a new context, which we are unprepared to deal with in the light of our experience of the past. The way in which institutions and beliefs from the past influence current choices plays an extremely important role. Communities that, on the basis of past experiences, face innovative change with suspicion, contrast with those whose heritage gives them a favourable predisposition to change; in these cases there are different shared mental models of the participants,

[2] Furthermore, Rodrik *et al.* (2004) argue that quality institutions can influence income levels through three channels: reducing information asymmetries; enforcing property rights; and reducing politicians' actions:

and our ideas and beliefs formalize the decisions we make, which keep bringing about changes to the environment in which we live.

3. Beliefs, Institutions and Economic Change

Understanding the process of change starts from the awareness that the individual has an imperfect knowledge of reality. Therefore, the development of beliefs establishes the individual choices, which subsequently shape the changes in the contexts of the environment.

In order to better understand the human environment, it is particularly important to overcome the assumption of perfect rationality[3] regarding complex situations that involve the presence of uncertainty. Individuals are placed in contexts where all participating agents have imperfect information, and the reaction to the actions of other actors is also imperfect. Both the imperfect information and the imperfect reaction are at the basis of the nature of uncertainty, the presence of which cannot be avoided. It is also pointed out that the application of the principle of rationality is not adequate to explain the relationship between the external environment and the human mind. Most rational choices are only partly the result of individual reasoning, but they come from the process of forming thought in a social and institutional scenario. In fact, Satz and Ferejohn (1994) state that rational choice theory works in contexts where the choice is limited.

The effort underway is to try to achieve an improvement in knowledge of the complex interaction between cognitive processes, belief building and institutions. According to North (1994, 362-363):

Learning involves the development of a structure through which one can interpret the different signals received by the senses. The initial framework of such a structure is genetic, but the subsequent scaffolding is the result of the experiences made by the individual: experiences that come both from the natural environment and from the linguistic-socio-cultural one. The structure consists of categories, *i.e.* classifications that evolve gradually, from early childhood, to organize our perceptions and store traces of analytical results and experiences in our memory; by building these classifications, we develop mental models to explain and interpret the environment, usually in ways that change according to our objectives. Both categories and mental models evolve to reflect feedback from new experiences, which sometimes strengthens our initial models and categories, and at other times brings about changes; this is what we call, in short, learning. Therefore, mental models can be continuously redefined through new experiences, including contacts with the ideas of others.

The learning process is unique to everyone, but it is also true that a common cultural/institutional structure leads to shared beliefs and perceptions. For this reason, a common cultural heritage provides the means to diminish the diversity of mental models that in a society are specific to each person and constitutes the vehicle for intergenerational transfer for unifying perceptions (Denzau, North 1994).

According to von Hayek (1952, 143) beliefs are the result of mental constructions in the light of the interpretation provided by the senses, i.e. that we do not reproduce reality, but construct classification systems to interpret the external environment.

Hutchins (1995, 354), states that it is not possible to fully understand the cognition process, without clarifying the key role played by culture and history, and also points out that they cannot be integrated into a context where the abstract properties of minds belonging to isolated individuals are privileged. The main objective must be to place cognitive activity not in a predefined scenario of surrounding conditions, but in a more extensive dynamic process of which the cognition of the individual is only a part. Only by ensuring this objective is it possible to demonstrate that human cognition is not only conditioned by culture and society but is itself a social and cultural process.

In the light of this, when dealing with cognitive change, the socio-material environment where thought occurs must be considered in the analysis. For Hutchins (1995, 289), culture is an adaptive process, able to accumulate partial solutions to the problems that have been encountered most frequently in the past. This statement highlights the important cognitive role played by social institutions. An efficient interrelation of individual beliefs and social contexts can make it possible to implement a set of mechanisms through which culture and social institutions operate directly in explaining the process of economic change.

There is a strong relationship between belief systems and institutional structure. Beliefs include the representation of the human environment, whereas institutions represent the structure that individuals impose on

[3] Perfect rationality has as its reference the *homo oeconomicus*, the foundation of neoclassical economy and *laissez-faire*. It presents the concept that each individual was able to order his or her preferences in a rational manner, to be perfectly informed about the current state of the world, and all possible future states, to act following objectives of maximisation of benefits and/or minimisation of costs (Blume, Easley 2008).

that environment. If there are opposing beliefs, institutions will manifest the beliefs of those who are able to implement their own choices (Bendor, Swistak 2001). According to Loasby (1999) the foundations of society are formed by the beliefs of its members. It is also important to highlight the work of Greif (1994) on the effects of beliefs on economic results. In the comparison between Genoese and Islamic merchants, during the Mediterranean trade in the 11th and 12th centuries, he realized the differences existing in their organizational structure. These differences came to light from the clash between beliefs of individualistic behavior and beliefs of collectivistic behavior. The Islamic merchants, in order to favor their collective action, had created a network of social communications within the group, but such a network was not able to favor the exchange, which came from the increasing size of the markets. Whereas, the Genoese, in order to ensure the compliance with the agreements, had introduced bilateral mechanisms of application which provided for the formation of organizations of a legal and political nature, allowing a more efficient trade. Therefore, the performance of an economic context comes from agents who are constrained in their choices by the combination of beliefs, institutions and structures from the past; and beliefs represent the initial path in order to understand the process of economic change.

4. Institutionalist Analysis and Game Theory

At the time of its development, game theory was placed within the paradigm of rational agents, and utilitarianists, reasoning in the context of methodological individualism and had an ahistorical and decontextualized nature. Among the contributions to this placement there are the game rules that are considered given*, i.e.* they are exogenous (Chavance 2010, 76).

Nevertheless, if we consider the important issue of coordination or cooperation and repeated games involving evolutionary processes, it is possible to link game theory to institutions (Walliser 1989)[4]. When repetitive games are involved, players are inclined to develop new implicit rules, norms, conventions and institutions based on a social agreement, which will be passed on to subsequent generations of players, thus constituting mechanisms aimed at providing information on the possible actions of other agents (Schotter 1981).

However, in such approaches there are some problems, namely the initial rules of the game are given and influence the new rules that emerge from the process of evolution or learning. The analysis of the institutions, therefore, implies a circular reasoning, linked to the absence of a concept of hierarchy or historicity of the rules. However, this does not detract from the fact that game theory has a considerable influence on certain trends of institutionalist economics. Moreover, game theory is sometimes also applied to historical experiences or institutions. In this respect, it is possible to highlight the comparative institutionalist analysis by Aoki (2000) and Greif (2006), which aims to compare institutions or national historical systems.

Aoki's theory is based on the concept that institutions represent forms of equilibrium within game theory. He states that there are three different approaches: institutions are identified in the players; institutions as rules of the game; institutions are the result of equilibriums or beliefs related to the games. According to Aoki, the concept of institutions as equilibriums has the merit of considering them endogenous (Aoki 2000, 141; 2007). As Field (1979) pointed out, it is not possible to create a game model that lacks institutions. Actually, every game model requires pre-existing human institutions, therefore Aoki (2001, 26) states that game theory, which is the basis of the institutionalist analysis, needs to be integrated by historical and comparative indications, and adds that the institution is a system of shared beliefs which reproduces itself autonomously and which concerns the modes in which the game is implemented.

An equilibrium identified as an institution can also be represented explicitly. But such representation will have the characteristic of an institution only if individuals consider it to be so. Thus, law and regulations are not institutions if they are not recognized and respected. If, for example, the State prohibits the import of certain goods, but one is convinced that it is sufficient to pay bribes to customs officers to circumvent the law, and suppose that this practice materializes, then it is the practice of bribes that is considered as an institution, instead of legislation being considered ineffective (Aoki 2000, 13).

In his comparative institutionalist analysis, Aoki (2001, 87) takes into account the example of the Sillicon Valley model, the Japanese model of the central bank, and thinks that the effectiveness of an exchange governance

[4] We also remember the study by Axelrod (1984), where players face each other in a series of direct matches, as in the prisoner's dilemma, and the choice not to cooperate gives a better result than the choice to cooperate, whatever the choice of the other player; but if both players decide not to cooperate, the result is worse than if both decide to cooperate. In the case of non-repeated play, the equilibrium solution is the choice not to cooperate. In the case of repeated games, on the contrary, if each player remembers how the other behaved in previous match situations, there may be willingness to cooperate.

mechanism can be strengthened by the institutionalization of a particular mechanism in the same economic system. Moreover, he adds that the institutional diversity of the different countries will not be erased by the process of globalization; on the contrary, this diversity is beneficial because the different institutions interact in a competitive way and the national contexts will continue to adapt to the changes in the global and technological environment[5]. In his update work, Aoki (2011) further explores the important role of institutions in the process of strategic interaction of individuals and their individual beliefs in societal games. Thus Aoki, in this paper, demonstrates the continuity of his basic position on the importance of institutions, trying to clarify the function of institutions as social constructions that cognitively mediate the interactions of agents and their individual beliefs in societal games (Takizawa 2017).

Turning to Greif (2006, 153), he is a supporter of comparative historical institutionalist analysis, as he thinks that it is a tool for reducing the existing gap between the evolutionary perspective of the old institutionalist economy and that of the new institutionalist economy, which basically considers the deliberately established institutions[6].

Greif (1998) shows interest in institutions that constitute spontaneous results, since they are based on an external sanction; the proposed approach considers the historical process and combines studies of game theory with empirical, historical and comparative analyses. As we have seen, Greif compares Genoese merchants (individualists) with Muslim merchants (collectivists), who traded in the Mediterranean area in the 11th and 12th centuries. The Muslim merchants created communal communication networks in order to act collectively, which, however, proved to be not very effective for relations with merchants of different ethnic origins. Whereas the Genoese merchants developed bilateral mechanisms of control with a limited level of communication, which produced formal organizations and policies designed to follow and sanction the established agreements, favoring the enlargement of the exchanges. In the end, the Genoese merchants replaced the Muslim ones; therefore, it is noted that the cultural values influence the institutions and, consequently, the performances. For this reason, Greif (1994) thinks of institutions as a system that includes rules, beliefs and organizations. Moreover, Nelson (1995) considers institutions as a set of socially learned and shared values, norms, beliefs, meanings, symbols, customs and standards, such as to outline a series of behavioral expectations accepted contexts of action.

5. Institutions and New Institutional Economics

The reintroduction of institutions into the *New Institutional Economics* originates from the analysis of the *organization*. Coase (1937) highlighted how conventional economics was lacking in explanations of the existence of enterprise. He believed that one cannot disregard the reflections on enterprise and organizational forms. This is because market transactions have a cost and a hierarchical organization is needed to counteract it. Thus, we arrive at the essential concept of "transaction cost", which will be developed by Williamson (1981).

He starts from Coase's analysis of the existence of the enterprise and the criticism of some hypotheses of neoclassical thought. Williamson supposes that in the beginning there was the market, later companies appeared, differentiating themselves by the importance of transaction costs. The latter are ignored by neoclassical theory, which only considers production costs. Moreover, another element of contrast with neoclassical thinking can be found in Simon's (1982) concept of bounded rationality. Williamson maintains that agents encounter limits in accessing information and its treatment. In actuality, individuals, companies and all other agents, possess limited information, and this represents a constraint on the ability of interactions in exchanges, so that decisions are the result of poor mental calculation skills. In such a scenario, it is evident that the choices that will be made will result in increased transaction costs (Chavance 2010, 65-66). The above mentioned poor mental calculation skills, together with incomplete information, appear to be the basis for an increase in transaction costs, as the information is expensive and asymmetrically distributed between the parties to the exchange[7].

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[5] The work of Rosenberg and Birdzell (1986) and that of Hall and Soskice (2001) highlight the differences between different areas of the world to explain the faster development of Western economies. Recent research includes research on the variety of capitalism, which analyses the different institutional structures of developed countries, using historical-sociological-empirical analyses.

[6] For an in-depth analysis of Old institutional economics and New institutional economics, see Morselli (2018*a*, 658-660).

[7] The assumption of perfect information presupposes that all agents know their reference variables as producers and consumers, as well as all prices and the characteristics of techniques and goods. The concept of perfect information is necessary and sufficient to achieve an overall competitive balance. It will also be important not to confuse it with the concept of complete information, which indicates that all agents know not only their reference variables but also the behavioural characteristics of all other agents. Under the assumption of perfect information, agents use a kind of statistical summary of the complete information. For more on this subject, see Rossitto (2008, 18).

Williamson (1998) also goes into the subject of bounded rationality, i.e. in the light of the economics of transaction costs, rationality, in the field of knowledge, is bounded. Furthermore, he maintains that, even within a market economy[8], the enterprise becomes a subject of regulation. Transaction costs are not limited to traditional production costs but are linked to human factors (bounded rationality and opportunistic behavior) or environmental factors (uncertainty, lack of information). These factors affect the exchange; therefore, the efficiency objective is not only the optimal allocation of resources, but also the minimization of transaction costs. In this context, the institutional approach identifies institutions, understood as principles and methods of exchange, as an important element of the regulation system, which is an alternative to the market (Morselli 2018*a*). Williamson (1964) sees clear advantages of the hierarchy and hierarchisation with respect to the market, since hierarchy limits uncertainty, reduces the lack of information and the incentives to opportunistic behaviour. Again, he argues that, considering the efficiency approach, the economics of transaction costs supports the hypothesis that the total variety of organizational forms develops to rationalize transaction costs.

North strengthened Williamson's theories. He began his work as an historian of economics with a neoclassical radicalism and the problem of efficiency based on the maximizing rationality of the individual, and then changed course and continued with the discovery of the importance of institutions; thus, gradually moving away from the neoclassical tradition, he developed an original institutional theory in the nineties (Chavance 2010, 67).

North (1994) criticizes neoclassical thinking because it disregards institutions and time, neglects transaction costs and relies on unlimited rationality. He argues that the institutions represent constraints decided by men, which structure human interactions, which concern formal constraints (rules, laws, constitutions) and informal constraints (rules of conduct, conventions, codes of conduct). In this regard, North refers to the work of Karl Polanyi, *The great transformation* (1944), which shows how the entire paradigm of *homo oeconomicus* is built in an ideological context developed with the Industrial Revolution and later became the postulate of the neoclassical economics. These reflections on Polanyi lead North to think about the importance of the historical dynamics that explain the problems of the market economy, so as to develop a new conception of institutions, precisely, as the rules of the game that found human interactions. In his important work *Structure and change in economic history* (1981, 202), Polanyi argues that institutions are sets of rules, procedures and moral and ethical rules of behavior created to constrain the behavior of individuals in order to maximize the wealth or usefulness of managers.

If institutions represent the rules of the game, organizations and their entrepreneurs are the players. The rules define how the game is played, while teams try to win within the scope of these rules using strategy, coordination, skills and more or less honest means. Organizations are formed by groups of individuals connected by a common project, to achieve objectives. The interaction between organizations and institutions is fundamental, as the institutional context conditions the kind of organizations that are created, as well as their evolution, but, in turn, organizations are at the origin of institutional change (Chavance 2010, 71).

As Hodgson (1995) points out, economic theory must be able to explain the economic choices made by individuals, the community and organizations. Behaviors are influenced by institutions, therefore individuals, the community, organizations, represent strategic elements of choices. When one of these elements is not explained, we are in the presence of a partially complete economic theory of choice.

6. The Role of Institutions in Economic Growth Models

We have analyzed the relationship between institutions and economic development from an empirical point of view. Let us see, now, what happens if we approach this issue at a theoretical level through extended growth models, in order to include institutional variables.

In order to define, from a theoretical point of view, the role played by the institutions within a model, Solow (1956) has been taken into consideration. An example is that provided by Tebaldi and Mohan (2008), who develop the Solow model including the institutions. This model examines the effect of the quality of the institutions on the level of the product and on the growth rates of the production. Specifically, Tebaldi and Moham have changed the function of aggregate production and the equation of capital accumulation of the Solow model, to allow the study of the effects of the institutions on economic performance. In the model in question, goods are produced through technology with constant returns to scale and offered in a market marked by perfect competition. Institutions play

[8] North (1999, 23) argues that even in the presence of a market economy, institutions are fundamental to create an environment capable of developing cooperative processes that can encourage exchanges. However, Acemoglu and Robinson (2013, 85-88) assert that the only positive institutions are the inclusive ones, which ensure that every citizen can follow his or her inclinations and enjoy the fruits of his or her work safely; while, the extractive institutions are negative, as they take the wealth produced by the working masses to give it to a small ruling aristocracy.

a major role in determining factor productivity and technology adoption, which is why output (Y) is produced using the following production function:

$$Y = f\,[A(T, t)\, K(t,T) L(T,t)] \qquad 6.1$$

where L represents labour, $A \geq 1$ is an index that indicates the level of technology, K is capital, T is an index that specifies the quality of institutions and t is time.

Let us assume that the economy taken as a reference has a stock of exogenously produced technology that grows at a constant rate g; and assuming that the growth rate of the workforce and the labour participation rate are constant over time, then $\dot{L}/L = n$ where n is the population growth rate. T is considered constant and is normalized between 0 and 1. Therefore T is equal to 1 for those countries with the best institutions, T is equal to 0 for those countries with the worst institutions.

Institutions can influence the use of available technology and the productivity of physical capital. As Tebaldi and Elmslie (2008) state, institutions in poorer countries can hinder the use of available technologies and limit efficiency. Thus, good institutions increase technological efficiency, and increase both labour and capital productivity.

Tebaldi and Mohan (2008) say that the elasticity of production in relation to capital is influenced by institutions. In particular, efficient institutions increase the productivity of capital, thus affecting production and investment indirectly. Therefore, we have:

$$Y = K^{\alpha T} (AL)^{1-\alpha T} \qquad 6.2$$

where $0 < \alpha < 1$. By defining $y = \frac{Y}{AL}$ and $k = \frac{K}{AL}$ we are able to rewrite the production function in the following way:

$$y = k^{\alpha T} \qquad 6.3$$

By combining the equation 6.3 to the capital accumulation function we obtain:

$$\dot{k} = sk^{\alpha T} - (\delta + n + g)k \qquad 6.4$$

δ is capital depreciation rate; n is population growth rate; g is technological progress rate.

Equation (4) indicates that the economy will converge to an equilibrium growth path where:

$$\frac{\dot{y}}{y} = \frac{\dot{k}}{k} = 0$$

This allows to solve equation 6.4 for the stock of capital in the steady state:

$$k^* = \left[\frac{s}{\delta + n + g}\right]^{\frac{1}{1-\alpha T}} \qquad 6.5$$

where k^* indicates the steady state of variable k. Equation 6.5 specifies that institutions have a positive effect on the stock of capital in the steady state and consequently on the level of output per worker. In particular, better institutions (T) increase capital accumulation and this implies higher steady state capital (k^*) and output per worker (y^*). However, in the long run, the growth rate of output per worker is still determined by the speed of technological progress. By defining $\bar{y} = \frac{y}{L}$ and considering that $\frac{k*}{k*} = 0$ and by log-differentiating equation 6.3 we have:

$$g_{\bar{y}} = \frac{\dot{\bar{y}}}{\bar{y}} = g \qquad 6.6$$

that model indicates that countries are richer or poorer because of their technology. Equation 6.5 means that rich countries should have better institutions than poorer countries. Equation 6.6 means that there should be no effect of the quality of institutions on the long-term growth rate. Therefore, institutions have effects on output levels, but not on its growth rate.

Another version of the model identifies the effects of institutions on technology and the productivity of capital. Tebaldi and Moham rewrite the production function:

$$Y = A^{T-1} K^{\alpha T} (AL)^{1-\alpha T} \quad 6.7$$

Equation (7) incorporates the effects of institutions into a Solow production function. The model is resolved by defining $y = \frac{Y}{A^T L}$ and $k = \frac{K}{A^T L}$ allowing the production function to be written in terms of actual work:

$$y = k^{\alpha T} \quad 6.8$$

the equation of capital accumulation is given by:

$$\frac{\dot{k}}{k} = sk^{\alpha T-1} - (\delta + n + Tg) \quad 6.9$$

this model presents a steady-state solution in which $\frac{\dot{y}}{y} = \frac{\dot{k}}{k} = 0$. Therefore, we have:

$$k^* = \left[\frac{s}{\delta+n+Tg}\right]^{\frac{1}{1-\alpha T}} \quad 6.10$$

This extended model means that institutions have an effect on the level of long-term production and the growth rate of output per worker. By defining $\bar{y} = \frac{y}{L}$ and knowing that, log-differentiated equati$\frac{\dot{k}}{k}=0$) generates:

$$g_{\bar{y}} = \frac{\dot{\bar{y}}}{\bar{y}} = Tg \quad 6.11$$

The model therefore implies that the growth rate of output per worker is determined not only by technological change, but also by the quality of the institutions. A given economy can have the technology, but its institutions (if they are not efficient) can hinder the adoption of technologies and decrease the productivity of production factors. The effect of institutions on output per worker comes not only from its impact on the state of technological efficiency, but also from its effect on capital accumulation. Institutions influence the marginal product of capital and consequently investments and capital accumulation. Specifically, since the ratio $\frac{y}{k}$ is constant in the steady state, Tebaldi and Moham derive equation 6.8 in relation to *K*, we thus have:

$$\text{MPk}\frac{\partial y*}{\partial k*} = \alpha T k^{\alpha T-1} = \alpha T \frac{y*}{k*} > 0$$

This means that the improvement of the quality of the institutions has a proportional impact on the marginal production of capital in the steady state. In particular, efficient institutions increase investment returns which, as a result, increase capital accumulation. The result obtained is consistent with empirical studies that state that capital accumulation is indirectly influenced by 'bad' institutions (Mauro 1995).

Unfortunately, the growth model taken into consideration, even including the institutional variable, overlooks some basic problems. This model provides for constant returns to scale and a perfectly competitive market. We are certain that these two conditions are not met in the real world. Moreover, the saving rate has no effect on long-term income trends, affecting only the system's ability to grow in the short term. The growth rate of technological progress is considered exogenous and its determinants are not adequately addressed. Finally, the process of economic growth is summarized in a simple competition between capital accumulation, fed by savings, and population growth. The neoclassical model does not pose the problem of investigating the forces that determine the trend of development, since it assumes that any increase in savings is automatically converted into investment. However, as the Keynesians say, saving reduces global demand and generates unemployment. In this context, the role of aggregate demand, as a factor capable of contributing to economic growth, is ignored; as well as the balanced growth equilibrium, proposed by Solow, is not adaptable for an analysis of actual growth processes.

An attempt to overcome some of the aforementioned strictures has been advanced by Mankiw, Romer and Weil (1992), which focused on the endogenization of the determinants of growth, considering, for example, the saving rate as a function of household choices, and the accumulation of human capital and technology as a function of business choices. According to the three economists, institutions can influence growth indirectly through an effect on investment, just as institutions can influence growth through total productivity. In this case, we can make explicit the notion that institutions influence productivity by specifying technology (*A*) as a function of institutions (*F*). This means that technology evolves in an exogenous way, but at the same time differences between institutions

have a fixed effect on the level of production between countries. Therefore, if growth affects productivity directly, both investment and institutional measures will be significant.

However, the consideration of the poor performance of most developing countries in terms of economic growth in the 1950s and 1960s, mainly as a result of non-quality or non-existent institutional structures, has again made it necessary to deepen the analysis of the determinants of development. Only those countries which applied growth models oriented towards foreign trade and which had institutions more attentive to the valorization of internal resources, such as the countries of South-East Asia (Singapore, Hong Kong, Taiwan, South Korea), showed, in that period, positive growth rates of their economies (Montalbano, Triulzi 2012, 311-329).

The Nobel Prize for Economics Myrdal (1974) proposes the structuralist - Keynesian approach to analyze economic development. A supporter of Keynesian theses, he understands economics not so much as an empirical science, rather as a moral science; it is the non-economic factors that represent the main source of strengthening effects, therefore a dynamic process can only be studied taking into account the interdependence of all its aspects, economic and non-economic. For Myrdal, the neoclassical economics, based on equilibrium, can only fail when considering poor countries, since the system does not move towards a form of equilibrium, rather tends to move away from that position. Therefore, the economist states that we are in the presence of a circular constellation of forces that tend to act and react on each other in order to keep a poor country in a state of poverty. This theory is called 'circular cumulative causation' (Myrdal 1957), in which backwash effects and spread effects can be recognized. The former is represented by those circumstances that explain the growing disparities between countries, regions and social groups; whereas the latter are those elements, which, as development progresses, can cause a decrease in territorial competitiveness.

Myrdal (1957), in the model of cumulative causation explains how the concentration of enterprises can strengthen itself, causing the increasing development of the locality and the impoverishment of the periphery. He uses the Keynesian tool based on an income multiplier mechanism, in order to highlight the need for external intervention by the state to hinder the natural tendency to inequality. Myrdal did not put faith in market mechanisms; in fact, he thought that if the market is left free to follow its own course, economic development is a process of circular cumulative causation that tends to produce its positive effects on those who are already well endowed and not on backward regions.

Myrdal's concept of circular cumulative causation has contributed to the development of the modern economy of non-equilibrium (in fact the model shows the possibility of persistent and cumulative imbalances). For Myrdal this concept is at the basis of institutionalist thinking, contrasting with neoclassical schemes. He is convinced that economic development cannot be analyzed through categories typical of neoclassical economics, whereas economic reflection must be combined with sociological and historical reflection.

7. The Virtuous Circle of Institutions and Economic Development

It is particularly important to create an institutional environment that encourages economic agents to invest in productive activities. Institutions reduce uncertainty, contribute to trade stability and make the information circulating in the economic system accessible; they create specialized labour, reduce transaction costs and encourage the formation of venture capital. All this sets in motion a virtuous circle, where the efficiency of institutions plays a major role in economic growth.

The institution factor orients the lives of agents, the community and nations in such a way that if it is present it favors cooperative behavior and coordination processes. Conversely, the absence of this factor leads to a high degree of uncertainty in the economic and social context, high transaction and coordination costs, poorly functioning markets and low business competitiveness.

In this regard, it is possible to draw up a scheme, called the *virtuous circle of institutions* (Figure 1), which summarizes how economic development is encouraged by efficient institutions.

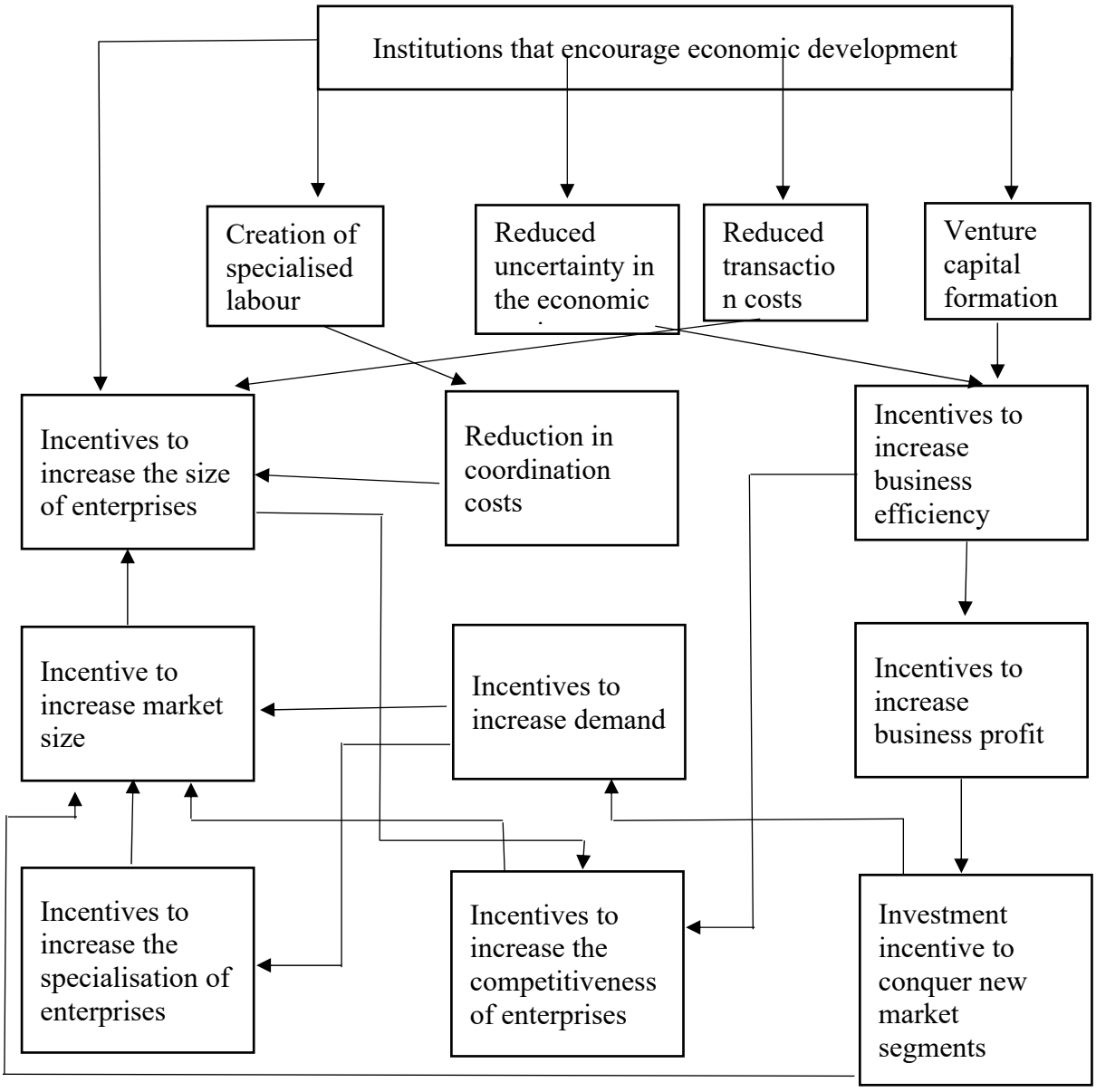

Figure 1. Virtuous circle of institutions

8. Institutional Transformations and Industrial Revolution

The Industrial Revolution had positive effects on the entire English economic system. There were clear improvements in transport, metallurgy and steam engines, but the most significant innovation was the mechanization of weaving and the development of industrial fabric factories. These developments began with the institutional changes resulting from the Glorious Revolution between 1688 and 1689, a period marked by institutional innovations. The change was also accelerated by the reorganization of economic institutions that helped innovators and entrepreneurs, based on a more efficient system of property rights (North, Weingast 1989; Weingast 1995). Investments in canals and roads increased after 1688, and as transport costs decreased, these investments laid the foundations for the subsequent Industrial Revolution (North, Thomas 1971, 777-803).

At the basis of the transport revolution and the reorganization of the land in the 18th century, there were a series of parliamentary acts that transformed the nature of land ownership, allowing groups of individuals to petition to reform property rights (Acemoglu, Robinson 2013, 211-213).

In an institutional environment scenario, we are in a state of equilibrium when the cost of the exchange exceeds the possible benefits, thus creating imbalances that lead to institutional innovation. In the passage from

the feudal system, marked by an economy of self-sufficiency, to an economic system based on the division of labour and the accumulation of capital, during the Industrial Revolution, three different forms of imbalances can be traced. First, long-term changes in the price of productive factors and products; second, an increase in the size of markets; and finally, structural changes in the criteria governing the state. The first change is due to the increase in population, which, due to the reduction of available land, caused a decrease in the value of labour, resulting in the production of an independent workforce. The second change concerns the expansion of markets which stimulates the process of institutional innovation, since transaction costs are influenced by economies of scale (North, Thomas 1970). The third change concerns the advent of socio-economic pluralism which resulted in new political institutions capable of strengthening the Parliament to the detriment of the Sovereign. The process of centralization of the governmental fabric that the Tudors had followed was essential to prevent the political change from taking place without the collapse of the system. Huntington (1968, 162) argues that the centralization of power was necessary to dismantle the old order, destroy feudal privileges and bonds, in order to create new social groups and develop new economic activities. A relevant factor is that the opposition to monarchic power came not from a monolithic elite, but from a coalition of social forces. This allowed the British institutions to assume a lasting plural attitude. The composition of the social forces of a system has an impact on the nature of the political regime, and if the dominant economic elite is homogeneous, then the political institutions, reflecting the power structure of the regime, will not need to be pluralistic; presumably, there will be institutions able to favor the closure of the system and the perpetuation of the economic ruling class, which, in return, will bring support to the political elite. Thus, in England, business and innovation were encouraged, property rights were protected, the law became more and more impersonal and the discretion of royal action decreased. Here too the foundations were laid for the Industrial Revolution (Vercesi 2015), which began in England thanks to the formation of an open political system attentive to the economic needs of society.

Conclusions

The evolution of market economies is based on the presence of institutions that play a major role. The absence of institutions, or their malfunctioning, represents an obstacle to investment and innovation and, therefore, to economic growth, and, as we have seen, the literature on the subject is now very extensive.

Despite everything, in the first part of the 20th century, neoclassical thought represented the benchmark of the international economy, dulling and overshadowing the institutional economy. The neoclassical current is based on the market, the analysis is set in terms of balance and develops from rational individual actions, focusing on efficiency; therefore, the themes related to institutionalism and the historical dimension of the economic process are not considered. The dominant economy, in its analysis of big business and the economy of development, has preferred to ignore institutions.

Coase decided to reintroduce institutions into the economic analysis through the *New Institutional Economic*s, starting in 1937. He pointed out that it is not possible to disregard reflections on business and its organizational forms, since market transactions have a cost and in order to reduce it, or not increase it, the need for a hierarchical organization arises. Coase's reflections, taken up by Williamson, represent the origin of the theory of transaction costs, which make it possible to understand and explain the existence of organizational models.

Certainly Coase's analysis, starting from his main work *The nature of the firm*, is a pioneering one, in which theoretical constructions are highlighted that need to be inspired by, in order to integrate the role of information in the structure of (transaction) costs, which, in turn, influence the dynamics of market prices.

We start from the fact that prices are marked, on all markets, by a more or less strong dispersion and change with a variable frequency. Discarding the hypothesis of the presence of a completely centralized market, no individual is able to know, at a given moment, the range of prices applied by the different bidders, since all potential buyers, in search of the most advantageous price, should contact all the different sellers; a hypothesis that Stigler (1961) defines as 'search'. The optimal search rule suggested by the economist concerns a search such that its marginal cost is equal to the expected growth in revenue. A valid rule for buyers and sellers. On second thoughts, this is the traditional neoclassical research of equality between marginal costs and revenues, since the search for information about the optimal price will be pursued to the point where the cost of the additional research will equal the gain derived from this additional research unit. Despite this search for the cheapest price, a certain price dispersion will continue to persist, also due to the precariousness of knowledge, as supply and demand conditions change rapidly over time. Thus, dispersion will be all the more relevant the more unstable the market conditions are, to the detriment of information provision.

As we have seen, Williamson maintains that agents encounter limits in accessing information and its treatment. In actuality, individuals are in possession of limited information, and this is a constraint on the ability to

interact in the exchanges, so that decisions are the result of poor mental calculation skills, increasing transaction costs.

At this point, the institutional approach comes into play, which identifies institutions, understood as principles and methods of exchange, as a relevant element of the regulation system, which is an alternative to the market. In this framework, the advantages of the hierarchy are identified, since it limits uncertainty, reduces the lack of information and the incentives to adopt opportunistic behavior.

North strengthened the institutional approach. Starting from Polanyi's considerations on *homo oeconomicus* matured during the Industrial Revolution, he reflected on the importance of the historical dynamics, in order to develop a new conception of institutions as rules of the game which found human interactions. Thus, it is possible to demonstrate that the origins of institutional doctrine are to be found in economic history. In fact, one of the main criticisms that North addresses to the neoclassical economics concerns its lack of consideration of the temporal dimension, and this has led him to favor the study of institutional change and the evolution of institutions, and not the origin of the latter.

As argued by Hodgson, behaviors are influenced by institutions, thus individuals, the community and organizations are configured as strategic elements of choices. When one of these elements is not explained, the economic theory of choice is incomplete.

At the conclusion of the study performed, the importance of institutions is evident, since they reduce uncertainty, encourage trade stability and make the information circulating in the economic system accessible; they create specialized labour, reduce transaction costs and encourage the formation of venture capital. In other words, long-term economic development can receive a great deal of help from institutional theory and the latter is able to intervene more directly in explaining the process of economic change.

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SPATIAL ANALYSIS OF POVERTY: THE CASE OF PERU

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Abstract: *The concept of Multidimensional Poverty traditionally was used for comparative analysis across regions or countries. This paper uses the concept of Multidimensional Poverty for each Peruvian region to analyzes spatial patterns, spatial autocorrelation, and identifies spatial spillovers in poverty. We find evidence of statistically significant spatial autocorrelation across regions; in other words, poverty has spatial effects. In more detail, we find that those spatial spillovers are originated in the error terms rather than the endogenous variable. Also, the covariates we use in our regressions are statistically significant and stable across the models.*

Keywords: poverty; spatial econometrics; Peru.

JEL Classification: C21; O10.

Introduction

Poverty is probably the essential concern of countries worldwide, even to be established as the Millennium Development Goals' first goal. Following this goal, the Peruvian government set policies to reduce poverty and extreme poverty. From 2004 to 2015, poverty was reduced from 58 to 22 percent, while extreme poverty fell from 16 to 4 percent. In absolute numbers, nine million Peruvians escaped from poverty.

The concept of poverty is widely investigated in the literature; Sen (1976, 227-230) argues that poverty is not only an income problem. It is composed of different dimensions thatform a more encompassing concept. i.e. a person is not poor only because he does not have enough income to fulfill his needs, but also due to his chances to escape from poverty are reduced due to insufficiency in education, health, and life quality. Nevertheless, we argue that poverty is also a spatial concept. Poverty is typically agglomerated in certain areas, regions with low-quality infrastructure where government policies do not reach the population.

This paper analyzes poverty based on household living conditions by constructing the Multidimensional Poverty Index (MPI, from now on). Therefore, the main objectives of this research are summarized in:

(1) Identify spatial patterns of poverty across the country;
(2) Identify the presence of spatial autocorrelation and clusters of poverty among regions;
(3) Find evidence of spatial spillovers across districts among Peru.

1. Literature Review

One of the first approaches to analyze poverty's spatial component was made by Brunn and Wheeler (1971, 8-15). They do a geographical and factor analysis and identify various poverty faces among US counties. They use the information for socioeconomic status, agricultural productivity, demographic composition, agricultural holdings and investment, and urbanization and manufacturing from the *County and City Data Book of 1967*. They find that these factors have different importance once a county measures its poverty level. Therefore, some counties have similar poverty levels, but the source differs among them. Later on, Bigman and Fofack (2000, 134-139), using a similar methodology, identify five advantages of using geographical data to alleviate poverty. First, it provides clear

criteria for determining the target population; second, easy to monitor and administer; third, it influences a household's behavior; fourth, it is possible to improve targeting by combining with other criteria. Finally, in fifth, they can include direct income transfer and other means to increase living standards.

Crandall and Weber (2004, 1279-1281) focus on analyzing the effect of job growth and social capital over the poverty rates. However, they can identify spatial spillovers by using two census tract-level data across the US. From a different perspective, Rupasingha and Goetz (2007, 662-667) investigate the determinants of poverty in the US at county-level data in 1999 by using spatial analysis techniques. They show that social capital, ethnic and income inequality, local political competition, federal grants, foreign-born population, and spatial effects are important determinants to explain poverty levels across the country. Holt (2008, 4-7) uses socioeconomic and health-related data at the county level in the US from the *Community Health Status Indicators* database to describe a spatial analysis of poverty across the country for 2000. The findings reveal significant and stark poverty patterns that the author describes as a "continental poverty divide". The US's poverty levels are concentrated in the south-east counties, while low poverty levels are located in the north-west counties.

Similarly, Grab (2009, 12-18) analyzes the spatial income disparities among households in Burkina Faso using three primary nation-wide household surveys in 1994, 1998, and 2003. He highlights the relevance of the space into the economic analysis of poverty. The author proves that spatial disparities are driven by spatial concentration of households with particular endowments and a large gap in those endowments. i.e. communities are poor because the households' endowment of these communities isinsufficient.

Torres *et al.* (2011, 50-59) use municipal level data to identify Brazil's rural areas' spatial patterns. Using Moran's I indicator, they identify "hot spots" and "cold spots", *i.e.* areas where poverty is agglomerated or dispersed. They find evidence of clusters among municipalities, and the poverty reduction policies must be taken into account when those clusters are identified. Tanaka and Lee (2011, 3-15) combine district-level poverty rates, population census data, income data, and geospatial data in Ghana to investigate the impact of human capital, structural change, infrastructure, and environmental degradation. They find that the working-age population, employment, and the service sector are critical factors for reducing poverty levels.All these findings are correlated with spatial patterns where it is possible to identify "hotspots" or poverty agglomeration. Akinyemi and Bigirimana (2012, 8-9, 12-18) seek for emerging poverty patterns based on household living conditions in Kigali city in Rwanda; also, they look for the contribution of four indicators over the poverty: expenditure, health, education, and services. With data from the *Integrated Living Condition* survey between 2000-2001, they show poverty patterns and the presence of urban-rural dichotomy.

Similarly, for China, Chen *et al.* (2015, 83-89) combine spatial statistical analysis and GIS information to identify patterns and factors of spatial poverty distribution in Xianfeng, China. Thus, they use two key indicators, poverty headcount ratio and the per capita net income of the poverty population. They find evidence of positive spatial autocorrelation and agglomeration of poverty levels across the county.All of the literature presented above shows evidence that poverty has a spatial component that requires research to display more data in favor of this spatial component.

2. Methodology

2.1. Data

Three kinds of data have been used for this research and for building the "Multidimensional Poverty Index" (Odekon 2015, 1075-1076), all belonging to the *National Census 2017* in Peru. These three types of data are the *Housing Characteristics and Services*, *Households' characteristics*, and *Population Characteristics*.

Therefore, the MPI is built by using five dimensions: Education, Childhood and youth, Health, Employment, and Household; they are weighted in the following way:

$$MPI = 0.2(Education) + 0.2(Childhood) + 0.2(Health) + 0.2(Employment) + 0.2(Housing)$$

The *"Education"* dimension is considered a principal factor for households to adapt to social changing conditions. This dimension is composed of two elements:

- *Educational achievements (educ 1)*. Based on the Population Characteristics database, we built a variable for the schooling years for each member of the household since the first grade in elementary school. Then we get the average schooling years for all members older than 15 years old. If the average is less than nine years of schooling, the household is considered deprived;
- *Illiteracy (educ 2)*. We count the number of household members older than 15 years old who cannot read or write. Those households with at least one member falling in this condition, it is considered

deprived.

"Childhood and youth" dimension is considered important since it is a stage where the crucial capabilities and skills are developed to have self-sufficient citizens. During this stage, people have higher probabilities of getting infected with some diseases. On the other hand, for many developing countries, schooling and child labor are risk factors since many households do not have enough income and need young members to leave school and start to work earlier. This dimension is composed of four elements:

- *Educational lag (child 1).* We apply a filter to pick up the member between 7 and 17 years old.We build the educational lag variables by considering the following rule: seven years old and do not have at least one year of schooling; eight years old and do not have at least two years of schooling, nine years old and do not have at least three years of schooling; up to 17 years old and do not have at least 11 years of schooling. Finally, we count the number of household members who fall under this condition; if there is at least one member under this condition, the household is deprived;
- *School absenteeism (child 2).* We count the member between 6 and 16 years old that are currently attending a school. If there is at least one person among these ages that are not attending any school, the household is considered deprived;
- *Childhood Care (child 3).* We count the members younger than five years old who do not have any insurance (public or private) and do not go to any educational institution to get care support. If there is at least one member under this condition, the household is considered deprived;
- *Child labor (child 4).* We count the member younger than 14 years old who are currently working to collaborate with their income. If at least one member is falling under this condition, the household is deprived.

"Health" dimension is crucial since the governments must supply a minimum healthcare level for their citizens to assure people's conditions to follow their objectives. The dimension is composed of:

- *Healthcare insurance (health).* We count the number of members older than five years old that are not affiliated with any health insurance system (public or private). If at least one member is falling under this condition, the household is deprived.

"Employment" dimension is crucial to go over the poverty stage by having a job and not belong to the informal sector. These two conditions help to assure a proper income and have a job with all its benefits. The dimension is composed of the following factors:

- *Employment (employment 1).* We count the members older than 14 years old who currently do not have a job and are looking actively for one. If at least one member is falling under this condition, the household is deprived;
- *Informality (employment 2).* We count the members working in a company with five or fewer employees. If at least one member is falling under this condition, the household is deprived.

"Housing" dimension is important since it creates minimum conditions where families and their members develop their daily-life activities allow them to access essential tools to build their capabilities. This dimension is composed of seven elements:

- *Water access (house 1).* We consider a household is deprived if they do not have access to water service inside the house, inside the building, or from a public sink. Additionally, we consider a household deprived if they do not have access to water less than three days per week;
- *Sewage access (house 2).* We consider a household is deprived if it does not have access to any sewage service inside the house or the building;
- *Floor (house 3).* We consider a household is deprived if the house's floor material is other than parquet, tiles, vinyl, or cement;
- *Walls (house 4).* We consider a household is deprived if the house's wall material is other than bricks, stones, mud bricks, or wood;
- *Roof (house 5).* We consider a household is deprived if the house's roof material is other than concrete, wood, or tiles;
- *Public lighting (house 6).* We consider a household is deprived if the house does not have access to any public lighting;
- *Overcrowding (house 7).* We consider a household is deprived if the house has more than three members per room.

Finally, The MPI is built as follows:

$$MPI = 0.2(Education) + 0.2(Childhood) + 0.2(Health) + 0.2(Employment) + 0.2(Housing),$$

where:

$$Education = \frac{1}{2}educ1 + \frac{1}{2}educ2$$
$$Childhood = \frac{1}{4}child1 + \frac{1}{4}child2 + \frac{1}{4}child3 + \frac{1}{4}child4$$
$$Health = health$$
$$Employment = \frac{1}{2}employment1 + \frac{1}{2}employment2$$
$$Housing = \frac{1}{7}house1 + \frac{1}{7}house2 + \frac{1}{7}house3 + \frac{1}{7}house4 + \frac{1}{7}house5 + \frac{1}{7}house6 + \frac{1}{7}house7$$

2.2. Spatial Autocorrelation Test

Global spatial autocorrelation analysis is used to identify a situation in which a variable at a specific location correlates with observations on this variable at other locations. In other words, it measures how related are the observations in a particular area respect to its neighbors. One of the most common tests for this analysis is *Global Moran's I*, described as:

$$I = \frac{1}{\sum_{i=1}^{n}\sum_{j=1}^{n} W_{ij}} \frac{\sum_{i=1}^{n}\sum_{j=1}^{n} W_{ij}(x_i - \bar{x})}{\sum_{j=1}^{n} W_{ij}(x_i - \bar{x})^2/2}, \quad \forall i \neq j$$

where n is the number of spatial units of analysis indexed by i and j. x_i are the values of the variable x in the unit of analysis, while the $\bar{x}$ is the mean of the variable x. W_{ij} refers to the weighted matrix $n \times n$ that definesthe influence that an area has over the others. For this research, we use contiguity row standardized weight matrix based on *"Queen"* method, which defines that two regions are neighbors if they share a common border, regardless of how short it is.

$$W = \begin{bmatrix} 0 & w_{12} & w_{13} & & w_{1n} \\ w_{21} & 0 & w_{23} & & w_{2n} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ w_{n1} & w_{n2} & w_{n3} & & w_{nn} \end{bmatrix}$$
$$w_{ij}^{*} = \frac{w_{ij}}{\sum_{j=1}^{n} w_{ij}},$$
$$W = \begin{cases} 1, & i \text{ neighbor } j, \\ 0, & \text{otherwise.} \end{cases}$$

The *Moran's I* is interpreted as a coefficient of correlation with a range of $[-1,1]$. A positive and significant value of the indicator represents positive autocorrelation among the spatial units, and high values indicateclusters' presence. Similarly, the indicator's negative and significant values show negative autocorrelation and tend to reveal the presence of *"hotspots"*. Finally, values close to zero indicate a random distribution of the variable among the analysis's spatial units.

Local spatial autocorrelation is used to determine the variable's spatial autocorrelation for each spatial unit with respect to its neighbors. Regarding the local indicator's relationship with the global autocorrelation one, local spatial autocorrelation helps us focus more on sublevel when there is no evidence of strong global spatial autocorrelation.Second, local autocorrelation helps explore spatial patterns. Third, local autocorrelation aidsin identifying any inconsistent pattern. The *Local Moran's I* is defined as:

$$I_i = \frac{n(x_i - \bar{x})\sum_{j=1}^{n} W_{ij}(x_i - \bar{x})}{\sum_{j=1}^{n}(x_i - \bar{x})^2}, \quad \forall i \neq j$$

2.3. Spatial Autocorrelation Model

Based on the general form of the spatial autoregressive model with spatial effects proposed by Anselin (1988, 32-40), we can express the model as:

$$y = \delta W y + X\beta + WX\gamma + \epsilon,$$
$$\epsilon = \lambda W \epsilon + \mu,$$
$$\mu \sim N(0, \sigma^2 I_n),$$

where y is the endogenous variable; δ is the coefficient of endogenous variable's spatial lagWy; W is the weighted matrix of spatial neighbors; X is the set of exogenous variables; β is the effect of the exogenous variables represented by X; γ is the coefficient to the spatial lag of the exogenous variables WX; λ is the coefficient to the spatial effect into the error terms $W\epsilon$; finally, μ are the uncorrelated disturbances.

By following the general model is the Spatial Autocorrelation Model (LeSage 2008, 21-23), our model is defined as:

$$\begin{aligned} IPM &= W(IPM) + \beta_1 Migration + \beta_2 Language + \beta_3 Female + \epsilon, \\ \epsilon &= \lambda W\epsilon + \mu, \\ \mu &\sim N(0, \sigma^2 I_n), \end{aligned}$$

where IPM is the *"Multidimensional Poverty Index"*. *Migration* is defined as the percentage of households in each district where at least one member migrated during the last five years from another region (i.e. called department for Peru). *Language* is defined as the percentage of households in each district where at least one member speaks another original language than Spanish. *Female* is defined as the percentage of families where the household's head is female. All the parameters are estimated using maxim likelihood methods to obtain robustly estimated coefficients.

Additionally, several diagnostic tests can be applied in the spatial model contexts, *e.g.* Lagrange Multiplier tests contrast the presence of spatial effects (Anselin 2001, 707-708; 2010, 10-11). Therefore, we have the *Lagrange Multiplier Test for Spatial Error* (LM-error):

$$\begin{aligned} &\text{Hypothesis:} \quad H_0: \delta = 0 \quad \text{vs} \quad H_1: \delta \neq 0 \\ &LM\_error = \frac{\left(\frac{e'We}{e'e/n}\right)^2}{tr(W' + W'W)}, \end{aligned}$$

and the Lagrange Multiplier Test for Spatial Lag (LM-lag):

$$\begin{aligned} &\text{Hypothesis:} \quad H_0: \lambda = 0 \quad \text{vs} \quad H_1: \lambda \neq 0 \\ &LM\_error = \frac{\left(\frac{e'Wy}{e'e/n}\right)^2}{D + tr(W' + W'W)}; \\ &D = \frac{(WX\beta)'(I - X(X'X)X')^{-1}(WX\beta)}{e'e/n} \end{aligned}$$

finally, the Akaike Criterion (AIC) remains a useful indicator to select the best model among all the estimated models.

3. Results

Table 1 displays the descriptive statistics for the primary data we are using in our estimations. These statistics give us a clearer idea of how varied the 1874 districts among Peru are. As we observe in the table, districts are as small as two squared km and as big as 24 049 squared km, but with an average size of 690 square km per district. Furthermore, concerning each dimension, we can identify some evident characteristics. Around 5.3% of the households did not achieve an average of nine years of schooling; similarly, 22.7% of households have at least one member without the skill of reading or writing correctly.

Regarding the *Childhood* dimension, we observe that most households do not fall into the poverty category. Less than 1% of households have at least one member that does not attend any school institution, has no health insurance (public or private), or has a job to contribute to the family income with less than 14 years old. Nevertheless, around 30% of households have at least one-member suffering from schooling lag. The descriptive statistics show that Peru is composed of districts where 18.7% of households have at least one member out of the healthcare system, and 63% of those households have members working in the informal sector. In other words, in a five-member family, one in five does not have any health insurance, and three in five have a job in the informal sector. This description of the households' labor situation complements that 4.7% of households have members without a job.

Concerning living conditions, we identify that 2.2% of the households have no proper access to water services; on the other hand, 38% have no sewage access, and 45% have no adequate electricity access. Also, 45%, 22%, and 16% of the households have poor building conditions on their floor, wall, and roof, respectively.

Finally, 15% of households are considered overcrowded since they have three or more members per room. These previous household conditions bring us a total of 20.1% of households falling into the poverty category under the *"Multidimensional Poverty Index"* concept.

Regarding the covariates we are using in our model, 6.4% of households have at least one member who migrated from another region, 41.6% of them have members who do not speak Spanish, and 31.1% of households have a female as household head.

Table 1. Descriptive Statistics

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
size	1,874	689.61	1922.27	1.99	92.91	500.09	24049.95
Dimensions							
educ1	1,874	0.0530	0.0370	0.0000	0.0300	0.0660	0.3210
educ2	1,874	0.2270	0.1310	0.0060	0.1220	0.3210	0.6890
childhood1	1,874	0.3010	0.0880	0.0430	0.2450	0.3560	0.5870
childhood2	1,874	0.0100	0.0080	0.0000	0.0050	0.0120	0.0910
childhood3	1,874	0.0010	0.0020	0.0000	0.0000	0.0020	0.0130
childhood4	1,874	0.0030	0.0090	0.0000	0.0000	0.0030	0.3150
health1	1,874	0.1870	0.1060	0.0100	0.1000	0.2600	0.6620
Job1	1,874	0.0470	0.0330	0.0000	0.0260	0.0620	0.4990
Job2	1,874	0.6300	0.1320	0.0950	0.5530	0.7210	0.9660
house1	1,874	0.0220	0.0420	0.0000	0.0030	0.0240	0.5480
house2	1,874	0.3810	0.2050	0.0000	0.2210	0.5290	0.9330
house3	1,874	0.4530	0.1920	0.0060	0.3280	0.5890	0.9550
house4	1,874	0.2180	0.2290	0.0000	0.0260	0.3680	0.9420
house5	1,874	0.1550	0.0950	0.0080	0.0900	0.1900	0.7020
house6	1,874	0.4520	0.2220	0.0020	0.2850	0.6210	0.9520
house7	1,874	0.1500	0.1210	0.0000	0.0710	0.1890	0.8650
Endogenous Variable							
IPM	1,874	0.2010	0.0380	0.0810	0.1760	0.2240	0.3600
Exogenous Variables							
migration	1,874	0.0640	0.0530	0.0000	0.0250	0.0920	0.4520
language	1,874	0.4160	0.3980	0.0000	0.0160	0.8860	0.9990
female	1,874	0.3110	0.0760	0.0920	0.2580	0.3680	0.5210

Source: National Census 201 – Instituto Nacional de Estadisticas e Informatica (INEI), Peru.

In Table 2, we observe the spatial autocorrelation for our set of variables that compose the *MPI.* As shown in most cases, except for*childhood 3, childhood 4, job 2*, and *house 1*, the *Moran's I*, which measures the spatial autocorrelation, are higher than 0.4, and in all the cases, it is statistically significant at 1%. These results give a clue to the spatial relationships that multidimensional poverty can have. Most of the variables that characterize poverty on its different faces show positive relational behaviors across space. In other words, poverty expressed in low education levels, insufficient levels of health, work, living conditions, and housing conditions show spatial behavior patterns and positive spatial self-correlation. That is, areas with high poverty levels that influence other places make the latter more likely to be poor.

Figure 1 shows the distribution of the *MPI* throughout the Peruvian districts. The left figure shows the *MPI* values for each district and the *MPI* histogram across them. In this figure, it can be seen that the majority of districts with high levels of multidimensional poverty are located in the central highlands and jungle areas of Peru. In contrast, the coast has low levels of multidimensional poverty.

Table 2. Summary Statistics of Spatial Autocorrelation

Statistic	Moran's I	p-value	Statistic	Moran's I	p-value
educ1	0.6184	0.0000	health1	0.6246	0.0000
educ2	0.6888	0.0000	house1	0.2142	0.0000
childhood1	0.6709	0.0000	house2	0.5146	0.0000
childhood2	0.4348	0.0000	house3	0.5948	0.0000
childhood3	0.2426	0.0000	house4	0.7492	0.0000
childhood4	0.0614	0.0000	house5	0.6140	0.0000
job1	0.4849	0.0000	house6	0.6974	0.0000
job2	0.2725	0.0000	house7	0.4132	0.0000
Endogenous Variable					
MPI	0.5641	0.0000			

Source: National Census 201 – Instituto Nacional de Estadisticas e Informatica (INEI), Peru.

The figure on the right shows *Moran's local* indicator's spatial distribution that measures the *MPI*'s spatial autocorrelation for each district. The figure shows that the communities with high spatial autocorrelation levels are located in Peru's central highlands and jungle. This evidence corresponds with the figure's left side, *i.e.* both maps show that poverty is highly concentrated in the central highlands and parts of the Peruvian jungle.

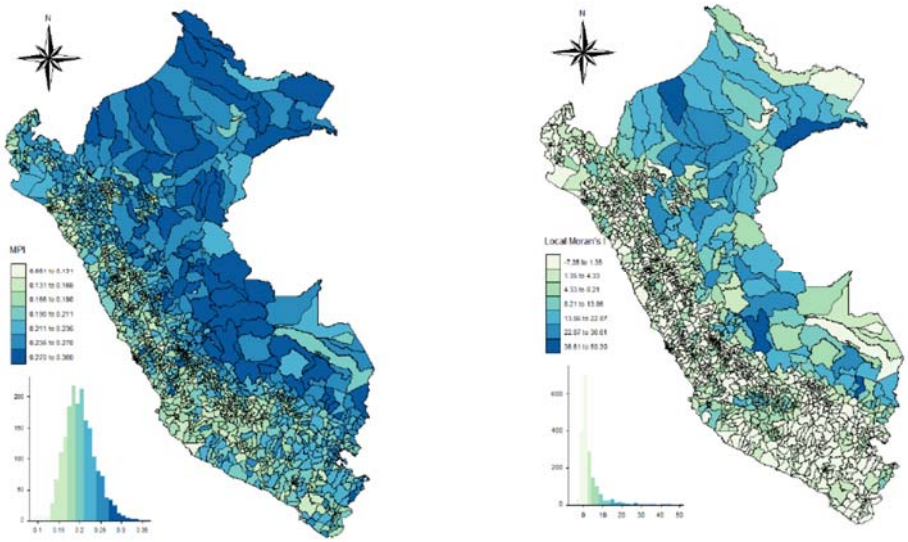

Figure 1. MPI and Local Moran's I per district

Table 3 shows the estimation results. The endogenous variable is the multidimensional poverty indicator, *MPI*, and the control variables were constructed to isolate possible household characteristics that may affect poverty levels within the household. The first control variable, *migrant*, captures the effect of migration between regions, taking the value of 1 when at least one household member has migrated from some other region and 0 otherwise. The second control variable,*language,* measures the second language's effect as a possible cause of poverty in the household. This indicator takes the value of 1 when at least one household member has another language other than Spanish as their mother tongue and 0 otherwise. Finally, the third control variable, *female*, captures the effect of having mothers as household heads. This indicator takes the value of 1 when the household head is female and 0 otherwise. In this table, the columns represent the estimation methods used.

The first column presents the results from an OLS estimation when there are no spatial effects on multidimensional poverty. The second column shows the spatial autoregression model results, where externalities come from the endogenous variable, i.e. the MPI variable of a given district has spatial effects on the surrounding districts. The third column shows the spatial error model results, where the source of spatial autocorrelation is the errors. In other words, the spatial autocorrelation is caused by variables not included in the model or by qualitative sources that could not be adequately captured in the model. Finally, column 4 displays the results of the autoregressive spatial model estimation with spatial errors. In this model, the sources of spatial autocorrelation arethe endogenous variable andthe errors.

Table 3. Estimation Results

Dependent variable: MPI				
	OLS	Spatial Autoregressive	Spatial Error	Spatial Error Autoregressive
migrant	-0.078***	-0.062***	-0.060***	-0.060***
	(0.015)	(0.015)	(0.015)	(0.015)
language	0.008***	0.008***	0.022***	0.023***
	(0.002)	(0.002)	(0.003)	(0.003)
female	-0.221***	-0.209***	-0.188***	-0.188***
	(0.011)	(0.011)	(0.011)	(0.011)
Constant	0.272***	0.249***	0.256***	0.256***
	(0.003)	(0.004)	(0.004)	(0.004)
δ		0.017***		-0.003***
		(0.002)		(0.002)
λ			0.127***	0.128***
			(0.003)	(0.003)
Observations	1,874	1,874	1,874	1,874
R2	0.196			
Adjusted R2	0.194			
Log Likelihood		3,701.63	4,111.52	4,112.32
sigma2		0.001	0.001	0.001
Akaike Inf. Crit.		-7,391	-8,211	-8,211
F-Statistic (df = 3; 1870)	151.596***			
Wald Test (df = 1)		85.818***	1,585.506***	
LR Test (df = 1)		87.192***	906.964***	908.570***
LM Test (df = 1)		1128.8***		

Note: **p <0.1; **p <0.05***; p<0.01*

Source: National Census 201 – Instituto Nacional de Estadisticas e Informatica (INEI), Peru.

The first thing that can be observed from these estimates is that the set of explanatory variables included in the model are statistically significant in all the estimated models. However, the signs appear to be somewhat counter-intuitive. In the variable that captures migration, the results indicate that households with at least one migrant household member from another region are less likely to be in a multidimensional poverty household. This result may be because much of the migratory flow amongPeruvian regions has been from the highlands and jungle areas to the coast and not vice versa. In this sense, migration has likely been from impoverished households to coastal cities searching for better economic and living conditions. Therefore, families with migrant members have possibly left poor households and have been able to escape to some degree from the poverty in which they were in their regions of origin. Under this assumption, the resultant sign of estimation makes sense.

For the variable that captures the second language's effect, it is clear that household members with a mother tongue other than Spanish are more likely to be in a poor household. This result is a consequence of the different social problems and cultural discrimination associated with Peru's mother tongue throughout its territory.The cultural and economic supremacy of those who speak Spanish over those whose mother tongue is one of the native languages such as Quechua, Aymara, Ashaninka, and Aguaruna.

Finally, the variable that captures women's effect as heads of a household has a negative and statistically significant sign in all cases. These results are based on the assumption that families led by women are more likely to plan household spending. Family investment decisions are directed towards developing household members' capacities, such as children. These assumptions are based on other research results for different realities, such as Duflo (2012, 1059-1070), who holds that women tend to have better spending decisions within the household than their male counterparts.

Regarding the estimates of spatial effects, it is observed that both the spatial effects coming from the endogenous variable, as well as the errors, are statistically significant in the three estimated models. In the model where only spatial effects on the endogenous variable are incorporated, a positive and statistically significant

coefficient is observed, suggesting that multidimensional poverty in a given district increases multidimensional poverty in a neighboring district. In short, multidimensional poverty shows positive spatial effects. Similarly, when the model only includes spatial effects on errors, the spatial effect is positive and statistically significant, as shown in column 3. Finally, when spatial effects are incorporated in both the endogenous variable and the errors, the coefficients are statistically significant at 1% in both cases; however, the endogenous variable coefficient changes to values close to zero. This result could have two possible explanations. First, the spatial effects coming from the endogenous variable are unstable. When other explanatory variables or other sources of spatial effects are incorporated, the coefficient changes in a large proportion. Second, the interaction between the endogenous variable's spatial effects and the errors produces changes in the coefficient of the spatial effects of the endogenous variable, making it even change its sign, although it is essential to notice that the value is negative but very close to zero. In short, this interaction causes the spatial effects coming from the endogenous variable to lose strength until they are minuscule. It is important to note is that the spatial effects of the errors have remained stable and statistically significant, suggesting that there are factors not incorporated into the model that affect the spatial interaction of the multidimensional poverty indicator. Therefore, an increase of 1 in the *MPI* of a district increases a neighboring district's multidimensional poverty by 0.128.

Furthermore, the *Wald* and *Lagrange Ratio* tests in all cases reject the null hypothesis of no spatial interactions; therefore, there is evidence of spatial effects. Also, the *Lagrange Multipliers* test of column 2 rejects the null hypothesis of no spatial interactions in the error terms; i.e. there is evidence that we must include the coefficient λ in our estimations. To support the LM test, the AIC criterion suggests that we must use the models where the spatial effect on the error terms is included.

Table 4. Spatial Effects

	Spatial Autoregressive			Spatial Error and Autoregressive		
	Direct	Indirect	Total	Direct	Indirect	Total
migrant	-0.0626	-0.0062	-0.0688	-0.0593	0.0009	-0.0584
language	0.0083	0.0008	0.0092	0.0226	-0.0003	0.0222
female	-0.2092	-0.0208	-0.2300	-0.1875	0.0029	-0.1846

Table 4 displays extra information where we include the direct and indirect effects that originated in our set of covariates. The direct effects represent the exogenous variable's effect over the endogenous variable without considering any spatial effects. Under no presence of spatial interactions, the direct effect corresponds to the OLS estimator. On the other hand, the indirect effects represent the exogenous variable's effect over the neighboring districts' endogenous variable. The variable endogenous impact goes back to the endogenous variable in the district of analysis through these effects. Direct and indirect effects can only be calculated when the spatial effects are in the endogenous variable or the explanatory variables but not in the errors. Therefore, the table does not incorporate the externalities generated in the spatial error model.

Direct effects are the explanatory variables' effects on the endogenous variable, similar to the OLS model's coefficients. However, in indirect effects, these capture the exogenous variables' externalities on a neighboring district's endogenous variable. The table shows that in some cases, the effects change sign, more specifically, in the whole set of explanatory variables, the externalities captured by the indirect effects change sign depending on the estimated model. This result is due to the observed instability of the endogenous variable's spatial effect coefficient incorporated in the model, as shown in Table 3.

Conclusions

This research studies multidimensional poverty in Peruvian households at the district level using data from the 2017 census. The study's central hypothesis is that multidimensional poverty also has a spatial dimension that has been little studied in the literature.

Among the main results, we find evidence of spatial correlation of the variables that compose the multidimensional poverty indicator's distant dimensions, *MPI*. A positive and statistically significant *Moran* indicator is observed in all cases. Likewise, it is observed that, in most cases, the value of spatial autocorrelation exceeds the value of 0.5, i.e. there are indications of the spatial dimension of poverty.

In the second part of the study, when spatial regressions are estimated for poverty incorporating some control variables, two significant results are observed. First, the set of explanatory variables are all statistically significant across the estimated models. These results are explained by the social, cultural, and economic changes that Peru has undergone in the last decades. Among these changes, we have a strong migration from the

countryside to the city, which not only caused low-income families to seek progress in the big cities, but in many cases, people left their cultural background in search of better opportunities. This fact had some consequences over poverty behavior among districts. Second, there is evidence of spatial effects on the endogenous variable and errors. Moreover, there is evidence that the spatial effects originating in errors have a stable value among the models, while the spatial effects originating in the endogenous variable are unstable.

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FADING THE EFFECTS OF CORONAVIRUS WITH MONETARY POLICY

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Abstract: *The Central Bank of Congo (BCC) reduced the policy rate in response to the uncertain effects of the coronavirus. The impact of the pandemic on the economy is still uncertain and depends on many factors. Using the Bayesian technique of the VAR model we notice that cutting the policy rate would not help the economy to cope with the consequences of COVID-19, we should rethink other tactics and strategies, such as a good communication strategy and / or try unconventional monetary policy measures. However, coordination with fiscal policy is a driver key in blurring the effects of the coronavirus crisis[9].*

Keywords: monetary policy; coronavirus; coordination.

JEL Classification: C32, E32, E44, E52, E63.

Introduction

On March 24, the BCC announced several measures to ease liquidity conditions by: (i) reducing the key rate by 150 basis points to 7.5%; (ii) eliminating compulsory reserves on demand deposits in local currency; and (iii) creating a new long-term guaranteed funding facility for commercial banks with a maximum duration of 24 months to support the provision of credit for the importation and production of food and other commodities. In addition, the BCC has taken steps to reduce the risk of bank note contamination and to promote the use of electronic payments.

Before the COVID-19 crisis hit the country, the economy was in full recovery following the knock-on effects of the exogenous shock of the fall in commodity prices, electoral psychological tensions, and the health shock Ebola. It was important to plan for major revisions and reforms to strengthen the resilience of the national economy and its resilience to external shocks. However, when these strategies should be implemented, the great coronavirus crisis comes. This new shock has once again precipitated the country into exceptional moments requiring the postponement of the efforts undertaken and necessitating the adoption of new extraordinary measures. In addition, even if the health aspects of the shock are likely to last no more than a year or two, its economic consequences are sure to last much longer, forcing political decision-makers to develop a real anti-COVID-19 strategy over the medium and long term, going beyond ad hoc special decisions. The virus has pushed their political conception from a decade of exceptionality to a new period of necessarily abnormal strategic attitudes.

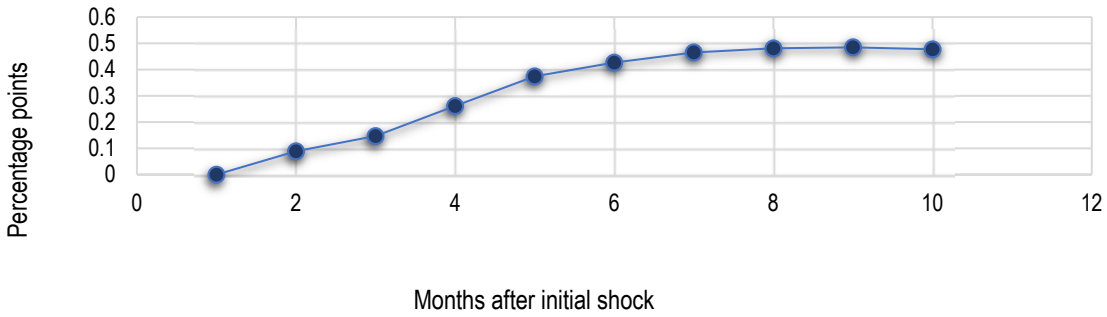
[9]Opinions expressed on this paper do not necessarily reflect the views of the Central Bank of Congo.

In the midst of significant uncertainty as to the line described by the pandemic and its impact on the world and Congolese economies, the data suggests that economic growth has declined considerably, reaching a negative figure of -2%, inflation has climbed to 11% and the value of the currency depreciated until 2000Cdf / Usd. In addition, people sick from COVID-19 face mandatory shelter and social distancing policies that inevitably disrupt economic and commercial activity. These circumstances encourage households and businesses to spend less, especially on non-essential goods and services. The rapid spread of COVID-19 and the massive containment measures that policy and health officials have taken to combat it represent an unprecedented negative shock to global demand and supply (Christensen *et al.* 2020; Pinshi 2020a). The uncertainty effects of coronavirus shock are reducing demand enough and squeezing the economy as a whole. Upward pressure from the general price level, intensified by an acceleration of the resulting exchange rate depreciation, undermines the BCC's mandate. How do these disturbances spread through the economy and affect the exchange rate, inflation and economic growth (unemployment), and to what extent can monetary policy blur these effects?

1. Inflation, Exchange Rates and Economic Growth: What Pass Through Effect?

The pass-through of the coronavirus shock on economic growth, the exchange rate and inflation takes place through various channels, mainly through fear and uncertainty (Leduc and Liu 2020; Baker *et al.* 2020; Dietrich *et al.* 2020; Barro *et al.* 2020), loss of confidence, pessimistic public expectations, great confinement, and so on. Following previous (Leitemo and Soderstrom 2001; Delle Chiaie 2009; Bekaer *et al.* 2010; Leduc and Liu 2012; Grigoli *et al.* 2015;) and very recent (Jordà *et al.* 2020; Leduc and Liu 2020); Curdia 2020; Baker *et al.* 2020), we use a Bayesian autoregressive vector econometric framework to isolate the effects of monetary policy on inflation, the output gap and the exchange rate, taking into account the uncertainty of the coronavirus[10]. We estimate the model using the monthly series from January 2012 to April 2020. From a theoretical point of view, we have argued that the uncertain effect of the coronavirus tends to lower economic growth, to increase the rate of inflation (especially in emerging markets and underdeveloped economies[11]) and to depreciate the value of the currency. In addition, the interest rate pass-through does not have a sufficient positive effect on inflation, the output gap and the exchange rate following the uncertain effects of the coronavirus pandemic.

A. Inflation rate response



Source: Bayesian vector estimate prior to Sims-Zha (normal-Wishart)

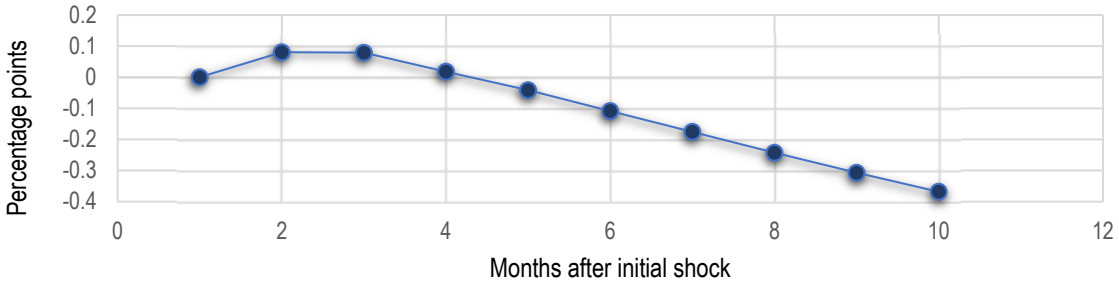
[10] We measure the uncertainty of the coronavirus through the global pandemic uncertainty index (WPUI) and the volatility index (VIX) symbolizing fear and lack of confidence in the international market. These two indicators are taken as exogenous variables in our framework. We use the following framework:

$$\Pi_t = \sum_{j=1}^{p} \varphi_j \Pi_{t-j} + \delta_j Z_t + \varepsilon_t \, \varepsilon_t \sim N(0, \sum)$$

Where ε_t is a reduced form residual vector at time t. The vector Π_t contains the policy rate, the consumer price index, the output gap and the nominal exchange rate. The WPUI Pandemic Uncertainty Index and the VIX Uncertainty Index Z_t are uncertainty variables constructed specifically to monitor, respectively, the evolution of the Coronavirus pandemic and the behavior of the international market, since these variables have a systemic effect on the majority of economies, including the Democratic Republic of the Congo. The behavior of these indices instills uncertainty in the dynamism of other economies. Therefore, they are assumed to be exogenous in this model.

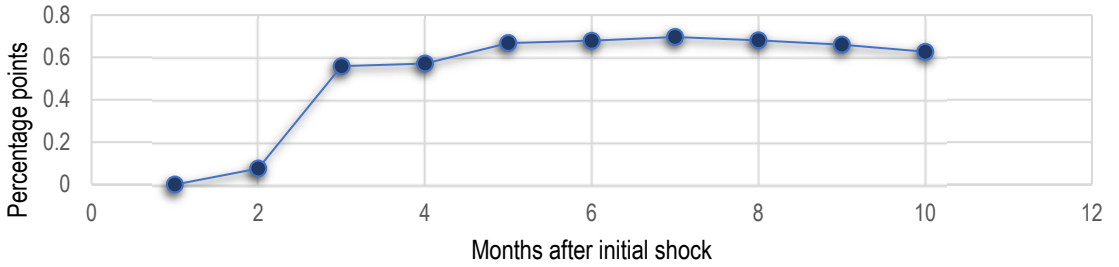
[11] The effect is reversed in developed countries, where they are experiencing deflationary pressures.

B. Output gap response



Source: Bayesian vector estimate prior to Sims-Zha (normal-Wishart)

C. Exchange rate response



Source: Bayesian vector estimate prior to Sims-Zha (normal-Wishart)

Figure 1. Macro-variable responses to the policy rate shock taking into account the exogenous effect of uncertainty and fear of the Coronavirus

These theoretical predictions are supported by empirical evidence. Figure 1 plots the effects of a policy rate shock on the three macroeconomic interest variables. Each plot displays the average as a solid line, with an average certainty of 95%. Following the monetary policy shock via the policy rate taking into account the uncertain effect of the coronavirus, the inflation rate shown in Figure A increases more and more over time, reaching a peak about 8 months after the impact. Likewise, Figure B shows that the output gap decreases persistently for approximately 7. This reflects a decline in growth and an increase in the persistent unemployment rate. The exchange rate shown in Figure C is increasing rapidly, reflecting increased currency depreciation following pessimistic expectations fueled by uncertainty from the coronavirus shock. This shock puts in difficulty the formulation of monetary policy to blur these harmful effects on macroeconomic stability.

2. Monetary Policy: What Strategies and Tactics Adopted?

The unprecedented conditions created by the spread of the coronavirus call for exceptional strategies and tactics from the BCC. In addition to traditional tactics such as lowering the policy rate, the bank should try to devise unconventional measures to avoid the permanent consequences of a temporary, but potentially serious, shock to domestic production. The development of new tools could help businesses and households' weather the storm. Not only is the central bank in a different situation than before the previous shocks, but this one is also of a different nature. The front line in addressing the challenges of COVID-19 should include the extraordinary efforts of the National Institute of Biomedical Research (INRB) health professionals, caregivers and volunteers across the DRC, but as the virus and the interventions needed to reduce its spread have Also having important effects on macroeconomic stability, monetary policy should seek to minimize the resulting disruption for households and businesses. The effect of the coronavirus rages fear heightens uncertainty and breaks confidence, the objective would therefore be to allow the economy to recover its potential before the coronavirus crisis once the risks to public health are mitigated.

To reduce the recessionary gap due to the shock of the coronavirus, which is shaking the Congolese economy, the tactics of the BCC could turn to monetary easing policies with the massive purchases of treasury bonds. The expansion of the latter could gradually revive the economy and flatten the mortality curve for small and medium-sized businesses. In addition, support to banks could help ease financial conditions and allow credit recovery to the private sector. The uncertainty of the coronavirus could be reflected in the strains on the financial

system. The impact could be severe, price instability and currency depreciation (including capital inflows) have bad repercussions on the financial system (Ma *et al.* 2020). Financial stability is like a puzzle piece to monetary policy. Its development automatically affects monetary policy. Banks should continue to provide credit to keep the economy at a significant level from the depths of the recession. The introduction of a reduction in lending interest rates would be beneficial for the economy and especially for small and medium-sized enterprises for a term financing scheme with additional incentives. These decisions should contribute to the broader objectives of economic policy in various ways. First, a reduction in the cost of credit will increase cash flow for many borrowers, which, combined with other unconventional central bank programs to offer loans and maintain income, should support households and help businesses avoid wasting capital and laying off or going bankrupt. This latter characteristic reflects the rarely used role of the central bank as a stabilizer of the financial system. This should be coordinated by its intent and scale, and in line with the financial stability mandate.

These unconventional monetary policy measures are aimed exclusively at preserving economic and financial stability and do not constitute monetization of the debt itself. With this in mind, the objective would be to ease financial conditions, ease financial turmoil and gradually pull the economy out of recession. Pessimistic expectations from the market and the general public exacerbate monetary instability which affects price developments. This impact is due to the uncertainty of the coronavirus and the lack of confidence that it amplifies. The best strategy for the bank would be to adopt good communication to guide these expectations and rebuild perfect confidence with the market and the general public. In fact, communication is the strategy and the instrument of the situation to restore macroeconomic stability (Pinshi 2020b).

3. Set the Perimeter

There are lines that should not be crossed or be very vigilant for the central bank. Firstly, the non-respect of its mandate, secondly the fear of the loss of its independence.

Given the nature of the shock, which is different from all the previous ones, the bank could take urgent measures mentioned above. In doing so, it could and would prevent any lasting reduction in overall supply capacity and help offset any lingering negative effect on aggregate demand. These measures will help support households and businesses during the crisis. However, the main objective defined in the BCC's mandate is to maintain price stability. Low, stable and predictable inflation is an essential prerequisite for long-term economic prosperity. It allows individuals to make informed decisions about savings and spending. And it allows households, businesses and governments to finance their spending without introducing inflation risk premiums to their borrowing costs. Despite all these measures, the BCC should ensure price stability and its priority policy should comply with its mandate. Hence there must be an optimization between respect for the mandate and stabilization of the output gap towards the restoration of economic growth.

The accumulation of the budget deficit further feeds public debt and deteriorates fiscal sustainability. Excessive massive purchases of treasury bonds could cause the independence of the BCC to be lost, as disgusting monetary funding will follow. This would reduce the credibility of the BCC and undermine the institutional independence of the BCC. In addition, the natural boundaries between fiscal and monetary policy will need to be fully restored to preserve the credibility of the BCC.

4. Towards Coordination

Monetary policy is only a small part of the overall economic policy response. COVID-19's economic disruption and containment affects many industries and businesses much more than others. Monetary policy, which affects the economy as a whole, cannot solve these difficulties alone. This is why the BCC must coordinate its actions with those of other committees. There have been a wide range of government programs (the multisectoral emergency mitigation program for COVID-19 in the DRC (PMUAIC-19)) launched to address different aspects of the coronavirus crisis. Policy coordination is the key to an effective response and the option to limit the negative impact of the effects of the coronavirus.

The optimal combination of fiscal and monetary policies can mitigate the negative economic effects of the COVID-19 pandemic. With a large part of the economy confined, such coordination would be essential to compensate for drastic disruptions in normal income, credit and spending habits of businesses and households. The effectiveness of policy support will depend on the credibility of the measures and the extent of pre-existing vulnerabilities such as high debt levels and large financing needs and structural problems. In addition, fiscal multipliers are generally lower in high-debt economies (Lzetzki 2010; Huidrom *et al.* 2019). The effectiveness of fiscal policy will also critically depend on the social security system, which could be complicated by high levels of informality. Easing monetary policy may also be less effective due to the large informal sector and low financial

inclusion. Despite these weaknesses in the structure of the Congolese economy, coordination is a good strategy for blurring the effects of the coronavirus.

Conclusions and Implications

The coronavirus epidemic is exacerbating the heavy negative toll of the Congolese economy, which has resulted in a recession, price instability and a depreciated exchange rate. This paper examines the role that the BCC could have in mitigating the economic effects of the coronavirus epidemic. While it is difficult to capture all the complexities of the economy in one model, this paper suggests that conventional monetary policy is not big enough to contain this crisis. Because of this limitation, we suggest including a wide menu of policies to mitigate the effects of the health crisis. A good communication strategy and the testing of unconventional monetary policy measures are major factors in blurring the effects of the coronavirus crisis.

Beyond the conduct of short-term monetary policy to deal with the uncertainty of the coronavirus, the likely long-term implications of the epidemic also underscore the need to lay the foundations for long-term sustainable growth. In addition, for political decision-makers to be able to finance the health system and support domestic demand through the possible recovery, it would be worthwhile to credibly undertake a coordination of budgetary and monetary policies aimed at promoting health care programs. Comprehensive reforms to improve institutions and frameworks that can ensure a possible return to robust growth while preparing the ground for strengthening long-term prospects. This would require a credible fiscal framework guaranteeing the restoration of fiscal sustainability and would also require a credible monetary policy framework ensuring preservation of price stability as well as maintenance of confidence.

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THE POLITICAL ECONOMY THEOREM

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Abstract: *Welfare maximization is constrained by the ultimate frontier of efficient allocations, with a unique, interior optimum. By the second welfare theorem, such an optimum depends on a specific wealth distribution out of innumerable ones at given prices, whereby the state cannot refrain from redistributing. Such has long been known by the profession, but it never received a mathematical formalization, which this article takes up. Building on the literature, this research also presents two simplified proofs to the two welfare theorems and a mathematical formalization of the resolution to the compromise between equity and efficiency, for the additional constraint binds the social welfare function in equity and it originates the ultimate possibility frontier in efficiency.*

Keywords: competitive equilibrium; Pareto efficiency; political economy; social welfare; utility possibility; wealth distribution.

JEL classification: D31; D51; D61; D63; I31; I38; P46; P48.

Introduction

There famously exist two fundamental theorems of welfare economics. The first welfare theorem dictates that a price equilibrium with transfers in a complete market system is a feasible Pareto efficient allocation (i.e. market capitalism); the second welfare theorem dictates that a feasible Pareto efficient allocation is a price equilibrium with transfers in a complete market system (i.e. state capitalism). Both theorems are the syntactic implication $\mathrm{A} \longrightarrow B = \neg A \vee B$, which is true even if antecedent A is false (i.e. no existential fallacy); their failures, stressed by market and state socialism respectively together with their remedies, therefore only mean that A is not guaranteed in order to yield B (i.e. no counterexample, negative or inverse error singly taken): in the first case the state has an allocative role to guarantee market completeness and full employment; in the second case the state has a redistributive role to ensure the feasible Pareto efficient allocation optimizing social welfare, because the social welfare function is constrained by the Pareto set and their mathematical structure yields a unique, interior optimum. In positive terms, however, market completion, business cycle stabilization and wealth redistribution are difficult, and knowledge of the optimal allocation and its necessary price enforcement are equally improbable.

The two welfare theorems are not therefore strictly concerned with welfare, but with efficiency, notes Fenoaltea (2001) especially, for the feasible Pareto efficient allocation of interest is exogenous: a feasible Pareto efficient allocation can be reached through exchange in a complete market system at fixed prices, preceded by wealth redistribution, but which one is it to be? The answer is only the one optimizing social welfare. Such a reflexion triggers a welfare theorem of its own, which the profession has long known, see Bator (1957, 22), but which lacks a mathematical formalization, as proven by the updated encyclopedic references Mas-Colell et al. (1995), Jehle and Reny (2001), Kreps (2012) and Varian (1978). Fenoaltea (2001) presented it more or less thus: if initial wealth redistribution is decentralized at given prices then the probability of selecting the initial level of wealth distribution optimizing social welfare is infinitesimal; we formalize it mathematically and following him we call it the theorem of political economy.

Before doing so let us recall Fenoaltea (2001)'s remarks: market capitalism can at most yield efficiency, not welfare optimality, unlike state capitalism on contemplating our theorem; the object of redistribution is wealth because the optimal allocation is not known, which wealth redistribution can be unjust, we add. We in fact specify that because wealth redistribution is about aggregate utility optimization, not unjustified egalitarianism, such an optimization cannot be utilitarian, but ethical, which means it need not happen. We further note two points. Firstly, centralized transfers for the known feasible Pareto efficient allocation, whereby the market is avoided, are improbable as well as contradictory, because even if impossible for the direct achievement of the known feasible Pareto efficient allocation they would still be needed for its initial wealth redistribution. Secondly, state socialism conceptually resolves the second welfare theorem failure just as market socialism resolves the first's, providing knowledge of the feasible Pareto efficient allocation optimizing social welfare, therefore, state socialism allows state capitalism to function, as sociologically understood.

1. Structure

In this section we lay out the building blocks for the mathematical formalization of the political economy theorem following Mas-Colell et al. (1995), presenting direct proofs to the two welfare theorems in the process, with attendant remarks.

Let $\{X_i, \succsim_i\}_{i=1}^{I} \subset \mathbb{R}^K$ be a consumption set and preferences sequence with regard to I consumers, $\{Y_j\}_{j=1}^{J} \subset \mathbb{R}^K$ a production set sequence with regard to J producers and $\mathrm{e}=[e_1, \ldots, e_K]^\top \subset \mathbb{R}^K$ a K dimensional vector of initial endowments, relative to K real commodities.
Preferences are complete and transitive, and production is non-empty and closed:

$$\forall \{z_n\}_{n=1}^{\infty} \subset \mathbb{R}^K,\ z_1 \succsim_i z_2 \vee z_2 \succsim_i z_1$$

and

$$z_1 \succsim_i z_2 \wedge z_2 \succsim_i z_3 \longrightarrow z_1 \succsim_i z_3;\ \overline{Y}_j = \left\{y \in \mathbb{R}^K :\ \forall \{y_{j_n}\}_{n=1}^{\infty} \subset Y_j,\ y_{j_n} \to y\right\} \neq \{\}.$$

Individual consumption and production vectors $\mathrm{x}_i = [x_{1i}, \ldots, x_{Ki}]^\top \in X_i \subset \mathbb{R}^K$ and $\mathrm{y}_j = [y_{1j}, \ldots, y_{Kj}]^\top \in Y_j \subset \mathbb{R}^K$ form the allocation
$(\mathbf{x}, \mathbf{y}) = (\mathbf{x}_1, \ldots, \mathbf{x}_I, \mathbf{y}_1, \ldots, \mathbf{y}_J) \in X_1 \times \ldots \times X_I \times Y_1 \times \ldots \times Y_J = X \times Y.$
Preference characteristics are famously captured by household utility functions homogeneous of degree one, continuous, increasing and concave in consumption:

$$\mathrm{u}: \mathrm{X} \to \mathbb{R}^I,$$

where $\mathrm{X}=\{\mathbf{x} :\ \mathbf{x} \in \mathbb{R}^{KI}\}$,
such that $\mathrm{U}=\mathrm{u}(\mathbf{x});\ \forall \alpha \in \mathbb{R},\ u(\alpha \mathbf{x}) = \alpha u(\mathbf{x}),\ u \in C^2(X),\ u'(\mathbf{x}) > 0 \text{ and } u''(\mathbf{x}) < 0.$
The same holds for production and firm production functions.
A feasible allocation is such that aggregate consumption equals aggregate production:

$$\mathrm{a}=\left\{(\mathbf{x}, \mathbf{y}) \in X \times Y \subset \mathbb{R}^{K(I+J)} :\ \sum_{i=1}^{I} \mathbf{x}_i = \mathbf{e} + \sum_{j=1}^{J} \mathbf{y}_j\right\}.$$

For any K dimensional price vector $\mathrm{p}=[p_1, \ldots, p_K]^\top \subset \mathbb{R}^K$, aggregate wealth is the sum of individual wealths, namely, aggregate consumption weighted at given prices, which is the sum of the initial endowment and aggregate production weighted at given prices:

$$\sum_{i=1}^{I} \mathbf{w}_i = \sum_{i=1}^{I} \mathbf{p}^\top \mathbf{x}_i = \mathbf{p}^\top \mathbf{e} + \sum_{j=1}^{J} \mathbf{p}^\top \mathbf{y}_j.$$

Centralized transfers happen by redistributing priced endowments and production. A feasible allocation is Pareto efficient if and only if there exists no other feasible allocation such that almost all agents prefer it to the given one and at least one agent strictly prefers it to the given one:

$$\tilde{a} \longleftrightarrow \nexists a'$$

such that, $\forall i,\ a'_i \succsim_i a_i$ and, $\exists i,\ a'_i \succ_i a_i$.
The Pareto set is the collection of all feasible Pareto efficient allocations:

$$\tilde{A} = \left\{\tilde{a} :\ \tilde{a} \in \tilde{X} \times \tilde{Y} \subset \mathbb{R}^{K(I+J)}\right\}.$$

For consumption, preferences, production, initial endowments and wealth, a price equilibrium with transfers is an allocation and a non-zero price vector pair such that profits and preferences are optimal and markets clear: $(a^*,\ \mathbf{p}\neq 0)$ such that

(i) $\forall \mathbf{y}_j' \in Y_j,\ \mathbf{p}^\top \mathbf{y}_j^* \geq \mathbf{p}^\top \mathbf{y}_j'$,

(ii) $\mathbf{x}_i^* \succ_i \mathbf{x}_i'$, where $\mathbf{x}_i^*,\ \mathbf{x}_i' \in B\left(\mathbf{p}^\top\right) = \left\{\mathbf{x}_i' \in X_i :\ \mathbf{w}_i \geq \mathbf{p}^\top \mathbf{x}_i'\right\}$,

(iii) $\sum_{i=1}^{I} \mathbf{x}_i^* = \mathbf{e} + \sum_{j=1}^{J} \mathbf{y}_j^*$.

The first welfare theorem dictates that a price equilibrium with transfers in a complete market system is a feasible Pareto efficient allocation: $(a^*,\ \mathbf{p}\neq 0) \longrightarrow \tilde{a}^*$. It can be proven directly. There exists a consumption vector optimizing preferences for optimal profits and all agents; therefore, it is preferred to all the others and the feasible allocation supporting it is Pareto efficient; formally: $\sum_{i=1}^{I} \mathbf{x}_i^* = \mathbf{e} + \sum_{j=1}^{J} \mathbf{y}_j^* \succ \mathbf{e} + \sum_{j=1}^{J} \mathbf{y}_j' = \sum_{i=1}^{I} \mathbf{x}_i'$ for $\sum_{i=1}^{I} \mathbf{p}^\top \mathbf{x}_i^* = \mathbf{p}^\top \mathbf{e} + \sum_{j=1}^{J} \mathbf{p}^\top \mathbf{y}_j^* \geq \mathbf{p}^\top \mathbf{e} + \sum_{j=1}^{J} \mathbf{p}^\top \mathbf{y}_j' = \sum_{i=1}^{I} \mathbf{p}^\top \mathbf{x}_i'$ and $\mathrm{a}^* = \left\{(\mathbf{x}^*,\ \mathbf{y}^*) \in X \times Y \subset \mathbb{R}^{K(I+J)} :\ \sum_{i=1}^{I} \mathbf{x}_i^* = \mathbf{e} + \sum_{j=1}^{J} \mathbf{y}_j^*\right\}$, therefore, $\nexists a'$ such that, $\forall i,\ a_i' \succsim_i a_i^*$ and, $\exists i,\ a_i' \succ_i a_i^*$.

We remark that the use of locally non-satiated preferences is unnecessary, because one need not hypothesize a feasible Pareto dominating allocation automatically embedding a contradictory consumption vector optimizing preferences.

The second welfare theorem dictates that a feasible Pareto efficient allocation is a price equilibrium with transfers in a complete market system: $\tilde{a} \longrightarrow (\tilde{a}^*,\ \mathbf{p}\neq 0)$. It can be likewise proven directly. There exists no feasible Pareto dominating allocation, therefore, it must embed a consumption vector optimizing preferences for optimal profits and all agents; formally: $\nexists a'$ such that, $\forall i,\ a_i' \succsim_i a_i^*$ and, $\exists i,\ a_i' \succ_i a_i^*$ and $\mathrm{a}^* = \left\{(\mathbf{x}^*,\ \mathbf{y}^*) \in X \times Y \subset \mathbb{R}^{K(I+J)} :\ \sum_{i=1}^{I} \mathbf{x}_i^* = \mathbf{e} + \sum_{j=1}^{J} \mathbf{y}_j^*\right\}$, therefore, $\sum_{i=1}^{I} \mathbf{x}_i^* = \mathbf{e} + \sum_{j=1}^{J} \mathbf{y}_j^* \succ \mathbf{e} + \sum_{j=1}^{J} \mathbf{y}_j' = \sum_{i=1}^{I} \mathbf{x}_i'$ for $\sum_{i=1}^{I} \mathbf{p}^\top \mathbf{x}_i^* = \mathbf{p}^\top \mathbf{e} + \sum_{j=1}^{J} \mathbf{p}^\top \mathbf{y}_j^* \geq \mathbf{p}^\top \mathbf{e} + \sum_{j=1}^{J} \mathbf{p}^\top \mathbf{y}_j' = \sum_{i=1}^{I} \mathbf{p}^\top \mathbf{x}_i'$. Observe that locally non-satiated preferences are similarly unnecessary. We additionally recall Maskin and Roberts (2008, 233)'s remark: convex production sets (and preferences) are unnecessary for both the second welfare theorem and the existence of a price equilibrium with transfers (e.g. in large non-atomic economies they are unnecessary for its existence). Specifically, the second welfare theorem's historic proof uses convex production sets and preferences only to derive existence of a price quasi-equilibrium with transfers, not to show that a true antecedent implies a true consequent, therefore, we note, if the consequent is true through convex production sets and preferences then the second welfare theorem holds trivially. Maskin and Roberts (2008, 233) also remarked that a counterexample to the second welfare theorem is a sufficient condition for the non-existence of any price quasi-equilibrium with transfers: by definition, a feasible Pareto efficient allocation embeds a consumption vector optimizing preferences for optimal profits and all agents, thus, if such an optimization were impossible then the defined notion of an equilibrium would not exist at all.

There exists a transformation of the Pareto set into multidimensional, real household utility: $t : \tilde{A} \to U$, where $\mathrm{U}=\left\{\mathbf{u} :\ \mathbf{u} \in \mathbb{R}^I\right\}$, such that $\mathrm{T}=\mathrm{t}(\tilde{a})$. It is homogeneous of degree one, continuous and increasing in the Pareto set elements. The utility possibility frontier follows from the Pareto set through a function composition, because each household presents a maximal utility level given those of others, matching the notion of Pareto efficiency; more clearly, the utility possibility frontier maps household utility to the non-negative real line: $\mathrm{f}\circ t : \tilde{A} \to \mathbb{R}_+;\ f : U \to \mathbb{R}_+$ such that $\mathrm{F}=\mathrm{f}(\mathbf{u})$. It is homogeneous of degree one, continuous, increasing and convex in utility: $\mathrm{f}''(\mathbf{u}) > 0$, all else equal. The social welfare function maps household utility to the non-negative real line: $\mathrm{s}:\ \mathrm{U} \to \mathbb{R}_+$ such that $\mathrm{S}=\mathrm{s}(\mathbf{u})$. It is homogenous of degree one, continuous, increasing and concave in utility: $\mathrm{s}''(\mathbf{u}) < 0$, all else equal. Social welfare optimization is the maximization of the social welfare function with respect to utility subject to the utility possibility frontier; social welfare function concavity and utility

possibility frontier convexity are famously sufficient, but unnecessary, conditions for a unique, interior optimum: $\max_{\mathbf{u}} s(\mathbf{u}) \; s.t. \; f(\mathbf{u})$ and $\mathrm{n}(U_o) = 1$, where $\mathrm{U}_o = \{\mathbf{u}_o : \mathbf{u}_o \in \mathbb{R}^I\}$.

2. Theorem

In this section we formalize the political economy theorem mathematically; we further mathematically formalize the notion of the ultimate possibility frontier following Fenoaltea (2001), resolving the equity efficiency compromise in the process.

The social welfare optimum is a unique tangency point between the social welfare function and the utility possibility frontier and it is a feasible allocation along the Pareto set. A feasible allocation is such that aggregate consumption equals the initial endowment plus aggregate production; priced aggregate consumption is wealth, whereby price changes vary the angle at which the wealth hyperplane crosses the Pareto set. A probability density function with individual consumption vectors as arguments models the probability of randomly selecting an initial level of wealth distribution at given prices: for the probability space (Ω, X, π), where Ω is the sample space, $\mathrm{X}=\{\mathbf{x} : \mathbf{x} \in \mathbb{R}^{KI}\} \subset \mathbb{R}^{KI} = \mathcal{P}(\Omega)$ is the σ-algebra and $\pi : X \to [0, 1]$ is the probability measure, $\mathrm{P}=\pi(\mathbf{x}) \geq 0$ and $\int_{-\infty}^{\infty} \pi(\mathbf{x})\, d\mathbf{x} = 1$.

By the second welfare theorem, a feasible Pareto efficient allocation can be reached by exchange in a complete market system at fixed prices given an initial level of wealth distribution. The feasible Pareto efficient allocation optimizing social welfare is contingent on an initial level of wealth distribution at given prices and since a specific initial level of wealth distribution is infinitesimal the probability that it result through decentralization is also infinitesimal: since the initial level of wealth distribution is modeled through an aggregate consumption vector taken from the real hyperplane at fixed prices the probability that a specific one result randomly is zero.

Theorem 2.1 (Political economy theorem) *Let* $\hat{\mathbf{w}} = \mathbf{p}^{\top}\hat{\mathbf{x}}$ *be an arbitrary level of initial wealth redistribution. If initial wealth redistribution is not centralized at fixed prices then the probability of selecting the initial level of wealth distribution optimizing social welfare is zero. Formally:*

$$\mathbf{w} \neq_C \hat{\mathbf{w}}|\mathbf{p} \longrightarrow P(\mathbf{w} = \mathbf{w}_o) = 0. \qquad 2.1$$

Proof. The proof is direct. If wealth redistribution is not centralized at fixed prices then the probability that the initial level of wealth distribution equal the one optimizing social welfare is the integral of the aggregate consumption probability density function evaluated at the point optimizing social welfare, which is zero; formally: $\mathbf{w} = \bar{\mathbf{p}}^{\top}\mathbf{x}$, therefore,

$\mathrm{P}(\mathbf{w} = \mathbf{w}_o) = P(\bar{\mathbf{p}}^{\top}\mathbf{x} = \bar{\mathbf{p}}^{\top}\mathbf{x}_o) = P(\bar{\mathbf{p}}^{\top}\mathbf{x} \in [\bar{\mathbf{p}}^{\top}\mathbf{x}_o, \bar{\mathbf{p}}^{\top}\mathbf{x}_o]) = P(\mathbf{x} \in [\mathbf{x}_o, \mathbf{x}_o]|\mathbf{p}^{\top}) =$
$\int_{\mathbf{x}_o}^{\mathbf{x}_o} \pi(\mathbf{x})\, d\mathbf{x} = |\phi(\mathbf{x})|_{\mathbf{x}_o}^{\mathbf{x}_o} = \phi(\mathbf{x}_o) - \phi(\mathbf{x}_o) = 0.$ *QED*

The reason for which the converse is not stated is clear from contrapositive of the converse (i.e. inverse denial), namely, if initial wealth redistribution is centralized at fixed prices then the probability of selecting the initial level of wealth distribution optimizing social welfare need not be non-zero, as another initial level of wealth distribution could result, intentionally and not; formally: $\mathrm{w}=_C \hat{\mathbf{w}}|\mathbf{p} \not\longrightarrow P(\mathbf{w} = \mathbf{w}_o) \neq 0$.

Corollary 2.2 *If the probability of selecting the initial level of wealth distribution optimizing social welfare is non-zero then the arbitrary level of initial wealth redistribution equals the initial level of wealth distribution optimizing social welfare. Formally:*

$$P(\mathbf{w} = \mathbf{w}_o) \neq 0 \longrightarrow \hat{\mathbf{w}} = \mathbf{w}_o. \qquad 2.2$$

Proof. The proof is a tautology of Theorem 2.1's contrapositive. Theorem 2.1's contrapositive dictates that if the probability of selecting the initial level of wealth distribution optimizing social welfare is non-zero then initial wealth redistribution is centralized at fixed prices: $\mathrm{P}(\mathbf{w} = \mathbf{w}_o) \neq 0 \longrightarrow \mathbf{w} =_C \hat{\mathbf{w}}|\mathbf{p}$. It follows that the arbitrary level of initial wealth redistribution equals the initial level of wealth distribution optimizing social welfare, namely, the one centrally selected: $\mathrm{w}_o = \mathbf{w} =_C \hat{\mathbf{w}}$. *QED*

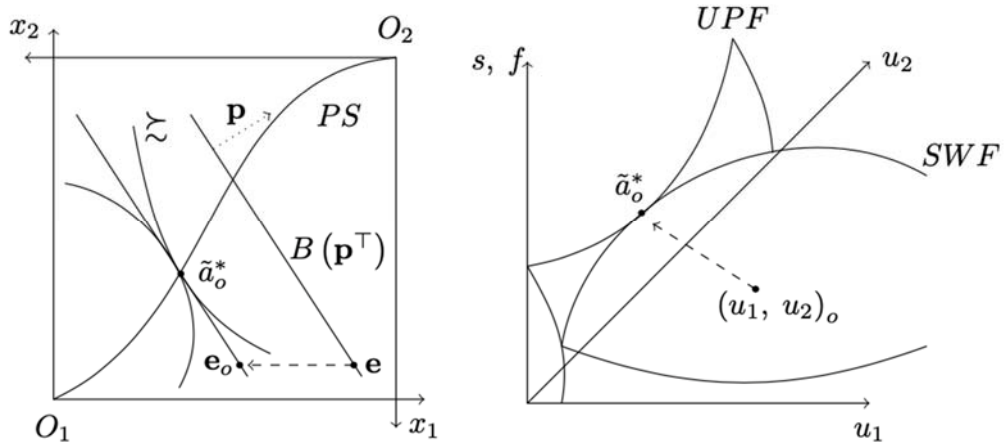

Figure 1. The first diagram is a pure exchange Edgeworth box with two agents, O_1 and O_2, and two consumptions, x_1 and x_2 : tangency points between preferences $\succsim$ at given budget constraint $\mathrm{B}(\mathbf{p}^\top)$, to which prices p are orthogonal, are Pareto set PS; the budget constraint's slope is price ratio $\frac{p_2}{p_1}$. Social welfare optimum $\tilde{a}_o^*$ is a specific feasible Pareto efficient allocation, reached at specific initial wealth $\mathrm{w}_o = \mathbf{p}^\top \mathbf{x}_o = \mathbf{p}^\top \mathbf{e}_o$ and fixed prices: if initial wealth does not yield the social welfare optimum through trade along the budget constraint's slope in a complete market system then the state can redistribute it by shifting the budget constraint at a constant slope from $\mathrm{w}=\mathrm{p}^\top \mathbf{x} = \mathbf{p}^\top \mathbf{e}$ to $\mathrm{w}_o = \mathbf{p}^\top \mathbf{x}_o = \mathbf{p}^\top \mathbf{e}_o$. The second diagram is a three dimensional graph of social welfare function SWF and of utility possibility frontier UPF with the same agents. The social welfare optimum, at specific initial wealth $\mathrm{w}_o = \mathbf{p}^\top \mathbf{x}_o = \mathbf{p}^\top \mathbf{e}_o$ and fixed prices in a complete, efficient market system, is the tangency point between the two manifolds. The probability of randomly selecting the initial wealth optimizing social welfare is zero: $\mathrm{P}(\mathbf{w}_o) = P\left(\bar{\mathbf{p}}^\top \mathbf{e}_o\right) = P\left(\mathbf{x}_o | \mathbf{p}^\top\right) = 0$. The diagrams are not to scale.

A partially more binding constraint than the utility possibility frontier for the social welfare function is such that the new tangency point between the acting social welfare function and the new constraint (i.e. second best) excludes both the former social welfare optimum and tangent allocations with lower social welfare levels on the binding segment of the utility possibility frontier. More clearly, the ultimate utility possibility frontier is the union of the binding segments of the new constraint and the utility possibility frontier about their point of intersection: new constraint function c is defined as f and, $\forall d = c,\ f$ and $\mathrm{u} \in U$ such that $\mathrm{U}_{<\mathbf{u}} = \{\mathbf{u} :\ \mathbf{u} \in (\mathbb{R}^I \backslash G) \subset \mathbb{R}^I\}$, where $\mathrm{G} \subset \mathbb{R}^I$ is a set subtrahend, and $\mathrm{U}_{\geq \mathbf{u}} = U \backslash U_{<\mathbf{u}},\ d_{<\mathbf{u}} : U_{<\mathbf{u}} \to \mathbb{R}_+,\ d_{\geq \mathbf{u}} : U_{\geq \mathbf{u}} \to \mathbb{R}_+,\ D_{<\mathbf{u}} = \{d_{<\mathbf{u}}(\mathbf{u}) :\ d_{<\mathbf{u}}(\mathbf{u}) \in \mathbb{R}_+\}$ and $\mathrm{D}_{\geq \mathbf{u}} = \{d_{\geq \mathbf{u}}(\mathbf{u}) :\ d_{\geq \mathbf{u}}(\mathbf{u}) \in \mathbb{R}_+\}$, therefore, $\mathrm{F'}=\min\{F_{<\mathbf{u}},\ C_{<\mathbf{u}}\} \cup min\{F_{\geq \mathbf{u}},\ C_{\geq \mathbf{u}}\}$.

The fact that the second best has a higher social welfare level than the tangent allocations on the binding utility possibility frontier means there semantically exists no equity efficiency compromise: the second best is meaningfully efficient and Pareto efficiency is only Pareto stability by which exchange no longer happens. The equity efficiency compromise exists neither effectively, because the second best is the tangency point between the social welfare function and the new constraint, making it equitable (in that it optimizes social welfare), and it is also the tangency point between the social welfare function and the ultimate utility possibility frontier, making it efficient (in that it accounts for Pareto efficiency). Such an observation is due to Fenoaltea (2001). Fenoaltea (2001) also added that perduring market equilibria are Pareto efficient and whenever not recognized as such they allude to unidentified binding constraints along which utilities have been maximized: it seems true, however prevaricating such further constraints be.

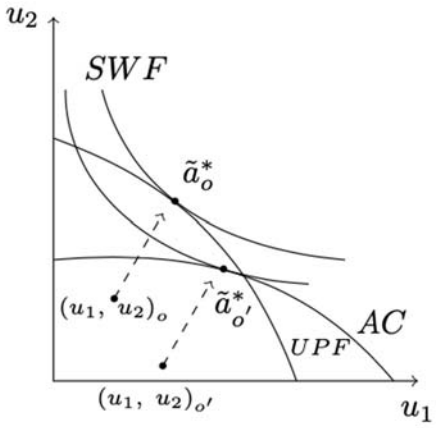

Figure 2. Such a diagram graphs social welfare functions SWF, utility possibility frontier UPF and additional constraint AC with two agents in two dimensions, omitting the axis of the codomain. The diagram displays the ultimate utility possibility frontier, which is the binding union of the additional constraint and the utility possibility frontier; it highlights both the equity and efficiency of new social welfare optimum $\tilde{a}^*_{o'}$: equity because tangency point between the acting social welfare function and the binding additional constraint; efficiency because tangency point between the acting social welfare function and the ultimate utility possibility frontier. The diagram is not to scale.

Conclusion

Efficient allocations are competitive equilibria at given wealth and prices, but welfare is maximized subject to the ultimate frontier of efficient allocations, with a unique, interior optimum; the efficient allocation optimizing welfare reached as a competitive equilibrium at given prices thus requires a specific wealth distribution, which cannot systematically arise unless it be centrally determined: if wealth redistribution is decentralized at given prices then the probability of optimizing welfare is infinitesimal. Such is the political economy theorem long known by the profession, now formalized mathematically. Finally, whichever additional constraint were to bind the social welfare function would tautologically give rise to an equitable allocation, but also to an efficient one, for then partaking in the ultimate possibility frontier of the economy and settling the compromise.

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AGGREGATION WITH A LABOUR-SUPPLY DECISION AND HABITS IN CONSUMPTION

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Abstract: *The objective of this paper is to study the problem of a discrete labour supply decision in an artificial economy where the households feature habits in consumption. We demonstrate how lotteries a la Rogerson (1988) can be used to make consumption choices into convex sets, and then produce an equivalent aggregate household with convex labour supply. The presence of consumption habits does not affect the main results of the paper. As in Hansen (1985) and Rogerson (1988) and no consumption habits, with a discrete labor supply decision at individual level, the elasticity of hours worked at the aggregate level increases from one to an infinitely large value.*

Keywords: aggregation; indivisible labour; consumption habits.

JEL Classification: E10; J22; J46.

Introduction and Motivation

The objective of this paper is to study the problem of a discrete labour supply decision in an artificial economy where the households feature habits in consumption. We demonstrate how lotteries a la Rogerson (1988) can be used to make consumption choices into convex sets, and then produce an equivalent aggregate household with convex labour supply. The presence of consumption habits does not affect the main results of the paper. As in Hansen (1985) and Rogerson (1988) and no consumption habits, with a discrete labor supply decision at individual level, the elasticity of hours worked at the aggregate level increases from one to an infinitely large value.

1. Model Setup

The artificial economy is a static setup without physical capital; the households face a non-convex labour supply decision. The focus of the paper is on a one-period framework, the model economy abstracts away from additional complications like technological progress, population growth and uncertainty. It will be assumed in the exposition below that there is a continuum of identic alone-member households. Households will be indexed by index i and distributed uniformly on the unit interval. In the exposition below, we will use small case letters to denote individual variables and suppress the index I to economize on notation.

1.1. Model Description

Each household will be assumed to maximize a utility function of the form:

$$U(c,l) = \ln (c - \phi c_{-1}) + \alpha \ln l, \quad 1.1$$

Where c denotes current consumption of output, c_{-1} is past consumption (taken as given), $0 < \phi < 1$ denotes the persistence in consumption, or the strength of the consumptionhabits; l is the leisure enjoyed by each individual household, and $\alpha > 0$ is the relative weight attached to utility of leisure. Each household is endowed with a time endowment of unity, which can be split between hours worked, h, and leisure, so that

$$h + l = 1. \quad 1.2$$

The households make a discrete labor supply choice: whether to work full-time, or not at all. In other words, $h \in \{0; \bar{h}\}$ and 0<$\bar{h} < 1$. The hourly wage rate is w. Finally, the households own the representative firm, and are entitled an equal share of the profit (π).

The household that decides to work full-time sets $h = \bar{h}$ and enjoys

$$U^w = \ln(w\bar{h} + \pi - \phi c_{-1}) + \alpha \ln(1 - \bar{h}), \quad 1.3$$

while a household that decides not to work, sets $h = 0$ and enjoys

$$U^u = \ln(\pi - \phi c_{-1}) + \alpha \ln(1) = \ln(\pi - \phi c_{-1}). \quad 1.4$$

1.2. Stand-in Firm

There is a representative firm in the model economy, which produces a homogeneous final product using a production function that requires labor H as the only input. For simplicity, output price will be normalized to unity. The production function f(H) features decreasing returns to scale: $f'(H) > 0, f''(H) < 0, f'(0) = \infty, f'(\bar{h}) = 0$. The representative firm acts competitively by taking the wage rate*w*as given and chooses *H* to maximize profit:

$$\pi = f(H) - wH \text{ s.t. } 0 \leq H \leq \bar{h} \quad 1.5$$

In equilibrium, there will be positive profit, which follows from the assumptions imposed on the production function.

1.3. Decentralized Competitive Equilibrium (DCE): Definition

A DCE is defined by allocations $\{c^w, c^u, c_{-1}, h\}$, wage rate $\{w\}$, aggregate profit ($\pi = \Pi$)s.t. (1) all households maximize utility; (2) the stand-in firm maximizes profit; (3) all markets clear.

2. Characterization of the DCE and Derivation of the Aggregate Utility Function

In this section it will be shown that in the DCE we defined above, if it exists, only some of the households will be employed and work full-time, while the rest will optimally choose to be unemployed. Following the arguments in Rogerson (1988) and Hansen (1985), it can be established that the polar case in which either every household choosing the same - working, or does not, cannot not be equilibrium outcomes. Therefore, in equilibrium only some of the agents in the economy will be working, while the rest will not. Denote this mass of employed by λ, and the mass of unemployed by $1 - \lambda$. Workers will receive consumption c^m, while those staying unemployed will consume c^u. Alternatively, the proportion$\lambda$of individuals chosen for work can be interpreted also as the probability of being chosen to work: This probability will be endogenously determined, as workers would optimally balance at the margin between the net benefit from working vs leisure. Eventually, and independently from the employment outcome, it turns out that every household enjoys the same utility level. Thus, in equilibrium $H = \lambda\bar{h}$.

From the firm's point of view then the wage is set equal to:

$$w = f'(\lambda\bar{h}). \quad 2.1$$

Firm's profit is then

$$\Pi = f(\lambda\bar{h}) - f'(\lambda\bar{h})\lambda\bar{h} > 0, \quad 2.2$$

which follows from the decreasing returns to scale assumption imposed on the production function.

Next, to prove that the characterized DCE actually exists, it will be sufficient to show the existence of a unique value for λ in the unit interval consistent with the fact that in equilibrium utility isthe same for all households. In particular, it is trivial to show that everyone working (λ= 1) is not an equilibrium, since then w = 0. Next, from the ex-ante symmetry assumption imposed on all individual households in the model, final consumption would be the same for both the workers and those not selected for work, while the latter would enjoy higher utility out of leisure(holding *h* fixed), hence there is no benefit of working. Similarly, nobody working in the market sector (*h*= 0) is not an equilibrium outcome either, since the firm would then offer a very high wage for the first unit of labor supplied, and then a marginal worker could increase his/her utility a lot by taking a full-time job.

Thus, if there is a DCE, then it must be that not all households would receive the same consumption bundle. If $0 < \lambda < 1$ is an equilibrium, then total utility for households that work should equal to the utility of households that do not work any hours. This equation is monotone in λ, as the utility function is a sumof monotone functions,

and we can explore the behavior of that function as we let λ varyin the unit interval: As λ approaches zero, the left-hand-side dominates (utility of working is higher),while when λ approaches one, the right-hand-side dominates (utility of not working is higher), where the results follow from the concavity of the utility functions and the production technologies. Next, from the continuity and the monotonicity of those two functions, it follows that there should be a unique $\lambda \in (0,1)$, which is consistent with the DCE. Finally, let c^{m*} and c^{u*}denote the equilibrium consumption allocations of the individuals selected for work, and those who will not work, respectively.

However, given the indivisibility of the labor supply in the market sector, the equilibrium allocation obtained above is not Pareto optimal, as demonstrated in Rogerson (1988). More specifically, a social planner (SP) could make everyone better off by using an employment lottery: in the first stage and choosing the fraction$\lambda$of individual households to work in the market sector and give everyone consumption$\lambda c^{m*} + (1-\lambda)c^{u*}$. In order to show this, we need to (i) check that such an allocation is feasible - which is trivial as total hours and total consumption are identical to the corresponding individual equilibrium values, and (ii) that it provides a higher level of total utility. Showing that the new allocation - which is independent of a household's employment status - makes households better off, is also easy; it generates strictly higher utility on average, where the strict inequality follows from the convexity of the production function and the concavity of the logarithmic function. Thus, the SP is indeed giving in expected utility terms an allocation that is an improvement over the initial equilibrium allocation. If households can pool income together and doing so, they will be able to equalize consumption across states, i.e. $c = c^{m*} = c^{u*}$:

$$\ln(c - \phi c_{-1}) + \lambda\alpha \ln(1 - \bar{h}) \qquad 2.3$$

Observing that for the aggregate household $H = \lambda\bar{h}$, substituting the expression in the aggregate utility above and rearranging terms yields

$$\ln(c - \phi c_{-1}) + AH, \qquad 2.4$$

where

$$A = \frac{\alpha \ln(1-\bar{h})}{\bar{h}} < 0 \text{ as } \ln(1-\bar{h}) < 0 \qquad 2.5$$

The resulting aggregate utility function is of an interesting and novel form. At the aggregate, the representative agent obtained from the aggregation features convex preferences of work in terms of aggregate hours, as compared to the individual household, which was faces with a discrete labour choice. Interestingly, the result is not affected in any major way by the presence of consumption habits.

Conclusion

This paper studies the problem of a discrete labour supply decision in an artificial economy where the households feature habits in consumption. We demonstrate how lotteries a la Rogerson (1988) can be used to make consumption choices into convex sets, and then produce an equivalent aggregate household with convex labour supply. The presence of consumption habits does not affect the main results of the paper. As in Hansen (1985) and Rogerson (1988) and no consumption habits, with a discrete labor supply decision at individual level, the elasticity of hours worked at the aggregate level increases from one to an infinitely large value.

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CONCEPT OF EVALUATION OF CREDITWORTHINESS OF ENTERPRISES IN CONDITIONS OF ECONOMIC CYCLE

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Abstract: *The economic content and components of creditworthiness of enterprises are substantiated. An in-depth critical analysis and structuring of the main tools and methods for assessing the creditworthiness of enterprises in the current conditions of transformation of the world market. The classification of the main factors influencing the formation of creditworthiness of enterprises and should be taken into account in the formation of strategic guidelines for each enterprise is proposed. The main criteria for assessing the creditworthiness of enterprises depending on the type and specificity of economic activity based on the analysis of credit risk models are substantiated. The concept of assessing the creditworthiness of enterprises in modern conditions of economic cyclicality, taking into account the characteristics of the industry, volume and specifics of activities. A method of assessing the creditworthiness of enterprises by type of economic activity using multidimensional discriminant analysis taking into account the influence of various factors, both internal and external environment, which, unlike existing ones, will quickly determine the financial condition and determine and take into account the impact of various factors. The developed concept of assessing the creditworthiness of enterprises through multidimensional discriminant analysis will ensure effective management decisions and optimize the financial condition.*

Keywords: concept; enterprise; creditworthiness; risk; profit; efficiency.

JEL Classification: C38; G32; F47.

Introduction

The key goal of the study is the formation of conceptual approaches to assessing the credential of enterprises in conditions of economic cyclicality. For enterprises of any industry and field of activity, it is quite relevant and necessary to obtain additional financing in the form of loans. The relevance of this research topic and the need to form a concept for assessing the creditworthiness of enterprises in a cyclical economy is caused by a number of factors such as: socio-economic instability; negative impact of global imbalances on the national economy; increased distrust of banking institutions as major creditors in the financial statements of companies and their creditworthiness; increase in the cost of credit resources; complication of the lending procedure; an increase in the share of bad debt in banks' portfolios. The need to form a concept for an adequate assessment of the creditworthiness of borrowers, in particular legal entities, as well as a high likelihood of bankruptcy of enterprises, which is mainly associated with a high level of debt and effective management of financial flows, taking into account risks, necessitates a revision of existing approaches and their improvement through the formation of an innovative assessment concept the credibility of enterprises in conditions of economic cyclicality. The transformation of the financial market of the country in accordance with international banking business standards prompts banking

institutions to use the newest methods for assessing creditworthiness, which provide financial substantiation of credit relations both for the creditor and for enterprises (borrowers).

1. Concept of Evaluation of Creditworthiness of Enterprises

The application of an adequate methodology for assessing creditworthiness using the latest tools of economic and mathematical modelling from the standpoint of the borrower allows for efficient management and use of attracted resources that are aimed at providing and improving the financial condition and long-term growth.

The introduction of a comprehensive and reliable methodology for assessing the creditworthiness of enterprises (borrowers) from the position of the creditor provides an opportunity to ensure effective risk management and reduce the level of credit risk, which is directly related to non-return or partial non-repayment of loans by economic entities. In order to improve the management of financial flows and reduce the credit risk of both the creditor and the borrower in terms of economic cyclicality, the selection of a valuation methodology that meets the set goals is a topical priority.In modern conditions, economic cyclicality is gaining increasing relevance issues related to ensuring financial stability, improving the credit rating and finding additional sources of financing for enterprises and organizations, regardless of the type of economic activity. The main arguments for this relevance are socio-economic instability and the constant need for additional sources of financing for enterprises in any sector of the economy, which is also confirmed by a multitude of research and development in this area. A critical analysis of the existing theoretical aspects of the features of assessing the creditworthiness of enterprises made it possible to determine the existence of many different approaches, methods and tools, which in their essence are identical and differ only in the field of application, which necessitates a more detailed study and formation of the concept of assessing the creditworthiness of enterprises in conditions of economic cyclicality.The variety of existing methods for assessing the creditworthiness of enterprises differs from each other in indicators and approaches to their calculation, which indicates the need for a comprehensive study and development of the concept of credit assessment. It should be noted that the variety of existing methods for assessing the creditworthiness of enterprises differs from each other in indicators and approaches to their calculation, which indicates the need for a comprehensive study and development of the concept of credit assessment. It is important to note that the main theoretical aspects of the creditworthiness of enterprises are considered in the scientific works of a group of scientists, such as: (Epifanov 2011: 217), (Lakhtionova 2005: 315), (Caplinska *et al.* 2020: 2546), (Helfert 2012: 436). Which consider this issue from the position that in order to guarantee the achievement of strategic goals, it is necessary to radically change the approach to managing their credit funds, strengthen control over their use and tighten the criteria for the formation of the company's creditworthiness, which in turn will contribute to further financing. However, it should be noted that the considered approach does not correspond to the realities of doing business and does not distinguish between the features of assessing the creditworthiness of enterprises in conditions of economic cyclicality, which requires more detailed and detailed study. Special attention to creditworthiness as a key factor in credit risk management is given in the scientific works of a group of scientists, such as: (Ilic *et al.* 2019: 7), (Tereshchenko 2012: 27), (Thompson and. Strickland 2000:165) (Pukala 2020: 35), (Vasyurenko and Podcesova 2011: 170), (Vitlinsky 2000: 40), which argue in the need to build a strategy for managing an enterprise's credit risks based on credit ratings. It should be noted that the system for constructing credit ratings as an individual enterprise, organization or country as a whole in modern conditions is quite relevant and used in practice, however, these ratings are not reliable if they are based only on static factors, which is not accepted in conditions of economic cyclicality. This approach does not take into account the peculiarities of the processes of transformation of the financial market and its key macroeconomic factors of influence, which requires further improvement and study. Particularly noteworthy are the studies of a group of scientists such as: (Ostafil 2009: 388), (Dinçer 2019: 186), (Larionova 2000: 4), (Litvinyuk 2014: 210), (Galasyuk 2001: 55), (Nam, 2020: 345), who in their works consider the assessment of financial results as an integral part of the management of financial flows of enterprises.

This approach is more modern and allows one to assess the aggregate financial flows of an enterprise taking into account internal factors, but takes into account macroeconomic factors, which in modern conditions is an important element in the concept of assessing the creditworthiness of enterprises. It should be noted that this approach needs to be improved by including in the assessment concept, both internal factors of the enterprise that affect financial flows, and external ones, which have an important role and influence on the quality of the formation of creditworthiness indicators. Paying due attention to the scientific experience of domestic and foreign scientists, it is necessary to note that there is a need to develop a concept of credit assessment of enterprises in the context of economic cyclicality using the tools of multidimensional discriminant analysis.For the formation of conceptual approaches to assessing the creditworthiness of enterprises in conditions of economic cyclicality, various research

methods were applied. To form the theoretical aspects of assessing the creditworthiness of enterprises, a critical analysis of the theory of the economics of enterprise management was carried out, taking into account the modern features of economic cycles. To develop the main approaches to the formation of the concept of assessing the creditworthiness of enterprises, both general scientific and special methods of cognition were used: analysis and synthesis - to classify existing scientific approaches and views on determining the solvency and creditworthiness; logical generalization - in the process of forming the key factors of the company's creditworthiness in modern conditions of economic cyclicality. To determine the concept of assessing the creditworthiness of enterprises in an economic cyclical environment, a systematic approach to the classification of existing risk assessment models was used. The main results of the theoretical generalization made it possible to develop the main criteria for assessing the creditworthiness of enterprises, depending on the type of economic activity, based on models of credit risk analysis, taking into account modern trends in economic cyclicality. With the help of economic and statistical analysis, the dynamics of the loan portfolio of banks dependingon the risk category and the category of debtors is considered. The main results of the presented analysis made it possible to form methodological approaches to the integral assessment of the financial condition of a debtor of a legal entity based on aggregated financial indicators.

The structured main stages of the process of assessing the creditworthiness of enterprises on the basis of multidimensional discriminant analysis tools depending on the types of economic activity. To implement practical recommendations for improving the process of assessing the creditworthiness of enterprises in the context of economic cyclicality, the tools of multidimensional discriminant analysis were used to assess the integral indicator of the financial condition of enterprises by sectors of the economy. The developed criteria for assessing creditworthiness can be applied in practice, both for individual enterprises and for individual sectors of the economy, when determining the integral indicator of the financial condition and possible risks. The information base of the study was statistical data of annual balances of enterprises broken down by sectors of the economy, as well as by individual banking institutions, scientific works of domestic and foreign scientists and economists. Financing the real sector of the economy has a very important impact on the country's economic growth. Without the financing and support of additional financial resources of enterprises of any sphere of activity, it will be impossible to effectively function and ensure competitiveness in the field of the corresponding sphere of the economy. For a more thorough study of theoretical aspects and the definition of components of the creditworthiness of enterprises in terms of economic cycles, it is appropriate to consider the interpretation of the economic content of the concepts of "creditworthiness" and "solvency". The ability of the borrower to timely and within the established time frame to recover received loans and interest thereon is a key indicator that determines its creditworthiness and increases creditor credibility and increases the chances of obtaining additional sources of financing for the development of the company and the industry as a whole. The ability of the borrower to meet its obligations is determined by its solvency and creditworthiness. A generalization of theoretical approaches of foreign and domestic scientists allows us to state that the concept of "solvency" is more general and characterizes not only the creditworthiness of the enterprise, but its financial stability. Hence, it is appropriate to state that the solvency of an enterprise is the financial and economic state of the enterprise, which is characterized by the ability to meet liabilities in a timely manner and in full by all terms, volumes and amounts. Unlike solvency, the creditworthiness of an enterprise is narrower and concerns only lending and the possibility of timely execution of credit obligations under terms of loans provided within the specified period.Modern methods and instruments for assessing the borrower's creditworthiness used by creditors-banks are quite diverse and take into account different factors and factors of their formation according to their specifications. Classification of the main factors that affect the formation of creditworthiness of enterprises are presented in Fig. 1

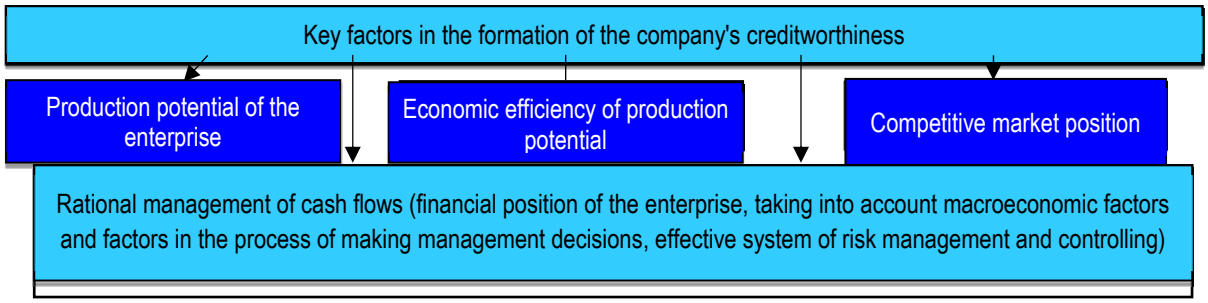


Figure 1. Key factors in the formation of the company's creditworthiness

Credibility is directly related to the financial and economic condition of the enterprise and a set of characteristics that reveal its availability of financial resources that are necessary for rational functioning, the

efficiency of the use of both assets and liabilities, financial and economic links with other economic entities, solvency and financial sustainability and promising growth. The key and strategic direction of any bank as a creditor to determine credit risk is the assessment of the borrower's creditworthiness. To develop the concept of assessing the creditworthiness of enterprises by types of economic activity in terms of economic cyclicality, it is necessary to classify the existing approaches, which are presented in Table 1

Table 1. The concept of assessing the creditworthiness of enterprises in terms of economic cycles, depending on the category of models

Category of models for assessing the creditworthiness of an enterprise	
Classification	Comprehensive
Rating (ball) assessments based on a structural indicator system	Model 5C
Forecast models of viability (models E. Altman, K. Beerman, G. Springleit, R. Lis, R. J. Tahfler, IDEA, and others), which are based on the analysis of cash flows of the enterprise.	CAMPARI
	MEMO RISK
	PARSER
Multivariate discriminant analysis	4FC system
CART	PARTS

Source: Made by the author on the basis of (Angilella, Mazzù 2019), (Brigham, Houston 2009)

Classification models make it possible to differentiate borrowers according to the relevant features: (1) Category of the borrower, which is determined by calculating the aggregated financial indicators and determining their ranks in accordance with the model; (2)Probability of bankruptcy based on forecasting aggregated and structural financial indicators of the enterprise. Comprehensive models for assessing the creditworthiness of enterprises by types of economic activity in conditions of economic cyclicality allow to conduct a rating (point) assessment on the basis of calculation of structural and aggregated financial indicators, and their subsequent transfer to the points in accordance with the model and parameters of the model that is being used.

Mathematical Expressions. To determine the amount of credit risk on assets on an individual basis, commercial banks use the formula:

$$CRiнд. = max\{0; PDx[EAD - (\sum_{i=1}^{J}(CV \cdot k)i + RC)]\}, \quad 2.1$$

which is argued as follows:

$$CRiнд. = PDiнд.* LGDiнд.* EADiнд. \quad 2.2$$

$$LGDiнд. = 1 - Riнд. \quad 2.3$$

$$\text{RRінд.} = \frac{\sum_{i=1}^{j}(\text{CV}*\text{k})*\text{i}+\text{RC}}{\text{EADінд.}} \quad 2.4$$

For identifying the value of credit risk in the case of active operations by banking institutions and assessing the creditworthiness of enterprises, the calculation of the integral indicator of the financial status of the borrower - a legal entity with the weighing of aggregated and structural financial ratios using a multi-factor discriminant model is carried out:

$$Z = a_1K_1 + a_2K_2 + a_3K_3 + a_4K_4 + a_5K_5 + a_nK_n - a_0 \quad 2.5$$

where, $CR_{інд.}$ - the amount of credit risk on an asset on an individual basis;

$PD_{інд.}$ - coefficient of default probability of the debtor / counterparty for the asset;

$RR_{інд.}$ - a coefficient that reflects the level of return on the debt on an asset due to the implementation of security and other receivables of the debtor; $EAD_{інд.}$- exposure at risk under the debtor's asset at the date of valuation;

CV_i – the value of the i-th provision of the debtor, which is considered for the calculation of credit risk (in the presence of several types of collateral for a single asset by the debtor). In the event that the collateral provided for the asset is not in accordance with the list, the principles and eligibility criteria determined by the National Bank of Ukraine must be accepted for the calculation of the CV, equal to "0", or none at all;k_i – the liquidity ratio of the nth type of security, which is determined by the banking institutions in accordance with the requirements of the National Bank of Ukraine.

Each Bank uses a lower (lower) value of the liquidity ratio of the security on the basis of a specified amount of security costs; *RC* - other receipts, in particular, insurance indemnity, financial guarantee, realization of debtor / guarantor's property, except for pledged. The amount of credit calculated to determine the amount of credit risk is determined on the basis of the judgment of the bank, but it cannot exceed 5% of the amount of debt, not covered by the collateral value (subject to adjustments to the liquidity ratio).From the formulas (1) - (4), it should be noted that the total amount of credit risk for each banking institution (the amount of borrower's debt to the bank, EAD – exposure at risk on the valuation date) becomes a net credit risk (CR - the amount of credit risk for an individual asset), the amount of which is subject to reservation at the expense of the bank. In terms of economic cycles, the determination of the net credit risk of a debtor's asset is related to the complexity of assessing the probability of default of the debtor and the value of the collateral, taking into account liquidity, which has a significant impact on the conclusion of contracts and compliance with all regulatory requirements of the National Bank of Ukraine.

Z - Integral indicator of financial condition of the borrower-legal entity taking into account aggregated financial ratios;$K_1, K_2 \ldots K_n$, - aggregated financial ratios, determined on the basis of financial reporting data of the borrower - legal entity;$a_1, a_2 \ldots a_n$– key parameters of a discriminant model, determined by taking into account the importance of financial ratios and their significant impact, which are updated annually by the National Bank of Ukraine;a_0 – a0 is a free member of a discriminant model, the value of which is updated annually by the National Bank of Ukraine by making changes and additions to the methodology of credit risk assessment.

To determine the magnitude of credit risk, the concept of assessing the creditworthiness of enterprises by main types of economic activity is presented based on the processing of financial statements and the calculation of the integral indicator of the financial state with the weighing of aggregated financial ratios using the tools of multifactorial discriminatory analysis. Group of companies by types of economic activity:

(1) Agriculture, forestry and fisheries:

$$Z = 2{,}305 + 0{,}707 * X_5 + 0{,}588 * X_8 + 0{,}421 * X_{10} + 0{,}615 * X_{11} + 0{,}502 * X_{12} + 0{,}634 * X_{13} \quad (2.6)$$

where, X_5 - Turnover of enterprise stocks; X8 - Turnover of accounts payable; X10 - Maneuverability of working capital; X11- Coverage of debt with net income; X12- Coverage of debt to profits for depreciation and taxation; X13 - The share of non-operational elements of the balance sheet of the enterprise.

(2) Extractive industry and quarry development, manufacturing industry, construction:

$$Z = 1{,}670 + 0{,}375 * X_2 + 0{,}333 * X_{11} + 0{,}313 * X_{13} + 0{,}436 * X_{14} + 0{,}352 * X_{15} + 0{,}261 * X_{16} \quad (2.7)$$

where, X2 - Total liquidity; X11 - Debt covering with net income; X13 - The share of non-operational elements of the balance of the enterprise; X14 - Turnover of current assets; X15 - Coverage of financial expenses by profit before taxation and depreciation; X16 - Profitability before taxation.

(3) Wholesale and retail trade: repair of motor vehicles:

$$Z = 1{,}939 + 0{,}480 * X_2 + 0{,}556 * X_6 + 0{,}650 * X_8 + 0{,}282 * X_{17} + 0{,}202 * X_{18} \quad (2.8)$$

where, X2 - Total liquidity; X6 - Coverage of debt by gross product; X8 - Turnover of accounts payable; X17 - Coverage of financial expenses by gross profit; X18 - Indicators of indebtedness.

(4) Financial and insurance activities, real estate operations:

$$Z = 1{,}291 + 0{,}476 * X_1 + 0{,}602 * X_2 + 0{,}501 * X_3 + 0{,}381 * X_4 \quad (2.9)$$

where, X1 - Share of capital in the balance sheet of the enterprise; X2 - Total liquidity; X3 - Coverage of debt by profit before tax; X4 - Operating profitability of assets.

(5) Other types of economic activity of enterprises:

$$Z = 1{,}719 + 0{,}648 * X_5 + 0{,}662 * X_6 + 0{,}476 * X_7 + 0{,}468 * X_9 \quad (2.10)$$

where, X5 - turnover of stocks of the enterprise; X6 - Coverage of debt by gross product; X7 - Coverage of financial expenses by operating profit; X9 - Turnover of accounts receivable.

Bringing the indicators to the annual measurement is carried out by the method of sliding annual amount:

$$(I_{t-1} - I^p_{t-1}) \quad (2.11)$$

where, I^p_t - the value of the indicator for the reporting period of the current year; I_{t-1}- the value of the indicator for the previous year; I^p_{t-1}- the value of the indicator for the reporting period of the previous year;

If the presented figures cannot be calculated due to the lack of relevant data for previous years, then the following applies:

$$I_t^p = \frac{4}{K} \quad 2.1$$

where, K – serial number of the last reporting quarter, (Lettau 2001:819).

2. Application Functionality

The indicated ratings (scores) are calculated by multiplying the value of the indicator by its share in the rating and the integral indicator based on which management decisions are made regarding the creditworthiness of the enterprise. These models of assessing the creditworthiness of enterprises in terms of economic cycles, allow shortening the time for analysis of applications for loans, business plans and the deadline for the management decision on granting a loan.

A key disadvantage of these models of credit assessment of enterprises is that they all rely only on a number of factors that offset a number of equally important ones. The classification of the main criteria for assessing the creditworthiness of enterprises, depending on the type of economic activity, based on models of credit risk analysis is presented in Table 2.

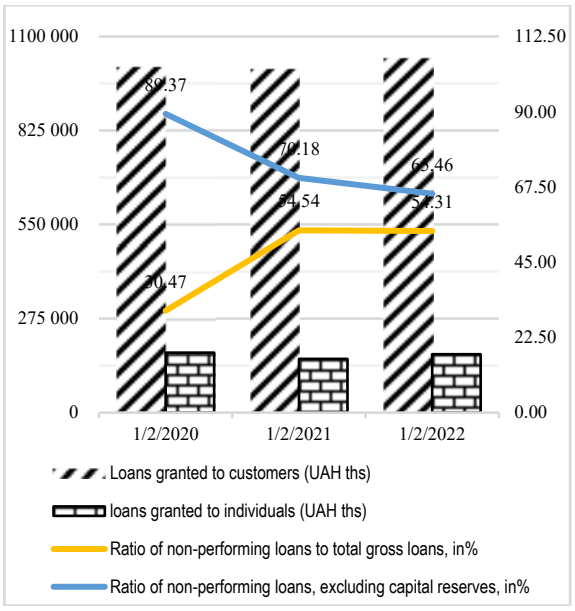
Table 2. Classification of the main criteria for assessing the creditworthiness of enterprises depending on the type of economic activity based on models of credit risk analysis

Models of analysis and credit risk assessment						
Criteria for evaluation	Model 5C	CAMPARI	MEMO RISK	PARSER	4FC system	PARTS
Reputation	+	+	+	+	+	+
Quality management	+	+	+	+	+	+
Industry specifics	-	-	+	-	-	+
Terms of business	-	-	+	-	-	-
Loan provision	+	+	+	+	+	+
Possibility of realization of collateral	+	+	+	+	+	+
Control	-	-	+	-	-	-
Financial position	-	-	+	-	+	+
Adequacy of enterprise capital	-	-	+	-	+	+
Exposure of cash flows and credit needs	+	+	-	-	-	-
Possibility to repay the loan	+	+	+	+	-	+
Justification of the purpose and amount of the loan	+	+	-	+	+	-
The term of the loan	-	-	-	-	-	+
Reimbursement for credit risk	-	-	+	+	-	-

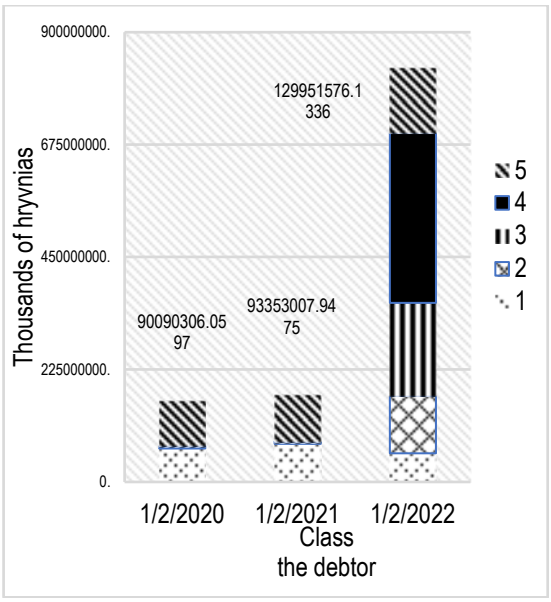
Source: Made by the author on the basis of (Steven 2014); (Malekipirbazari & Aksakalli 2015).

In terms of economic cycles, the concept of assessing the creditworthiness of borrowers (both individuals and legal entities) is based on the integrated and integrated application of quantitative and qualitative indicators to maximize the reliability and correctness of the results obtained, on the basis of which management decisions are made regarding lending and the level of credit risk (Zhu *et al.* 2019). Since the assessment of the borrower's creditworthiness (both physical and legal) by the bank as a creditor is a strategic direction that provides for the determination of the level of credit risk by using different techniques to ensure financial stability. In modern conditions, ensuring solvency and creditworthiness of enterprises is important, which leads to the search and development of new approaches and concepts of management and methods for evaluating financial status and creditworthiness using multi-factor discriminant analysis. Carrying out analysis and estimating the size of credit risks by banks as the key lenders of the real sector of the country's economy should be carried out in accordance with the basic principles of the risk management system, which should include: identification of the main sources of risks; definition of the basic properties of different types of risks and their classification, taking into account the interrelationships between their types; creation of a model based on discriminant analysis using economic and mathematical modeling (Litvinyuk 2016).

A) Distribution of granted loans - to individuals, depending on the categories of risk and classes of debtors

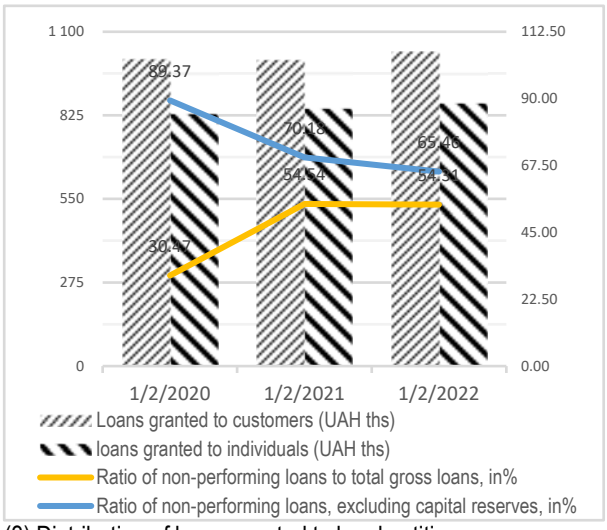


(1) Distribution of loans granted to individuals

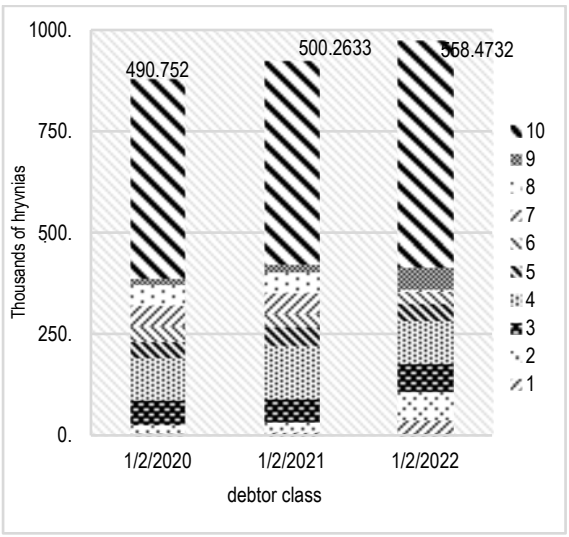


(2) Distribution of categories of credit risk by classes of debtors

B) Distribution of loans granted to legal entities depending on the categories of risk and classes of debtors



(3) Distribution of loans granted to legal entities



(4) Distribution of categories of credit risk by classes of debtors

Source: Made by the author on the basis of (National Bank of Ukraine 2019).

Figure 2. Distribution of loans granted by Ukrainian banks depending on the risk category and debtor class

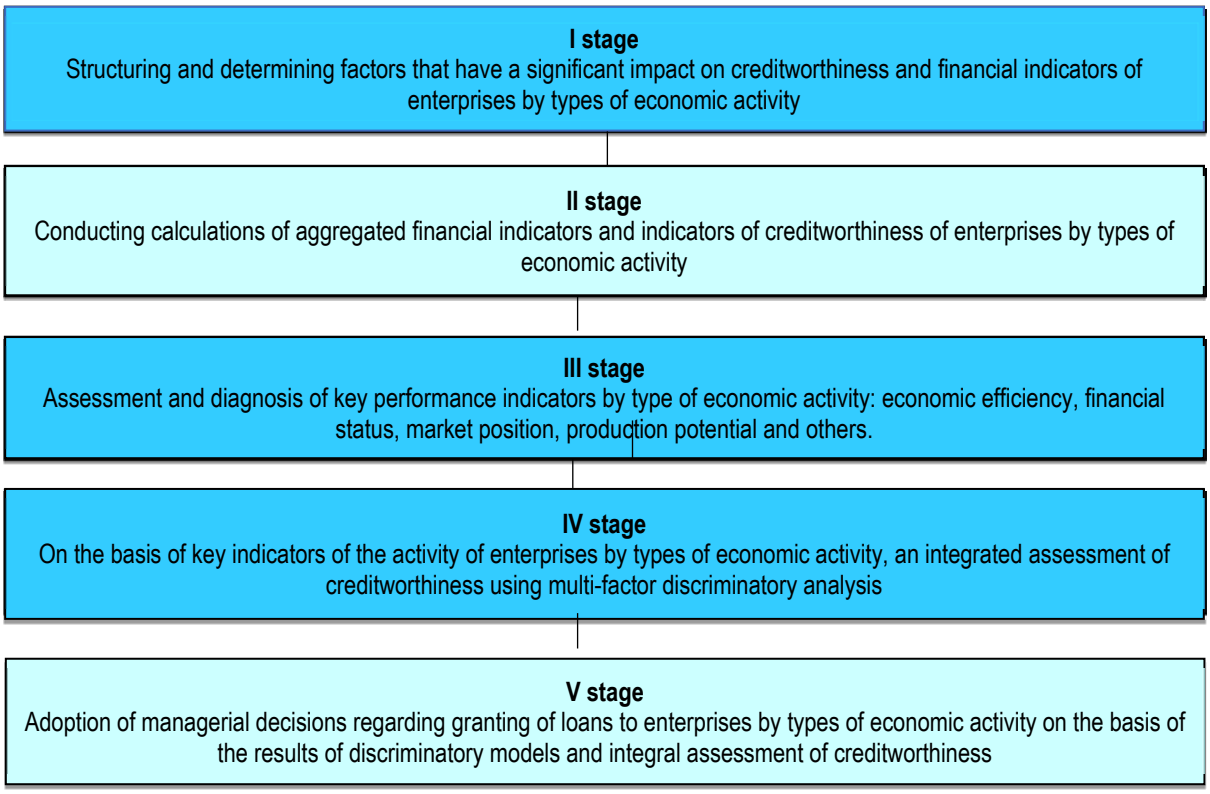
In accordance with the "Regulation on determination by banks of Ukraine of the amount of credit risk under active banking operations" approved by the National Bank of Ukraine Board Resolution № 351 dated June 30, 2016, the calculation of the amount of credit risk determines the value of each of the components of credit risk, depending on the type of debtor/counterparty, type of asset, security type, debt currency, and asset assessment method. For the purpose of organizing an effective credit policy, each bank implements its methodology and procedure for evaluating borrowers' creditworthiness, which must take into account all key indicators set by the Regulations of the National Bank of Ukraine with the justification and determination of the priority indicators in the assessment of creditworthiness that are necessary for the formation of provisions for the recovery of possible losses from implementation of risks.

To form a unified concept for assessing the creditworthiness of enterprises in terms of economic cyclicality, it is appropriate to carry out an analysis of the debt on loans granted by Ukrainian banks and the distribution of credit risk by classes of debtors, which is presented in Figure 2.As of 01.01.2016 ccompared with 01.01.2018 the volumes of loans granted by Ukrainian banks increased, however, the ratio of non-performing loans to total loans

in% increased significantly from 30.47% to 54.31%, which is evidenced by the fact that commercial banks of Ukraine have problems with identifying and assessing credit risks within their active operations.

Using multi-factor discriminant analysis to assess creditworthiness involves the construction of a model for calculating the integral indicator of the financial condition of the borrower and its calculation for a particular company, depending on the industry and kind of economic activity, which provides adequate financial diagnostics in conditions of economic cyclicality. To develop an actual concept for assessing the creditworthiness of enterprises in terms of economic cycles, it is appropriate to use a multifactorial discriminatory model for the diagnosis of financial condition of enterprises. Which allows us to assess the integral indicator of the financial state in order to determine the magnitude of credit risk and account in the process of making managerial decisions. The volumes of loans granted to enterprises by type of economic activity by currency and maturity indicate that more promising areas of the economy of the country, which have the largest share of loans granted, are enterprises: wholesale and retail trade, processing industry, agriculture and forestry, construction and real estate management, mining industry and electricity supply.

It should be noted that the socio-economic instability and cyclicality of the country's economy leads to a shortage of funds and the need for additional financing by attracting loans from the term of 1 year, but it is evident in the long run that enterprises of the specified types of economic activity lack the liquid assets and assets to increase volumes production in order to improve the financial state and ensure economic growth (Dytchenko 2015: 832). The above points out the need to improve and develop an effective concept for assessing the creditworthiness of enterprises in terms of economic cycles using multi-factor discriminatory analysis. To carry out an integrated assessment of the creditworthiness of enterprises by types of economic activity, it is appropriate to identify the stages that are shown in Figure 3.



Source: Made by the author on the basis of (Blasques *et al.* 2019); (Steven 2014).

Figure 3. Stages of assessing the creditworthiness of enterprises by types of economic activity

In conditions of economic cyclicality, banking institutions independently determine the list of factors that should be taken into account when assessing the size of credit risk, set their thresholds and weightings for calculating the generalized criterion of the level of riskiness of the corresponding credit transaction. At the same time, it is very important to take into account and correct the formation of a system of factors that may indicate the emergence of a problem debt so that it is sufficiently representative and allows obtaining a reliable result, and the process of their assessment in calculating the amount of credit risk was not labor-intensive. Assessment of the borrower's creditworthiness - the enterprise by the type of economic activity is a priority component when making

a decision on granting a loan and managing the credit risk of a creditor. Which allows to protect the credit transaction from threats that are associated with the impact of both external and internal factors that have a significant impact on the possibility of repaying a loan and paying interest for using it.

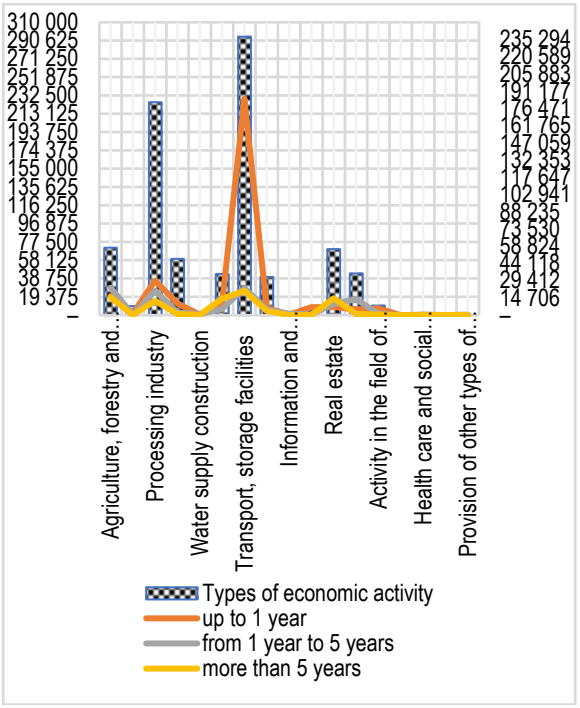
Based on the above, it should be noted that the most adequate and important tool for economic cyclicality is the inclusion in the concept of creditworthiness of a number of factors characterizing the sectorial, organizational and market aspects of the borrower's activities and are significant enough to ensure the effective and stable functioning of the borrower - the enterprise by types of economic activity.

For the effectiveness of financial diagnostics of the enterprise, it is appropriate to consider the dynamics of the main indicators of lending by types of economic activity of enterprises, currencies and terms, which are presented in Figure 4.

In order to interpret the key findings of the concept of assessing the creditworthiness of enterprises by types of economic activity, using multi-factor discriminant analysis, it is appropriate to consider the methodology for calculating aggregated financial ratios based on which the analysis and definition of the integral indicator of the financial state is carried out.

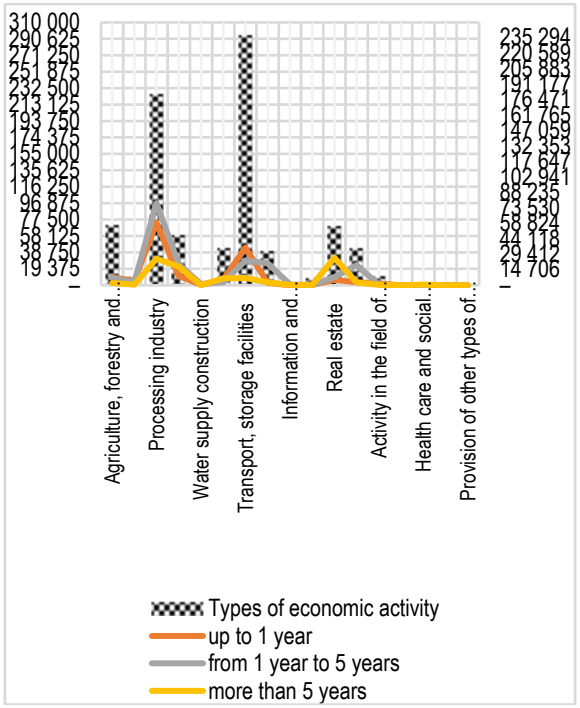
The financial indicators in table 4 and the data on turnover on accounts, the credit history of enterprises, reputation, sphere of activity, liquidity, financial flows, receipts and debts, the life of the enterprise, control over the current activities of the client and others are included in the special tables by which they are calculated the total amount of points and is determined by the debtor class. The value of X_i depends on the values K_1, K_2…K_n (aggregated financial ratios determined on the basis of financial reporting data of the debtor-legal entity for a large, medium or small enterprise (Chai *et al.* 2019). When calculating the aggregate financial indicators of KI on the basis of quarterly reporting, seasonal adjustment and bringing figures of the form of financial statements to the annual measurement is carried out (Nam 2020).

Figure 4. Amounts of loans granted to enterprises by types of economic activity by currencies and maturity date as at 01.01.2019



(A) in the national currency

(B)



(C) in foregin currency

Table 4. The concept of assessing the creditworthiness of enterprises by types of economic activity with the specification of the method of calculation of aggregated financial ratios

Aggregated financial indicators (K_i)	Method of calculation financial indicators
Share of capital in the balance sheet of the enterprise *(K_1)*	Equity / Balance Sheet (asset)
Total liquidity*(K_2)*	Current assets / Current liabilities
Coverage of debt with profit before tax *(K_3)*	Financial result before tax / Liabilities
Operating profitability of assets *(K_4)*	Financial result before tax / Balance (asset)
Company inventory turnover*(K_5)*	Stocks / Cost of sold products
Coverage of debt by gross product*(K_6)*	Gross Profit / Liabilities
Coverage of financial expenses by oper. profit *(K_7)*	Financial result / Net financial expenses
Turnover of Accounts Payable *(K_8)*	Current payables / Cost of sold products
Turnover of accounts receivable *(K_9)*	Current Accounts Receivable / Net income from sales of products
Maneuverability of working capital *(K_{10})*	Current assets without liabilities / Balance (asset)
Net Debt Coverage*(K_{11})*	Liabilities / Net income from sales of products
Coverage of debt to profits for depreciation and taxation *(K_{12})*	Financial result before tax and depreciation / Liabilities
The share of non-operational elements of the enterprise balance *(K_{13})*	Non-operational assets / Balance sheet (asset)
Turnover of current assets *(K_{14})*	Current assets / Net realizable sales
Coverage of financial expenses by profit before tax and depreciation *(K_{15})*	Financial result of operating activities before taxation / Financial expenses
Profitability before tax *(K_{16})*	Financial result before tax / Net income from sales
Coverage of financial expenses by gross profit *(K_{17})*	Gross profit (loss) / Financial expenses
Debt Indicators *(K_{18})*	Short-term and long-term liabilities / Balance (asset)

Source: Made by the author based on Platt 1991; Lettau 2001.

Listed in the multifactorial discriminant model of the value Xi are updated annually by the National Bank of Ukraine based on financial reporting data of debtors, legal entities. Each bank for updating the logistic model submits to the NBU the data on the classification of debtors-legal entities, as well as their financial statements in the form and within the time limits established by the National Bank of Ukraine. The concept of assessing the creditworthiness of enterprises depending on the type of economic activity with the use of multifactorial discriminatory analysis is proposed, it allows diagnosing the financial condition and determining the borrower's class, which will help to determine the amount of credit risk from the implementation of a credit transaction. Having stated the key results of multifactorial discriminatory analysis of the creditworthiness of enterprises by types of economic activity, it should be noted that according to the range of integral indicator of financial condition, all the enterprises on which the analysis was conducted are sufficiently creditworthy within the framework of their specificity of the industry and the magnitude of activity. Listed in the multifactorial discriminant model of the value Xi are updated annually by the National Bank of Ukraine based on financial reporting data of debtors, legal entities. Each bank for updating the logistic model submits to the National Bank of Ukraine the data on the classification of debtors-legal entities, as well as their financial statements in the form and within the time limits established by the National Bank of Ukraine. The concept of assessing the creditworthiness of enterprises depending on the type of economic activity with the use of multifactorial discriminatory analysis is proposed, it allows diagnosing the financial condition and determining the borrower's class, which will help to determine the amount of credit risk from the implementation of a credit transaction. Having stated the key results of multifactorial discriminatory analysis of the creditworthiness of enterprises by types of economic activity, it should be noted that according to the range of integral indicator of financial condition, all the enterprises on which the analysis was conducted are sufficiently creditworthy within the framework of their specificity of the industry and the magnitude of activity.

The proposed concept for assessing creditworthiness was applied in general to the enterprises of the branch depending on the type of economic activity for the period from 01.01.2014 to 01.01.2019, using these annual consolidated financial statements. From the key findings of the multifactorial discriminatory analysis, it should be noted that the enterprises of the main branches of the economy of the country are sufficiently creditworthy, and the validation of their classes is within the 4-2 classes, which is permissible in this concept of

evaluation. Nevertheless, each bank, as the key creditor of the real economy, can classify the borrower's class differently depending on the existing internal normative documents regarding the assessment of the amount of credit risk in active operations, taking into account the recommendations of the National Bank of Ukraine.

Table 5. Definition of the debtor class - enterprises depending on the type of economic activity and the value of the integral indicator of the financial state

Group of enterprises by type of economic activity		Ranges of values of the integral indicator of the financial condition of enterprises Class of a debtor-legal entity								
		1	2	3	4	5	6	7	8	9
Agriculture, Forestry and Fisheries	≥	+5,2	+4,3	+3,4	+2,6	+1,7	+0,8	+0,02	-0,8	
	<		+5,2	+4,3	+3,4	+2,6	+1,7	+0,8	+0,02	-0,8
Mining and quarrying, manufacturing	≥	+3,3	+2,7	+2,1	+1,4	+0,8	+0,2	-0,4	-1,06	
	<		+3,3	+2,7	+2,1	+1,4	+0,8	+0,2	-0,43	-1,0
Wholesale and retail trade: repair of motor vehicles	≥	+3,7	+3,1	+2,4	+1,8	+1,2	+0,5	-0,07	-0,7	
	<		+3,7	+3,1	+2,4	+1,8	+1,2	+0,5	-0,07	-0,7
Financial,insurance activities, operations with real estate	≥	+3,1	+2,6	+2,2	+1,7	+1,3	+0,8	+0,3	-0,08	
	<		+3,1	+2,6	+2,2	+1,7	+1,3	+0,8	+0,38	-0,08
Other types of economic activity of enterprises	≥	+3,6	+3,0	+2,5	+1,9	+1,4	+0,8	+0,3	-0,21	
	<		+3,6	+3,1	+2,5	+1,9	+1,4	+0,8	+0,33	-0,21

Source: Made by the author on the basis of (National Bank of Ukraine 2019).

In conditions of uncertainty, the main priority of any organization and enterprise is to ensure financial stability and efficiency, taking into account all possible risks. Because, in conditions of economic cyclicality, the financial stability of the enterprise is ensured by effective management of financial flows and risks, and the lack of a unified approach and concept of evaluation will necessitate more detailed research and development of scientific and methodological approaches to assessing creditworthiness. Through critical analysis of scientific research and theoretical generalization, it is proved thatthe solvency of the enterprise is the financial and economic condition of the enterprise, which is characterized by the ability to timely and in full under all conditions, volumes and amounts to be liable for liabilities. In contrast to solvency, the creditworthiness of the enterprise is narrower and applies only to lending and the possibility of timely fulfillment of credit obligations under the terms of loans granted during this period.

The existing methodology for assessing the risks of enterprises in modern conditions is explained, the basic models of risk assessment are structured, which are the most popular, but do not fully meet modern conditions and need improvement in terms of branching factors in assessing the creditworthiness of the enterprise.It is substantiated that the formation of scientific and methodological approaches to the concept of assessing the creditworthiness of enterprises by type of economic activity in terms of economic cyclicality should be carried out in two stages: (1) Determining the value of aggregate financial indicators that characterize the financial condition of the borrower, to refer them to the relevant analytical groups depending on the group of economic activity of its industry and size; (2) Analysis of the financial condition of the borrower and assignment of the borrower (enterprise) to the appropriate class depending on the value of the integrated indicator of financial condition.To implement the selected stages, in contrast to existing approaches, the main tools of multifactor discriminant analysis are used, taking into account the type of economic activity of the enterprise, its industry and value.However, the defined tools of multifactor discriminant analysis taking into account the type of economic activity of the enterprise, its industry and value are not perfect and do not allow to reliably assess the crelitism taking into account the current realities of economic cyclicality. In this regard, in order to improve this methodology, for the distribution and structuring of borrowers-legal entities to the appropriate class, the main parameters are defined depending on the value of the integrated indicator Z, taking into account its ranges and values, depending on the type of economic activity, industry and size .Interpretation of key results of enterprise valuation based on the integrated indicator Z, taking into account its ranges and values, depending on the type of economic activity of the enterprise, industry and its size is implemented by building economic and mathematical models. The formed scientific and methodological approach to assessing the creditworthiness of enterprises in contrast to insuing allows to take into account time factors, the specifics of economic activity, both individual enterprises and the industry as a whole and is based on multidimensional discriminant analysis of aggregate financial indicators. This approach allowed to classify and determine the class by the values of the integrated indicator of the financial condition of enterprises Z by types of

economic activity of its specifics and industries. Developedrecommendations to improve the process of assessing the creditworthiness of enterprises in economic cyclicality can be used in practice in the formation of strategies for managing financial flows, both individual enterprises and the industry as a whole.

Conclusion

For the effective evaluation of the creditworthiness of the enterprises, the main tools and methods based on which analysis are structured; the classification of the main factors that have a significant impact on the formation of the creditworthiness of the enterprises and need to be taken into account in the process of making managerial decisions is proposed. Based on the analysis of credit risk models, the main criteria for evaluating the creditworthiness of enterprises depending on the types of economic activity were substantiated. It is stated that the partial or incomplete account of certain criteria is inadmissible and affects the creditor on the probability of loss of profit and non-repayment of credit funds. On the basis of the generalization of theoretical approaches and analysis of modern methods of credit assessment of enterprises, it is determined that the concept of credit assessment and the diagnosis of financial condition of enterprises is impossible without the use of tools of economic and mathematical modeling, which are the most effective and reliable tools in modern conditions. The analysis and presented the dynamics of the main indicators of loans granted by Ukrainian banks and the distribution by classes of debtors, which confirms the need to improve existing methods and tools for assessing the creditworthiness of enterprises in order to improve the quality of the loan portfolio of the bank and adequately determine the value of credit risk. The necessity of improvement of existing methods of credit assessment is proved based on the use of multifactorial discriminatory analysis for diagnosing the financial status of enterprises by types of economic activity. The multifactorial discriminator model for assessing the creditworthiness of enterprises depending on the type of economic activity and size using the recommendations of the NBU is substantiated. Based on multifactorial discriminatory analysis, an assessment of the creditworthiness of enterprises by types of economic activity for the period from 01.01.2014 to 01.01.2019 was carried out, which allows to state that the following groups of enterprises are sufficiently creditworthy. The practical application of the proposed concept of assessing the creditworthiness of enterprises by types of economic activity will improve the risk management system in the bank and increase the efficiency of making managerial decisions.

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MARSHAL MCLUHAN'S TECHNOLOGICAL DETERMINISM THEORY IN THE ARENA OF SOCIAL MEDIA

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Abstract: *McLuhan (1964) proposed that mediated technologies ensure culture diffusion in a society which in turn helps change human behavior. He states, "We shape our tools, and they in turn shape us." Most of the scholars in the field talked about radio and television etc. as mediated technologies but McLuhan perceived a bit differently by including numbers, games and money as mediated. Regarding numbers, he held that every individual in a theater enjoys all those others present. This creates a mass mind which let elites to establish a profile of the crowd. The phenomenon in turn homogenizes the masses that are easily influenced. McLuhan stated that games are media of interpersonal communication and extension of human social self. Games according to him "allow for people to simultaneously participate in an activity that is fun and that reflect who they are." To him money is power that facilitates access. It is money that empowers people to travel the world and serve as transmitter of information, knowledge and culture. These mediated tools according to McLuhan turn the world into a global village.*

The media of social networking exactly play the same role attributed by McLuhan with number, game, money along with traditional media of radio and television. Social Media (SM) users make use of identical applications and undertake almost similar activities that turn them into a homogeneous mass. Likewise, online profiles reflect identity features and most of them consume SM to have fun. SM connects people across cultures, religions, and boundaries and let them feel members of a single community. SM has not only converted the world into a small village but also shaped every aspect of human social life.

Key words: Marshal McLuhan; technological determinism; domain; social media.

JEL Classification: O35; O39; L82.

Introduction

Technological Determinism theory generally refers to the exploration of media's systems and mediated content's cultures in contemporary societies. The theory also takes into account the influences of media on the respective societies. This theoretical approach, however, associates greater role of technology (media) than mediated contents in terms of influencing society. Postman (2000) is believed to have refined the philosophy of Technological Determinism by suggesting that media producers and consumers shape cultures. According to Postman, people live in two environments - natural and mediated. Natural environment serves humans with air, water, trees and food etc. whereas, mediated environment serves individuals with "language, numbers, images, holograms, and all of the other symbols, techniques, and machinery" that make people what they are.

Application of Technological Determinism theory in this digital age focuses mainly on social media (SM), social mediated contents and its effects on human social, economic and political behavior. This new technology of SM has penetrated deep into human lives. People make use of this technology for social interaction with known and unknown people ((Boyd, Ellison 2007; Lenhart, Madden 2007) to increase their social capital (Putnam 2000). Political campaigns and affiliated endeavors are undertaken (Hardy, Scheufele 2005; Utz 2009; Park, Valenzuela, Kee 2009) and selling and buying are made through online technology of SM (Safko 2012).

Emergence of social networking sites (SNSs) in the latter part of 1990s has changed communication behavior of the people around the world. According to Boyd and Ellison (2007) SM spontaneously ensure one to one, one to many and many to many communications in the form of text messaging, photo sharing and video sharing. Innovations in these technologies from time to time have further paved way for advancement and development of communication facilities (Uricchio 2009). This technology has enabled people across borders and cultures to interact and talk to each other with such a speed and convenience that was not even imaginable a couple of decades ago. The mushroom growth of smart phones with attractive applications and interfaces and laptops with advanced specifications and facilities, computer video gaming, television, radio and wireless machines coupled with the integration of these into a single technology has tremendously changed the communication infrastructure. It would not be wrong to call it communication revolution. Interaction of the users with each other, sharing of information and exchange of ideas are the key features of this new digital technology (Martin, Erickson 2013).

1. Technological Determinism Theory

The theory of Technological Determinism or Media Ecology was conceived by Marshal McLuhan in 1964. According to this theory, the technology of mass media not only shapes attitudes and behavior of people but also bring a revolution in the mode of operation of a social system. The theory further proposes that functioning of a social fabric changes accordingly with emergence of every new technology. Basic principle of media ecology theory is that man survival on the globe is molded according to variations in the system of human communications. According to McLuhan (1964) growth of technologies of mass communication ensure culture diffusion in a society which in turn helps change human behavior. Here goes McLuhan famous quote "We shape our tools, and they in turn shape us" to fit in the discourse. West and Turner (2007) have quoted McLuhan to have stated that "we have a symbolic relationship with mediated technology; we create technology, and technology in turn re-creates who we are." The historical perspective of the theory proposes that revolutions in technology from time to time have brought corresponding changes in the societies.

2. Technological Determinism and SM

McLuhan (1964) branded human societies into tribal age, literate age, print age and electronic age. The diffusion of communication technologies helped modernize these societies at least one step forward. People in the tribal age marched towards literate age, literate age was transformed into print age and the print age arena was

promoted to the era of electronic communications. The living patterns of the people in their respective age were revolutionized accordingly. If McLuhan's continuum of marching of one stage of society to the next stage of society exist then we, of course, are witnessing another stage commonly termed as digital age. This new technology has brought abrupt changes in human lives. Since, Finnemann (2002) proposed that SM has not replaced other types of traditional mass media. Rather it has integrated all other forms of media like "electronic text, the telephone, radio, and television." The users of SNSs can read an electronic edition of every newspaper, they can make easy and almost free of cost phone calls, they can listen to each and every radio channel of the world with much ease and convenience and can watch any television channel of their choice. Unlike the mainstream media, SM platforms offer variety of contents that are contributed by the users themselves. Such contents may include reporting of local events, and happenings, and comments on various contents that are extracted from traditional mass media and uploaded online.

Traditional mass media allow for the lopsided vertical flow of contents with passive recipients at the other end. Information flow in the traditional media setting is directed from producers of the mediated messages to consumers of the same messages. In traditional mass media systems like radio and television, the users have no other option than to watch and listen to the contents presented by the media management except by changing the channel or switching off the system. The technology of SM, on the other hand, ensures horizontal flow of information with active users at the ultimate end. Information in the SM systems flows from consumers to consumers. The users of social mediated contents are also producers of the online stuff (Allan, Thorsen 2009). SM users have liberty to enjoy what and when they want to have and even to share the same with other users of the technology. It is not all over; the user of SM can generate their own contents and share the same with other users (Abdulahi *et al.* 2014).

3. Key Assumptions of Technological Determinism Theory

Technological Determinism theory frames three assumptions. Firstly, media instill every act in society. Secondly, media shape perceptions and organize human experiences. Thirdly, media link the world (West, Turner 2007).

The first assumption let the scholars to believe that people cannot shirk media since McLuhan included numbers, games and money along with traditional mass media of radio, television and movies as mediated. With regard to numbers, he held that every individual in a theater or playground enjoys the feelings of being among the masses. The feelings turn the crowed into a homogeneous mass which is easily influenced. McLuhan stated that games are media of interpersonal communication and extension of human social self. Games according to him "allow for people to simultaneously participate in an activity that is fun and that reflect who they are." McLuhan also proposed that money is power that facilitates access. It is money that empowers people to travel the world and serve as transmitter of information, knowledge and culture. He resembled money with language that connects miscellaneous segments of population such as formers, plumbers, physicians and engineers. These mediated tools according to McLuhan turn the world into a global village and shape every aspect of human life. He believed that society in turn influences technology in the passage to its evolution.

The media of social networking exactly play the same role attributed by McLuhan with number, game and money along with traditional media of movies, radio and television. Social Media (SM) users make use of uniform applications and undertake almost similar activities that turn them into a homogeneous mass. Likewise, online profiles reflect identity features and most of them consume SM to have fun. SM connects people across cultures, religions, and boundaries and let them feel members of a single community. SM not only converts the world into a small village but also shape every aspect of human social life.

Secondly, media shape perceptions and organize human experiences. McLuhan also believed that media are effective tools in shaping perceptions about the world. The powerful mediated messages let people to look at the world with the spectacles of the media. Positive portrayal of an issue, idea, movement or activity not only lead people to see positive aspects of the same but also start debating on the positive aspects of that issue. In the same manner, negative portrayal of an issue let people to watch, listen and read negative contents about the issue and even to start talking about the same negatives at every forum. For instance, media reports about moral break down in a society force people to watch contents on child or female kidnapping, drug abuse, and the like. People in their day to day talk begin to talk about moral degradation in society. These prevailing circumstances in turn direct individuals to live their lives accordingly and people in the respective society start looking at every stranger with suspicion (West, Turner 2007, 463). The same held true with respect to the use of online digital technologies. Stories on ATM fraud in Pakistan in the month of December2017 forced top management of National and Private commercial Banks in the country to take precautionary measures with respect to every online business transaction.

Thirdly, media turn the world into a great "political, economic, social and cultural system." McLuhan termed this global inter-connectedness as global village. This assumption of Technological Determinism theory is believed to be McLuhan's prediction of the emergence of social networking websites.

Keeping human needs, requirements, and capabilities in mind, producers of the digital technology strived to improve its various features and make it more useful for users of the contemporary world. According to Uricchio (2009) all forms of SNSs have their own logic for their use and offer their own reasons and terms and conditions for consumption of the same. Innovations have been made from time to time with respect to the advancement of technology and the varying and increasing demands of the users. The world has been witnessing the introduction of a different networking site with different features, functions and scope with every passing day. Uricchio (2009) noted that "The World Wide Web" was developed after the introduction of the "Mosaic" web browser and the "Pentium chip" was presented a couple of decades ago. Introduction of "networked computers" assisted by broadband cable services, "compression algorithms", and "cheap memory" have contributed a lot in improving the capacity of this technology in terms of memory and speed of transmitting information. Increase in the memory of technology enabled users to store lots of contents that have either been produced by the consumers or found floated online. Similarly, the speed of transmission has been raised to a position where the users can send dozens of terabyte data in a single click of a button.

Prior to the introduction of new digital media, traditional mass media which Uricchio (2009, 138) called as "Analogue Media" are meant to spread information without any participation of the consumers of such contents. But in this digital age of information dissemination, the newly introduced SM makes sure participation of the users in the process.

Castells (2001) in his book "The Internet Galaxy" states that "technological systems are socially produced and that social production is culturally informed." In other words, initially the culture of the people who developed information communication technology (ICT) greatly influenced the medium. The reason for shaping of the technology was that producers of the technology were actually the users of the same. The technology of internet is continuously changing and giving way to the invention of more sophisticated technologies like SNSs to meet modern market demands. The makeover of the early stage of the technology and the technology of the day in line with its use has been classified by Castells as 'producers as users of the technology' and 'consumers as users of the technology'. The use of internet by the producers as users contributed a lot in the development of the system, whereas, the consumers as users have no direct link with advancement of the digital technology. Their use of internet, however, has contributed to the emergence of new facilities in the system of digital technology (Castells 2001).

Inspired from the advent of satellite technologies, McLuhan (1964) thought of global connectedness of the entire cultures and societies and termed the phenomenon as "global village". His concept of "global village" proved to be a prediction of the role of SM that has shrunk the world far smaller than the village. This interconnectivity of the world through SNSs has now becomes a reality. The cross-cultural transmission of television and radio led McLuhan to call the world as global village where people can get information about each other irrespective of geographical boundaries. But this terminology of global village holds very much true when it comes into the arena of SM platforms. The people of different countries, regions and cultures interact with each other and communicate through instant messaging within no time. They can update and inform each other as much instantly as that of face to face settings. Such interconnectedness through SNSs according to Ansgard (2011) facilitates the process of globalization in number of ways. SNSs cross space and time limitations and let its users to adapt to a global context, regardless of region, religion, ethnicity, color, race and caste. Beside the fact that the users of SM are very much heterogeneous, they still interact with each other like a single community. It has been recognized that the bonding force of a community is the common interests. The common interest of the users of SM is the 'use of the technology.

Conclusion

In the perspective of Technological Determinism theory and in the light of existing research studies it has been assumed that ideologies, human communication behavior, family relationships, interaction with colleagues, teaching-learning settings, interaction with friends, pastime and means of amusement, and participation in socio-political engagements have been changed considerably by the use of this new technology. However, these wonderful innovations are yet to be the climax as Uricchio (2009) called it the tip of an iceberg. The world is witnessing only a hint of advancement in technology but still it has effectively contributed to some of the spheres of human lives. However, a few aspects of life are yet to be touched by the technology. In other words, the people have not yet seen the digital technology with full potential and magnitude.

SM is overshadowing the importance of traditional media in terms of their services to society. Given this, some of the scholars have believed that this new media is superseding other form of electronic media like radio and television in their scope, functions and features.

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INVESTIGATING THE GOVERNMENT REVENUE–EXPENDITURE NEXUS: EMPIRICAL EVIDENCE FOR THE FREE STATE PROVINCE IN A MULTIVARIATE MODEL

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Abstract: *This paper examines the government revenue–expenditure nexus for the Free State Province in a multivariate vector error correction model (VECM) using real GDP and inflation as control variables over the period 2004Q2–2018Q1.Cointegration and intertemporal (causal) links among variables were established employing Johansen (1995) and Toda-Yamamoto (1995) non-Granger causality tests. The results of the cointegration analysis confirm the existence of a long-run relationship between variables. The results of the causal analyses show a bidirectional causality between government revenues and expenditures in both the long-run and short-run supporting the fiscal synchronization hypothesis. Real GDP and inflation individually Granger-causes government revenue, in both the long-run and short-run, stressing their importance on generating revenue. Based on these findings, an isolated fiscal measure to raise tax-revenues or cut expenditure will exacerbate fiscal imbalance. On the policy front, the Free State government should adhere to a planned budget process, devise innovative revenue-generating strategies to circumvent the burden of producing inflation revenue, as well as utilize its autonomy on fiscal instruments to maintain a sustainable fiscal policy path, and stimulate economic growth.*

Keywords: government revenue; government expenditure; causality; cointegration; Free State province; South Africa.

JEL Classification: C12, C51, C54, H61.

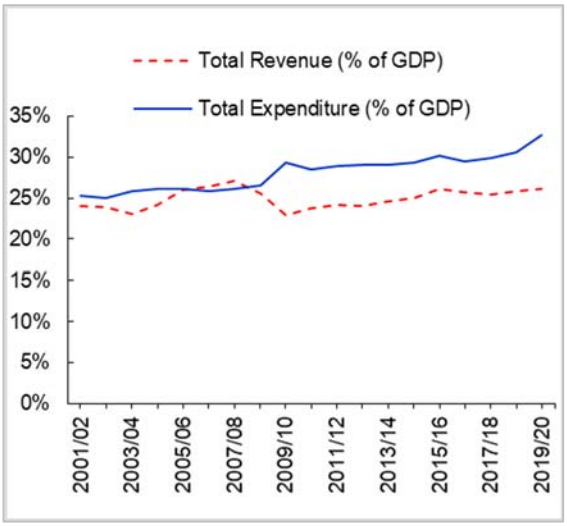
Introduction

In the aftermath of the latest global economic and financial crisis, the South African government have been grappling with an expanding fiscal debt (as a ratio of gross domestic product, GDP) due to government expenditures outpacing tax-revenues (Figures 1and 2), whereas economic growth is constrained with structural endogenous shocks such as shortage of power supply), political uncertainty, weak global demand for commodity export and gyrations in the world capital market (IMF 2009). At the same time, the labour market condition has steadily worsened in the past decade[12], and there is a growing concern over South Africa's ever-increasing fiscal debt utilized to finance the rise in government expenditures, which in turn widens the national budget deficit

[12]South Africa's fiscal debt (as % of GDP), a key measure of national government's indebtedness and financial health has nearly doubled in size from 31.8% in 1990 to 59.3% at the end of 2019 (National Treasury 2020), whereas the national economic growth drastically slowdown to about 0.7% at end of 2019 from the recorded 4.2% in 2000 (IMF 2020). The country is also experiencing a persistently high unemployment rate at 29.1% (narrowed definition) or 42.3% (expanded definition) at the end of 2019 (Stats SA 2020).

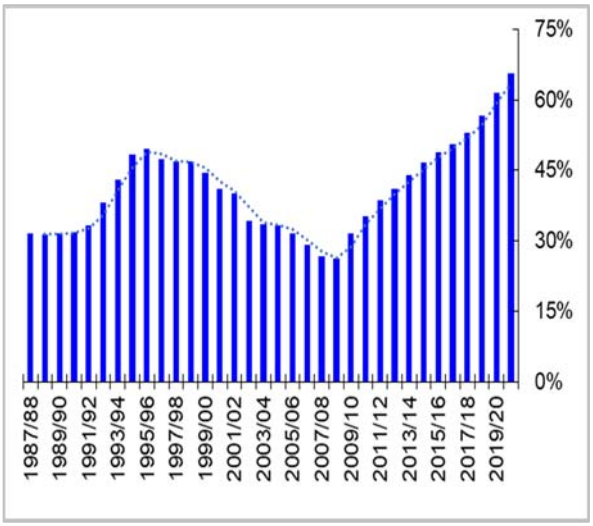
(National Treasury, 2020). The combined effects of these undesirable economic and social developments have led the national government to develop pro-growth and investment-driven macroeconomic and fiscal policies to tackle these prevailing issues (see, *e.g.,* NDP 2012; NGP 2011).

The national fiscal framework in South Africa (SA) allows the provincial governments to receive a large fraction of their revenue, in the form of a provincial equitable share (PES), from the national government. Usually, this intergovernmental transfer of revenue is mostly devoted to financing flagship programs or projects identified by the national government to show its political commitment to the voters, on tackling income inequality, unemployment and poverty rate. This process gives the assumption that provincial governments operate under a balanced budget, which becomes questionable due to off-budget activities deemed as the main priority in a particular province (Payne 1998). In the same vein, the fiscal autonomy of the provincial governments becomes crucial to generate extra revenue to fund off-budget activities (or provincial financial priorities) by either raising levies or surcharges[13]. Nonetheless, given the prevalence of narrow fiscal space, severely weak economic growth and relatively low tax-revenues in SA, the provincial government is confronted with the dilemma of either reducing public expenditure or utilize its fiscal autonomy to raise 'own' revenue to augment their provincial equitable share.



Source: National Treasury (2020), Own illustration.

Figure 1. The trend of total government revenue and expenditure (% of GDP) for South Africa.



Source: National Treasury (2020), Own illustration.

Figure 2. Fiscal debt (% of GDP) for South Africa

Against this backdrop, *a priori* decision by the policymakers either to raise tax-revenue or cut expenditure to finance current spending (or budget deficit) can lead to serious budget constraints which may indirectly dampen economic activity level or induce inflationary pressures in the domestic economy. Moreover, a better understanding of the dynamic interrelationship between government revenue and expenditures would aid policymakers to pin down the causes of, and remedies for, non-credible budget. From a policy standpoint, such knowledge could also be useful in designing and/or implementing appropriate fiscal measures to improve the budget planning process, achieve fiscal sustainability and reduce the budget deficit. Besides, it is widely accepted that sound fiscal policy can reduce output and employment fluctuations in the short-run, and also restore the economy to its potential level.

Therefore, this paper investigates the causal relationship between government revenues and expenditures at the state level, by focusing on the intertemporal interdependence between the two variables and real gross domestic product (GDP) for the Free State (FS) province, together with inflation series (control variable) over the period 2004 Q2 - 2018 Q1, employing the vector error correction modeling framework. We also apply the VAR-based Toda-Yamamoto non-Granger causality test (Toda-Yamamoto 1995) to validate the robustness of the intertemporal links (short-run causality) observed between variables, in our estimated mated vector error correction models. On this basis, one could expect, our analytical exercise to yield robust inferences and reliable conclusion on both the linear and intertemporal causative links between variables, than those reported in country-specific

[13]Levies and surcharges are other form of taxes used by the provincial (or state) government as fiscal tools to raise 'own' revenue. In this paper, provincial 'own' revenue is interchangeable referred to as government revenue.

studies focusing on South Africa (see, *e.g.,* Phiri 2019; Baharumshah *et al*. 2016; Ghartey 2010; Ndahiriwe and Gupta 2010; Lusiyan and Thorthon 2007; Nyamongo *et al*. 2007; Narayan and Narayan 2006; Chang *et al*.2002).

Our analysis is timely and important at least on two counts. First, the economic and labour market conditions in the FS province mirrors that of the national economy given a relatively high unemployment rate of 35% (narrow definition) or 37% (expanded definition) at the end of 2019 (Stats SA, 2019)[14], and a lack lustre domestic economy that recorded negative growth of -0.3% in 2019 compared to the growth rate of 2% and 2.5% in 2000 and 2010 respectively[15]. Given these prevailing challenges, the Free State government is obliged to use its fiscal autonomy to explore innovative measures to either generate more revenue to finance the provincial needs or reduce its expenditures to achieve fiscal balance. In this context, the findings on the underlying dynamic interrelationship between government revenues and expenditure will shed more light on whether the conventional fiscal measure to raise tax-revenues (on levies and surcharges) or cut expenditures or concurrently use both measures will revive the provincial economy as well as mitigate budget constraints due to higher expenditures and low revenue (Figure 3). Second, the relationship between government revenues-expenditures empirically rests on four hypotheses in the public finance literature, that is, tax-spend (Friedman 1978; Buchanan and Wagner 1978), spend-tax (Peacock and Wiseman 1961, 1979), fiscal synchronization (Musgrave 1966; Meltzer and Richard 1981), and institutional separation (Wildavsky 1988; Baghestani and McNown 1994). These theories have different policy implications on the government decision to cut the budget, raise tax-revenue or both. From a policy perspective, it is imperative for both the fiscal authorities and policymakers in the Free State province to have in-depth knowledge of the exact theoretical relationship underlying the government revenue-expenditure nexus in the province. Such evidence could equip fiscal authorities and policymakers to design and/or implement effective fiscal measures, at the provincial level.

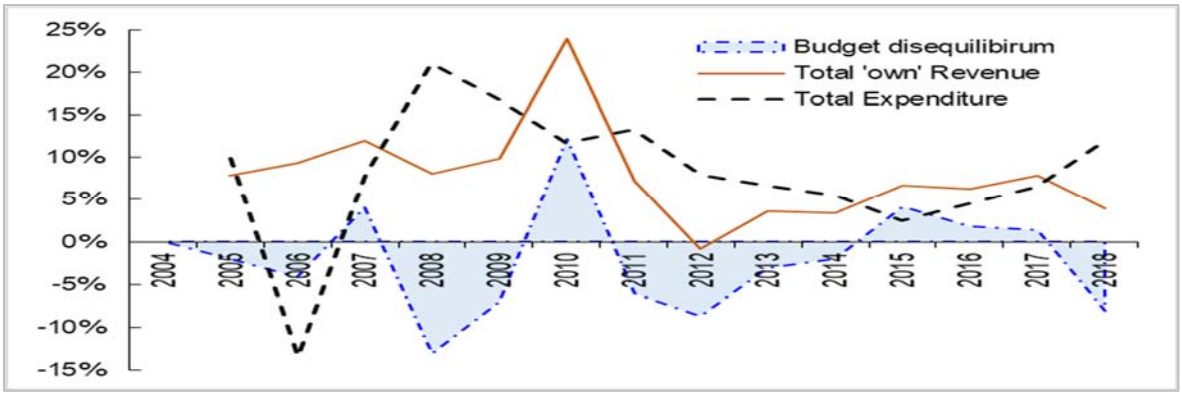
On the methodological front, the econometric method and model specification employed in this study circumvent the shortcomings of earlier studies such as using bivariate modeling approach, low frequency (annual) data and lack of testing for structural breaks in used data (see, *e.g.,* Ndahiriwe and Gupta 2010; Payne 2003; Islam 2001), which usually mask the intertemporal links between variables, and estimated model suffer from omitted variable problems. Most closely related to our work is Kavase and Phiri (2018), who investigate the fiscal sustainability across the nine South African provinces focusing on the existing asymmetric relationship between government revenue - expenditure. But, drawn inferences and conclusion of this particular study can be considered as unreliable since these authors used a bivariate model and high-frequency (annual) data that covers a short period (*i.e.,* 2000 to 2016). Also, the relatively short sample period suggests that the specified model is susceptible to misspecification bias, due to insufficient degrees of freedom required to construct the optimal number of lags for times-series in the estimated non-linear autoregressive distributed lag (NARDL) model.

We remedied the limitations in previous studies, by making use of a multivariate cointegration–based error correction model using high-frequency data (*i.e.,* quarterly series) with real GDP and inflation as control variables, to effectively deal with misspecification bias associated with omitted variable problems and spurious conclusions on the nature and direction of causality. This cointegration-based error correction model employed allows feedback between government revenue and expenditure running interactively through the real GDP and inflation variables in both the short-run and long-run (Granger and Lin 1995). Also, the error terms from the long-run regressions between government revenue, expenditure, real GDP and inflation can give more insight into how, for instance, responsive revenues and expenditures are to deviations from their long-run equilibriums with respect to GDP. Besides, the inclusion of the real GDP variable allows us to capture the intrinsic link between aggregate economic conditions, raised government 'own' revenue and expenditure growth, in the province.

The remainder of this paper is structured as follows: Section 2 provides the different theories explaining the government revenue-expenditures nexus, empirical evidence supporting these theories, and a synoptic survey of relevant studies. Section 3 outlines the econometric techniques employed. Data and stationarity properties of the time-series are presented in Section 4. Empirical results are reported and discussed in Section 5, while Section 6 concludes with some policy recommendations.

[14]Data available at http://www.statssa.gov.za/?page_id=1854&PPN=P0211&SCH=7622.

[15]Data on provincial GDP is sourced from the reliable IHS Global Markit's Rex database.



Source: In-Year-Monitoring (FS Provincial Treasury database), Estimates of Provincial Revenue and Expenditure (National Treasury's provincial financial database), Own illustration.

Figure 3. Historical trend of total revenue, total government expenditure and budget disequilibrium (ratio of GDP) for the Free State province.

1. Theories on Government Revenues - Expenditure Nexus and Empirical evidence.

In public finance, four theoretical postulations underpin the government revenue–expenditure nexus (or the tax-spend debate) and important for the formulation of fiscal policy[16].Foremost, Friedman (1978) and Buchanan and Wagner (1997) are the main proponents of the tax-spend theory. According to the Friedman (1978), changes in government revenues (taxes) leads to changes in government expenditure, hence an increase in government revenues will raise government expenditure, implying a positive relationship between the two variables. However, the widespread fiscal strategy of raising revenue through budget cuts could have an inflationary effect on goods and services, and raise government consumption expenditure, while lower taxes may reduce the budget deficit or engender fiscal sustainability (Payne 2003). But, Buchanan and Wagner (1978) posit a negative intertemporal relationship between government revenue and expenditure, implying that an increase in government revenue (or tax) can reduce the budget deficit since voters perceive tax reduction as a decline in public spending, which leads to an increase in demand for public goods and services. Empirically, a unidirectional causality running from government revenues (or taxes) to government expenditure confirms the tax-spend thesis (see, *e.g.,* Rahman and Wadud 2014; Magazzino 2013; Aregbeyen and Ibrahim 2012; Owoye and Onafowora 2010; Wolde-Rufael 2008; Kollias and Paleologou 2006; Narayan and Narayan 2006; Payne 1998).

The second thesis underscoring the government revenue-expenditure nexus is the spend-tax theory advanced Peacock and Wiseman (1961, 1979), implying that government spend first and raise revenue (taxes) later - an opposite view of the tax-spend thesis. According to the spend-tax theory, the occurrence of idiosyncratic shocks (*e.g.,* natural disaster and droughts) economic, social and political upheavals, typically leads to the imposition of higher taxes to finance the required increase in government expenditure. In the vast empirical literature, studies have shown that the spend-and-tax hypothesis holds if a unidirectional causality from government spending to government revenue (taxes) exists, indicating a 'displacement effect' (see, *e.g.,* Magazzino 2013; Keho 2010; Afonso and Rault 2009; Narayan and Narayan 2006; Chang *et al*. 2002; Ewing and Payne 1998; Von Furstenburg *et al*. 1986).

The third postulation on the government revenue-expenditure nexus is the fiscal synchronization hypothesis put forward by Musgrave (1966) and Meltzer and Richard (1981). These scholars argued that government expenditure and revenue (or tax) can be adjusted simultaneously (or concurrently) to achieve fiscal balance (or equilibrium) since policymakers have full control over these variables during budget adjustments. In other words, government expenditure and revenue are independent of each other, thus budget deficit can be reduced by raising taxes and reducing expenditure since both variables can be changed concurrently. As such, an isolated fiscal decision to raise government revenue or expenditure will lead to a serious budget deficit, since there is contemporaneous feedback between government expenditure and revenue. From a policy standpoint, the government can simultaneously choose an optimal package of public programs to be financed in its budget along with tax revenues required. Empirical evidence supporting the fiscal synchronization hypothesis shows a bidirectional causality between the government revenue and expenditure (see, *e.g.,* Al-zeaud 2015; Elyasi and

[16]See, *e.g.,* Phiri (2019) and Payne (2003) for a survey of the vast empirical literature.

Rahimi 2012; Mehrara *et al*. 2011; Owoye and Onafowora 2010; Chang and Chiang 2009; Kollias and Paleologou 2006; Wolde-Rufael 2008; Chang *et al*. 2002; Islam 2001; Ewing and Payne 1998; Manage and Marlow 1987).

Finally, Wildavsky (1988) and Baghestani and McNown (1994) propound the institutional separation hypothesis, under which decisions on government expenditure and taxation are taken independent of one another due to the conflicting views and interest of different parties or groups which causes fiscal debt to grow and makes it more challenging to implement deficit-reducing measures. From a policy perspective, if institutional separation thesis holds, fiscal consolidation implemented by raising tax revenues or cut in expenditure would have a negligible effect on the budget deficit (Lusiyan and Thorton 2007). Empirical evidence supporting the institutional separation hypothesis, indicates the absence of a causal link between government revenue and expenditure, suggesting fiscal neutrality (see, Magazzino 2013; Ali and Shah 2012; Wolde-Rufael 2008; Narayan and Narayan 2006; Kollias and Paleologou 2006; AbuAl-Foul and Baghestani 2004, among others).

1.1. Survey of Related Empirical Studies

So far, studies examining the relationship between government revenue and expenditure in South Africa is scanty, while similar research at the provincial (or state) level receives no attention. Be that as it may, reported evidence in the empirical literature is mixed, partly due to model specification bias, the different period being studied, and econometric techniques used.

Few cross-sectional studies have considered South Africa in their analysis, for instance, Ghartey (2010) utilized an ARDL model and the two-step Engle-Granger (1987) method to determine the direction of causality driving the government revenue-expenditure nexus for Nigeria, Kenya and South Africa, using annual data spanning 1960 - 2007, and reported a bi-directional causality between the two variables for South Africa, aligning with fiscal synchronization theory. In contrast, Narayan and Narayan (2006) applied the VAR-based Toda-Yamamoto (1995) causality test on the dataset of twelve developing countries for the period 1960 - 2000, and found no long-run causality between government revenue and expenditure for South Africa, keeping with the institutional separation (fiscal neutrality) hypothesis. Chang *et al*. (2002) estimate an error correction model over the period 1951 - 1996 and find a unidirectional causality running from government expenditure to revenue for South Africa in the short-run, supporting the spend-tax hypothesis.

On country-specific studies, for instance, Phiri (2019) make use of an asymmetric momentum threshold auto regression (MTAR) model (supplemented with a TEC component consisting of fiscal deficit/surplus variables (as a ratio of GDP)) to examine the government revenue-expenditure nexus for South Africa over the period 1960 Q1 to 2016 Q2, and finds a bi-directional causality between these variables, supporting fiscal synchronization hypothesis. In a different study, Baharumshah *et al*. (2016) used annual data on government expenditure and revenue, to compute an asymmetric (MTAR and TAR) and symmetric (ARDL) bivariate models for South Africa, over the period 1960 - 2013. The result of the asymmetric models indicate the absence of a long-run relationship between these variables, but evidence from the ARDL model (along with GDP as a control variable) shows that variables are cointegrated, and a bi-directional causal link between government revenue and expenditure, in the long-run and short-run.

Ndahiriwe and Gupta (2010) argued that the inconclusive result on the government revenue - expenditure for South Africa, is due to the frequency of time-series used in existing studies. Using both quarterly and annual data (with GDP and government debt as control variables), they find bi-directional causality between government revenue and expenditure in the estimated vector error correction model with quarterly data (1960 Q1 to 2006 Q2), but a similar model with annual series (1960-2005) showed no evidence on the causative links among variables. Lusiyan and Thorthon (2007) tested for structural breaks and include dummy variables in a bivariate model estimated for South Africa over the period 1895-2015 and find the existence of a long-run relationship, and bi-directional causal link between government expenditure and revenue. While, Nyamongo *et al*. (2007) used a bivariate VAR model estimated over period October 1994 to June 2004 and find a long-run bi-directional causality between government revenue and expenditure, but the absence of an intertemporal causative link between the two variables, which supports fiscal neutrality hypothesis.

Finally, Kavase and Phiri (2018) focused on South African provinces. Using an ARDL model, they examine the government revenue - expenditure nexus across nine provinces (or states), over the period 2000 -2016. They found differentiated effects of the strict fiscal stance to finance growing expenditure by raising taxes (increased revenue collection) on provincial budgets, in both the long-run and short-run. They conclude that fiscal sustainability is attainable in some provinces (such as Eastern Cape, Northern Cape and Free-State) in both the long-run and short-run, if government expenditure increases, but a reduction in government expenditure would

lead to fiscal sustainability in most of the provinces (which include Western Cape, North West, Gauteng, Mpumalanga and Limpopo).

1.2. Methodology: Cointegration-Based Vector Error Correction (VEC) and Non-Granger Causality Frameworks.

To examine the government revenue–expenditure for the Free State province, we construct a functional multivariate framework to capture the linear relationship between the provincial government revenue, expenditure, and the two control variables, namely real GDP and inflation, using linear stochastic equations describe as:

$$\ln GR_t = \lambda_0 + \lambda_1 \ln GE_t + \lambda_2 Y_t + \lambda_3 \pi_t + \delta g_{1t} + \delta d_{2t} + \varepsilon_{1t} \quad 1.1$$

$$\ln GE_t = \gamma_0 + \gamma_1 \ln GR_t + \gamma_2 Y_t + \gamma_3 \pi_t + \delta g_{3t} + \delta d_{4t} + \varepsilon_{2t} \quad 1.2$$

where lnis the logarithm operator; $\lambda_1, \lambda_2, \lambda_3, \gamma_1, \gamma_2,$ and γ_3 are coefficients to be estimated; GE_t and GR_t denotes real government expenditure and revenue respectively; Y_t and π_t are the real gross domestic product (GDP) and inflation series included as control variables to avoid the 'omitted variable' problem[17], and pin down the exact intertemporal (causal) relationship between variables; δg_{it} and δd_{it} are dummy variables to account for possible structural breaks in the series owed to important external (global) and internal (domestic) shocks; while ε_{1t} and ε_{2t} are serially uncorrelated error terms (white-noise). It is worth noting that the systems of equation presented in Eqs. 1.1 and 1.2 lend credence to the theoretical underpinnings driving the GR - GE nexus, with former denoting the spend-tax hypothesis, and the latter based on the tax-spend hypothesis. Specifically, the inclusion of the GDP variable in the system of equations allows us to account for the influence of the size of the provincial economy on the growth in both government revenue and expenditure, which in turn, are intrinsically dependent on the aggregate economic activity level (Payne 1998). Likewise, the specified system of equations also makes it possible to identify whether variables are cointegrated or not, as well as the nature (direct or indirect) and direction of causal links between variables, in the long-run and short-run (Granger and Lin 1995).

The next step is to determine whether the chosen variables are cointegrated (*i.e.,* share a common trend) in the long-run, and produce one (or more) linear combinations is stationary in levels, irrespective of varying stationarity properties. Although, variables may deviate in the short-run, in response to a shock in a system, but should revert to a steady-state in the long-run, since they share a common stochastic trend (Stock and Watson 1988). For this purpose, we apply the VAR-based Johansen's (1995) maximum likelihood reduced-rank procedure is applied. This procedure is preferred because it allows the estimation and identification of more than one cointegrating vector(s) in the multivariate system, have better small sample properties, permits feedback effect between variables, reflecting the interdependency between variables to yield robust cointegrating vectors, and the loss in terms of efficiency is minimal (see, Gonzalo 1994; Kremers *et al.* 1992).

The Johansen reduced-rank procedure (Johansen, 1995) is carried out to identify the rank of the cointegrating space, by determining the number of cointegrating vectors (r) in the parameter matrix Π. To perform the reduced rank cointegration test, consider a VAR (2, 1) with Gaussian errors, express as:

$$y_t = A_{(1)} y_{(t-1)} + A_{(2)} y_{(t-2)} + \ldots + A_{(n)} y_{(t-n)} + \Lambda + u_t; \quad t=1,2,\ldots,T. \quad 1.3$$

where y_t is a $m \times 1$ vector of endogenous variables (in our case, real government expenditure, revenue, GDP and inflation (in this case, *N*=4) in the system at time, t and u_t is $i.i.d.\ N(0,\Sigma)$. By taking first-differencing on the vector level, Eq. 1.3 becomes an error correction model estimate as:

$$\Delta y_t = \Gamma_{(1)} y_{(t-1)} + \Gamma_{(2)} y_{(t-2)} + \ldots + \Gamma_{(n-1)} \Delta y_{(t-n+1)} - \Pi y_{t-1} + \Lambda + u_t; \quad t=1,2,\ldots,T. \quad 1.4$$

where $\Gamma_i = -I + A_{(1)} + A_{(2)} + \ldots + A_i$ for $i = 1, 2 \ldots, n-1,$ and $\Pi = 1 - A_{(1)} - A_{(2)} - \ldots - A_{(n)}$. Here, matrix Π conveys information about the long-run relationship between y_t variables (in our case, *GE* and *GR*

[17]Failure to account for omitted variables can give rise to misleading causal ordering among variables, leading to spurious deduction, nonetheless, this problem is typically resolved by adding control variables (most notable, real GDP) to compute a multivariate model (Payne 2003; Baghestani and McNown 1994).

specified in Eqs. 1.1 and 1.2. The cointegration rank is derived employing the trace test statistic and the maximum eigenvalue statistics based on a likelihood ratio (LR) test, with the trace test (λ_{trace}) define as:

$$\lambda_{trace}(r) = -T\sum_{i=r+1}^{n}\log(1-\hat{\lambda}_1) \quad 1.5$$

where $\hat{\lambda}_{r+1},...,\hat{\lambda}_n$ are the estimated $n-r$ with the smallest eigenvalue. The null hypothesis, H_0: numbers of cointegrating vectors $\leq r$ is tested against the alternative, H_1: numbers of cointegrating vectors equal to r. In contrast, the maximum eigenvalues test is defined as:

$$\lambda_{\max}(r, r+1) = -T\log(1-\hat{\lambda}_{r+1}) \quad 1.6$$

The maximum eigenvalues test the null hypothesis, H_0: number of cointegrating vectors equals to r against the alternative, H_1: cointegrating vector is $r+1$. In Eq. (5) and (6), λ_i are the estimated values of the characteristic roots obtained from the estimated Π, and T is the number of observations.

In what follows, long-run relations and intertemporal links between variables are established using the vector error correction model (VECM). The presence of cointegration suggests the existence of, at least, one unidirectional causal link among variables (Granger 1988). In our application, the error correction models are computed based on the linear systems of stochastic equations in Eqs. 1.1 and 1.2 in the form:

$$\Delta\ln GR_t = \alpha_0 + \sum_{i=1}^{h_1}\alpha_{1i}\Delta\ln GR_{t-1} + \sum_{i=1}^{h_2}\alpha_{2i}\Delta\ln GE_{t-1} + \sum_{i=1}^{h_3}\alpha_{3i}\Delta\ln Y_{t-1} + \sum_{i=1}^{h_4}\alpha_{4i}\Delta\ln\pi_{t-1} + \theta\ln ECM_{1t-1} + u_{1t} \quad 1.7$$

$$\Delta\ln GE_t = \beta_0 + \sum_{i=1}^{k_1}\beta_{1i}\Delta\ln GE_{t-1} + \sum_{i=1}^{k_2}\beta_{2i}\Delta\ln GR_{t-1} + \sum_{i=1}^{k_3}\beta_{3i}\Delta\ln Y_{t-1} + \sum_{i=1}^{k_4}\beta_{4i}\Delta\ln\pi_{t-1} + \phi\ln ECM_{2t-1} + v_{2t} \quad 1.8$$

Here, $\Delta$is the first difference operator; α_i and β_i are the short-run dynamic coefficients of the model's convergence to long-run equilibrium; $h$and k are optimal lag length; θ and ϕ measures fiscal disequilibrium and the speed of adjustment to restore the model to its steady-state (or equilibrium) in the presence of a shock to the system; and the $ECM_{it-1}(i=1,2)$ is one-period lagged error correction term derived from long-run relationship capturing short-run causative process. The size and statistical significance of the lagged error correction term in the revenue and expenditure equations have important implications for policymaking, as it indicates how long it will take for each fiscal variable to return to long-run equilibrium in the aftermath of a shock to the system. u_{1t} and v_{2t} serially uncorrelated error terms, such that $E[u_{1t}, u_{2s}] = 0$, $E[v_{1t}, v_{2s}] = 0$, $E[u_{1t}, v_{2s}] = 0$ for all $t \neq s$. Other variables are as defined previously. Note that, short-run causality is tested in Eqs. 1.7 and 1.8 based on the standard $F-$test statistics (WALD test), which assess the joint significance of the coefficients of the first differenced (and lagged) explanatory variables. A significant negative signed *ECM* suggests that variables are cointegrated (*i.e.,* the existence of a long-run relationship), while statistically significant values of θ and ϕ confirms the presence of a long-run causality based on the significance of standard t-test. As mentioned before, we include dummy variables in Eqs. 1.7 and 1.8, to account for structural breaks due to global or domestic shocks.

Lastly, the robustness of the direction and pattern of the long-run causative processes in our models are validated by using Toda-Yamamoto (T-Y) non-Granger causality (Toda and Yamamoto 1995). Generally, the T-Y causality test requires no pre-testing for the presence of unit-root and cointegration to establish causal links between variables. The T-Y procedure uses a modified Wald test (MWALD) to test the linear restrictions of the parameters of a standard VAR (k) in levels, with $k$being the optimal lag length. The MWALD test based on the

T-Y procedure converges in the distribution of χ^2 random variables with m degrees of freedom whether the series is *I*(0), *I*(1) or *I*(2) stationary or not cointegrated (Wolde-Rafael 2008).

We implement the T-Y procedure by estimating a standard VAR (k) augmented with $(k+d_{\max})^{th}$ order of integration, while the $d_{\max}$ variables are treated endogenously. In the estimated model, the optimal lag length of k is selected based on Akaike information criterion (AIC), and the coefficients of the last lagged $d_{\max}$ are ignored. In the final step, the direction of causality is determined by carrying out an *F*-statistic (MWALD) test for linear or nonlinear restrictions on the first kVAR parameters. The application of the usual *F*-statistic test has asymptotic distribution for a valid inference (Clark and Mirza 2006; Zapata and Rambaldi 1997).

In our analysis, we apply the T-Y procedure by estimating seemingly unrelated regression (SUR)[18] with the system of equations, describe as:

$$\ln GR_t = \alpha_0 + \sum_{i=1}^{k+d\max} \alpha_i \ln GR_{t-i} + \sum_{i=1}^{k+d\max} \beta_i \ln GE_{t-i} + \sum_{i=1}^{k+d\max} \varphi_i \ln Y_{t-i} + \sum_{i=1}^{k+d\max} \vartheta_i \pi_{t-1} + \varepsilon_{1t} \quad 1.9$$

$$\Delta \ln GE_t = \gamma_0 + \sum_{i=1}^{k+d\max} \lambda_i \ln GE_{t-i} + \sum_{i=1}^{k+d\max} \Omega_i \ln GR_{t-i} + \sum_{i=1}^{k+d\max} \Lambda_i \ln Y_{t-i} + \sum_{i=1}^{k+d\max} \eta_i \pi_{t-1} + \varepsilon_{2t} \quad 1.10$$

$$\Delta \ln Y_t = \mu_0 + \sum_{i=1}^{k+d\max} \mu_i \ln Y_{t-i} + \sum_{i=1}^{k+d\max} \Gamma_i \ln GR_{t-i} + \sum_{i=1}^{k+d\max} \varpi_i \ln GE_{t-i} + \sum_{i=1}^{k+d\max} \Pi_i \pi_{t-1} + \varepsilon_{3t} \quad 1.11$$

$$\Delta \ln \pi_t = \psi_0 + \sum_{i=1}^{k+d\max} \psi_i \ln \pi_{t-1} + \sum_{i=1}^{k+d\max} \Theta_i \ln GR_{t-i} + \sum_{i=1}^{k+d\max} \Phi_i \ln GE_{t-i} + \sum_{i=1}^{k+d\max} \theta_i \pi_{t-1} + \varepsilon_{4t} \quad 1.12$$

where $\varepsilon_{i,t}(i=1,2,3,4)$ are serially independent random error terms with a mean of zero and finite covariance matrix. All other variables and symbols remain the same as previously described. For example, the existence of long-run causality can be assessed in Eqs. (9) and (10), given the null hypothesis that *GR* does not Granger-cause *GE (denoted as* $H_0 : \Omega_i = 0,\ \forall i \le k)$, or *GE* does not Granger-cause *GR,* represented as $H_0 : \lambda_i = 0,\ \forall i \le k.$

1.3. Data and Stationarity Properties.

The estimated models consist of the natural logarithms of quarterly series on total government revenue, total expenditure and GDP for the Free State (FS) province, including consumer price index (CPI) series, over the period 2004 Q2 – 2018 Q1[19]. Our choice of data frequency is justifiable since high-frequency data have been shown to produce more reliable evidence on the government revenue-expenditure nexus for South Africa, compared to annual data (Ndahriwe and Gupta 2010). Data on fiscal variables are primarily sourced from the South Africa Department of National Treasury[20] and Free State Provincial Treasury's In-Year-Monitoring databases. Historical CPI series is obtained from Statistics South Africa (Stats SA)[21]. Series on the provincial gross domestic product is sourced from the Global Markit ReX database. Where necessary, nominal series are rebased to index (2010=100). All nominal variables are transformed to real using the CPI, and seasonally adjusted applying ARIMA X–13 procedure. The real government revenue and expenditure series were rescaled as a ratio of real GDP, to capture the effects of growth in the domestic provincial economy (Zapf and Payne 2009), since the growth rates of these fiscal variables are reliant on economic activity levels (Narayan and Narayan 2006).

[18]The SUR procedure remains valid in the absence of a long-run relationship between variables, as long as the order of integration does not exceed the true lag length of the model (Toda and Yamamoto 1995:225).

[19]Annual data were converted to quarterly series using the linear transformation (first-to-match last) method provided in Eviews 10 software.

[20]Audited financial data sourced from various annual Budget Statements, Medium Term Budget (MTBPS) and Provincial Intergovernmental Fiscal Review (IGFR) publications, available at http://www.treasury.gov.za.

[21]Headline CPI series used to compute the inflation series is obtained from Stats SA, available at: http://www.statssa.gov.za/?s=consumer+price+index&sitem=publications.

Before testing whether selected variables in the estimated models are cointegrated, we check for structural breaks and establish the stationarity properties of each variables utilizing the Zivot and Andrews (1992, hereafter Z-A) and Phillips-Perron (1988) unit root tests, which identify inherent break dates congruent to existing endogenous breaks in each series. Given the exposure of South Africa as a small open economy to global shocks, it is plausible that our chosen variables may have structural breaks associated with important global and domestic events, which rendered the use of conventional unit root test such as the Augmented Dickey-Fuller inappropriate(see*, e.g.,* Vogelsang and Perron 1998;Barnejee *et al.* 1992)[22]. Failure to account for existing endogenous break in a time-series can lead to rejection of the presence of a unit root, which may otherwise be false (Islam 2001). To establish stationarity, the unit root tests are carried out on both levels and the first differences of the chosen variables.

More specifically, the Z-A unit root test can confirm the presence of structural breaks in the deterministic trend and also endogenously determine break dates from time-series, instead of *a prior* fixed date. In our application, we apply the Z-A unit root test (based on ADF) suitable for time-series with intercept and trend breaks, in the form:

$$\Delta y_t = \mu + \beta_t + \theta DU_t + \gamma D + \phi_1 DT_t + \alpha y_{t-1} \Sigma_{t=1}^{k} \vartheta_t \Delta y_{t-1} + \varepsilon_t \quad 1.13$$

where y_t is a time series, Δindicates the first difference of series, t is a time-trend, $k$is the optimal leg length to stationarity of y_t, ε_t is the error term. DU_t and DT_t are dummy variables to capture trend shift and mean shift respectively, occurring at each possible break date, *TB* defined as:

$$DU_t = \begin{cases} 1 & if\ t > TB \\ 0 & otherwise \end{cases} \quad \text{and} \quad DT_t = \begin{cases} t - TB & if\ t > TB \\ 0 & otherwise \end{cases} \quad 1.14$$

Conversely, the Phillips-Peron (PP) unit root test used can be represented as:

$$\Delta y_t = \alpha + \lambda_t + \rho y_t + \varepsilon_t \quad 1.15$$

where t value is associated with the estimated coefficient of ρ. The series is stationary if ρ is negative and significant.

To refrain from testing for structural breaks based on *a priori* fixed dates, we rely on the break dates identified by Z-A and PP unit root tests, which are provided in Table 1. For robustness, we also perform a multiple breakpoint unit root tests based on sequential breaks, recursive partitions and global crisis induced breaks proposed by Bai and Perron (2003)[23]. In general, structural breaks determined by all the unit-root test, are quite similar[24], suggesting break dates for the period 2009 Q1 and 2011 Q2 (for government revenue variable); 2006 Q1 and 2006 Q2 (for government expenditure variable); 2009 Q2 and 2017 Q2 (for the real GDP variable); and 2010 Q3, 2016 Q1 and 2015 Q2 (for the inflation series). On the basis, the estimated dummy variables included in the error correction models consist of: (i) 2008 Q1–2012 Q2, capturing the full impact of the latest global economic recession and financial contagion; (ii) 2009 Q1–2011 Q4, which accounts for the period of a synchronized economic downturn in Africa; (iii) 2009 Q1–2010 Q4, accounting for the sharp fall in economic activity level in South Africa, during the latest global economic crisis period, prior a rebound at the beginning of 2011; and (iv) 2013 Q1–2018 Q4 to capture the implemented s*trict fiscal consolidation period* to enforce prudent financial management and good governance across the three spheres of government (*i.e.,* national, provincial, and municipal levels), since 2013.

[22]See, *e.g.,* Perron (2017, 2006) for useful literature on dealing with structural break issue in time-series.

[23]The multiple breaking point unit root test is developed based on theoretical contributions of, for example, Zivot and Andrew (1992), Banerjee *et al*. (1992), and Vogelsang and Perron (1998). This test is carried out using Eviews 10, and the results are available upon request from the author.

[24]The three unit root tests employed produce break dates, which mostly coincide with, for example (i) the latest 2007/8 global economic recession; (ii) prevailing weak economic condition in the country, since 2014; (iii) the adoption of strict fiscal consolidation process by the national government since 2014, to reduce wasteful public expenditure and the rapidly expanding fiscal debt (% of GDP) which is above 58%; and (iv) the gradual decline in generated revenue, since 2017 (see, Figure 3).

1.4. Empirical Results and Discussion

We begin our analysis by considering the stationarity properties of the variables. The results of the Z-A and PP unit root tests presented in Table 1, unequivocally shows that the null hypothesis of unit root with a structural break for most of the time-series variables cannot be rejected at levels, but stationarity is achieved after first differencing[25]. As expected, only the inflation series is stationary in levels, and others are *I*(1) stationary variables with endogenous structural breaks.

Having confirmed that variables are *I*(1) stationary, the next step is to examine whether variables are cointegrated, that is, if a long-run relationship exists among variables before assessing the direction of causal links between variables using the vector error correction modeling approach. The Johansen's (1992, 1995) reduced-rank procedure is used to determine whether variables are linearly cointegrated. To carry out the VAR-based reduced-rank cointegration test, the next step is to select the optimal lag length. The set of information criteria used are provided in Table 2[26], mostly favored a maximum lag length of 2. Further, the number of cointegrating ranks based on both the trace and maximum eigenvalue test statistics provided in Table 3, confirm the existence of at least one cointegrated vector between variables, at a 5% significance level.

[25]The results of the Bai and Perron (2003) multiple breakpoints unit root tests carried out, align with those reported here, and available upon request.

[26]The selection criteria are log-likelihood ratio, sequential modified LR test statistic (at 5% significance level), Final prediction error (FPE), Akaike information criterion (AIC), and Schwarz information criterion (SIC) and Hannan-Quinn (HQ) information.

Table 1. Results of structural breaks unit root test.

Variables	$\ln GR$	$\Delta \ln GR$	$\ln GE$	$\Delta \ln GE$	$\Delta^2 \ln GE$	$\ln Y$	$\Delta \ln Y$	$\Delta^2 \ln Y$	π	$\Delta\pi$
Z-A structural unit root test (*t*-statistic)										
Intercept	-4.699***	-5.128**	-4.275	-5.484*		-4.83***	-3.371		-8.181*	-3.242
break dates	2009Q2	2010Q2	2007Q2	2007Q2		2011Q2	2009Q2		2007Q4	2006Q2
Trend	-3.971	-2.641	-4.112	-4.473**		-3.586			-7.631*	-3.185
break dates	2009Q4	2013Q1	2011Q1	2007Q3		2008Q2			2008Q3	2006Q3
Intercept and trend	-6.211	-5.548**				-4.677	-3.687		-8.188*	-4.788
break dates	2009Q2	2010Q2				2011q2	2009Q2		2007Q4	2008Q2
Phillips-Perron unit root (*t*-statistic)										
Intercept	-1.006	-2.608***	-0.028	-2.438	-7.275*	0.837	-2.560	-7.281*	-2.283	7.284**
Intercept and trend	-1.499	-2.647	-2.347	-2.485	-7.207*	-2.908	-2.493	-7.249*	-2.362	7.426**
Bai-Perron multiple breakpoint test.										
Intercept										
F-statistic				-4.571**				-8.056*	-4.955*	
break dates				2006Q1				2009 2	2010Q3	
t-statistic				-4.571**				-8.056*	-4.672*	
break dates				2006Q1				2009Q2	2016Q1	
Intercept and trend										
F-statistics	-9.579*	-5.678*		-6.119*				-7.940*	-5.856*	
break dates	2009Q1	2011Q1		2006Q1				2017Q2	2015Q1	
t-stat	-9.579*	-5.678*		-6.119*				-7.940*	-5.856*	
break dates	2009Q1	2011Q1		2006Q1				2017Q2	2015Q1	

Notes: *, **, *** denote 1%, 5% and 10% statistically significance level respectively.

Table 2. Optimal lag selection for the cointegration test based on information criteria.

Lag length	LogL	LR	FPE	AIC	SC	HQ
0	462.811	NA	0.000	-17.993	-17.841	-17.935
1	841.789	683.647	0.000	-32.227	-31.469	-31.938
2	903.672	101.925*	1.99e-20*	-34.026*	-32.662*	-33.505*
3	909.313	8.405	3.08e-20	-33.620	-31.650	-32.867
4	916.589	9.703	4.61e-20	-33.278	-30.702	-32.294
5	928.623	14.157	5.96e-20	-33.122	-29.941	-31.907

Notes: (*) indicates lag order selected by the criterion. LR, FPE, AIC, SC and HQ denote sequentially modified LR test statistic (each test at 5% level); Final prediction error; Akaike information criterion; Schwarz information criterion; and Hannan-Quinn information criterion, respectively.

Table 3. Results of Johansen (unrestricted) cointegration rank tests.

H_0	H_1	Test statistics	Critical Values (95%)	p-value
Trace Statistics				
$r = 0$	$r = 1$	48.555	47.856	0.042
$r < 1$	$r = 2$	19.543	29.797	0.454**
$r \leq 2$	$r = 3$	7.305	15.494	0.542
Maximum Eigenvalue Statistics				
$r = 0$	$r = 1$	29.0114	27.584	0.032
$r < 1$	$r = 2$	12.239	21.131	0.524**
$r \leq 2$	$r = 3$	7.216	14.264	0.463

Notes: p-values based on MacKinnon-Haug-Michelis (1999).

*, **, *** denote 1%, 5% and 10% statistically significance levels, respectively.

Next, before drawing inference from the estimated VEC models, we applied the stability test proposed by Brown *et al*. (1975) based on the cumulative sum (CUSUM) and CUSUM of the square tests for dynamic stability. Figures 4 and 5 (in the Appendix) shows that the parameters and variance of the estimated models are dynamically stable at 5% significance level, implying that deductions and conclusion on the nature and direction of causality between variables, in the long-run and short-run, are reliable.

Turning to the results of the VEC models summarized in Table 4. As expected, the one-period lagged error correction terms in both the government revenue equation $[F(GR|GE)]$, and government expenditure equation $[F(GE|GR)]$, are negative and statistically significant at 5% level respectively, confirming the existence of a stable and long-run relationship between variables. These results also suggest a bi-directional long-run causality from government revenue (expenditure) to expenditure (revenue), running interactively through real GDP and inflation. This evidence indicates that fiscal synchronicity hypothesis underpins the government revenue–expenditure nexus for the Free State province, consistent with the findings reported by Phiri 2019; Baharumshah *et al*. 2016; Ghartey 2010; Lusiyan and Thornton 2007; and Nyamongo *et al*. 2007, for South Africa, but at odds with those documented in earlier cross-sectional studies, supporting the institutional separation (Narayan and Narayan 2008) and spend-tax (Chang *et al*. 2002) hypotheses.

Furthermore, in both models, the coefficient of the lagged error correction terms is significantly negative in both dynamic models, but with a varying speed of adjustment to restore fiscal disequilibrium after a shock to the systems. Although, the rate of adjustment to restore equilibrium may appear to be relatively slow in both models, nonetheless, fiscal disequilibrium (or imbalance) is corrected by 26% in the $F(GR|GE)$ model compared to a much slower adjustment of about 11% in the $F(GE|GR)$ model, in each quarter. Additionally, real government expenditure, real GDP and inflation individually Granger causes government revenue in the long-run, only in the $F(GR|GE)$ model, given their statistical significance at 5% level, and corresponding significant t-statistics at 1% levels.

Table 4. Long-run Granger causality based on the estimated VEC models with dummy variables.

VECM 1: $F(GR\|GE)$			VECM 2: $F(GE\|GR)$		
	$\Delta \ln GR$	*p*-values		$\Delta \ln GE$	*p*-values
α_0	0.0001 [0.508]	0.000*	β_0	-0.003 [-4.238]	0.000*
$\phi \ln ECM_{2t-1}$	-0.256 [-4.125]	0.000*	$\theta \ln ECM_{1t-1}$	-0.107 [-2.991]	0.005*
$\Delta \ln GR_{t-4}$	-0.2556 [-1.839]	0.039**	$\Delta \ln GR_{t-1}$	-0.331 [-1.870]	0.071***
$\Delta \ln GE_{t-1}$	0.271 [1.995]	0.054**	$\Delta \ln GE_{t-1}$	0.464 [3.229]	0.003*
$\Delta \ln Y_{t-4}$	-0.056 [-2.387]	0.023**	$\Delta \ln GE_{t-4}$	-0.641 [-5.037]	0.000*
$\Delta \ln \pi_{t-3}$	0.001 [2.192]	0.036**	δ_{1t} (xdum01)	0.005 [4.716]	0.000*
δ_{5t} (xdum02)	0.001*	0.000*	δ_{2t} (dd4)	0.005 [6.651]	0.000*
δ_{6t} (dd4)	0.000*	0.044**	δ_{3t} (dfcon)	0.005 [4.142]	0.000*

Post-estimation diagnostic tests	VECM 1	VECM 2
F-statistic	9.331(0.000)*	14.829 (0.000)**
Adjusted $\overline{R}^2$	0.759	0.846
Jarque-Bera	3.975 (0.136)	4.978 (0.082)
BG Serial Correlation LM	2.603 (0.272)	2.062 (0.363)
ARCH	2.355 (0.124)	0.088 (0.765)
Breusch-Pagan-Godfrey	27.695 (0.186)	9.137 (0.995)

Notes: *, **, *** denotes 1%, 5% and 10% significance level respectively. α_0 and β_0 are constant parameters, *t*-statistics in [ ] parenthesis, and *p*-values in ( ) parenthesis with asymptotic values $Obs * R^2 \sim \chi^2$.

To validate the presence of long-run causality in the estimated error correction models, the standard $F-$ statistic test (at a 5% significance level) is applied, and the results are reported in Table 4. On block causality, the significant $F-$statistic value (lower panel) shows that the independent variables (which include real government expenditure, real GDP and inflation rate) jointly Granger cause government revenue, in the long-run, in the $F(GR|GE)$ model. On the contrary, there is no evidence of long-run causality either individually or jointly from the independent variables to government expenditure in the $F(GE|GR)$ model.

As can be seen in Table 5, the reported $F-$statistic test results for the $F(GE|GR)$ model indicates that government revenue Granger cause government expenditure, and government expenditure Granger cause government revenue in the $F(GR|GE)$ model, with these result being statistically significant 1% and 5% significant level respectively. This evidence suggests the existence of a bi-directional causality in the short run, consistent with the fiscal synchronization hypothesis, supporting the evidence reported by Phiri 2019; Baharumshah *et al*. 2016; Ghartey 2010; and Nyamongo *et al*. 2007, for South Africa. We also find a statistically significant unidirectional short-run causality running individually from real GDP and inflation to government revenue in the $F(GR|GE)$ model. This finding confirms the important roles of economic growth and inflation rate, on raising revenue, at the provincial level, especially the Free State province. Interpretively, an economic boom that raises aggregate consumption expenditure would lead to an increase in revenue collected, while inflation rate determines the growth rate of revenue collected over a period.

Table 5. $F-$statistic test results for Granger causality in the estimated vector error correction models.

Estimated VECM	$F(GR\|GE)$	$F(GE\|GR)$	
Variables	$\Delta \ln GR$	$\Delta \ln GE$	Direction of causality
$\Delta \ln GR_{t-1}$	–	3.498 (0.071)*	$GR \rightarrow GE$
$\Delta \ln GE_{t-1}$	3.998 (0.054)**	–	$GE \rightarrow GR$
$\Delta \ln Y_{t-2}$	5.699 (0.023)**	–	$Y \rightarrow GR$
$\Delta \ln \pi_{t-4}$	4.805 (0.036)**	–	$\pi \rightarrow GR$

Notes: *, **, *** denote 1%, 5% and 10% statistically significance level respectively. *p*-values in ( ) parenthesis.

In our final analysis, the causality analysis carried out in the VEC model is complemented with the Toda and Yamamoto non-Granger (modified WALD) test, and the results are provided in Table 6. In general, the T-Y non-Granger causality corroborates the long-run causality observed in the estimated error correction models. The result of the VAR-based T-Y causality test shows that the real government expenditure, real GDP and inflation, individually Granger cause government revenue, in the long-run, with these causal links are unidirectional and statistically significant (at 5% level). This finding further reinforces the important role of economic growth and inflation rate on government revenue and expenditure growth rates, as previously noted in the causality results based on the error correction modeling approach.

Similarly, the result of the T-Y causality analysis also suggests the existence of a long-run (unidirectional causality) running from government revenue to government expenditure, for the Free State province. On the other hand, we observed a significant unidirectional causality running from real GDP to both government revenue and expenditure, which aligns with the widely accepted notion that these fiscal variables are dependent on the level of economic activity (Narayan and Narayan 2006). Overall, the results of causality analysis provide concrete support for fiscal synchronization hypothesis, underscoring the dynamics of government revenue–expenditure nexus in long-run and short-run, for the Free State province. This finding is consistent with those reported in the extant empirical literature for developed and developing countries, for example, see Al-zeaud (2015) for Jordan; Elyasi and Rahimi (2012) for Iran; and Chang *et al*. (2002) for Canada.

Table 6. Results of the T-Y non-Granger (MWALD) causality test.

	$F-$statistic value	*p*-value	Long-run causality
$GR \rightarrow GE$	10.728	0.2181	No
$GE \rightarrow GR$	14.681	0.065*	Yes
$GR \rightarrow Y$	3.986	0.858	No
$Y \rightarrow GR$	14.648	0.066*	Yes
$GE \rightarrow Y$	12.907	0.115	No
$Y \rightarrow GE$	5.942	0.354	No
$\pi \rightarrow GE$	30.500	0.000*	Yes
$GR \rightarrow \pi$	7.344	0.049	No
$\pi \rightarrow GR$	15.765	0.045**	Yes
$\pi \rightarrow Y$	17.121	0.028*	Yes
$GE \rightarrow \pi$	14.005	0.081*	Yes
$Y \rightarrow \pi$	8.834	0.356	No

Notes: *, **, *** denote 1%, 5% and 10% statistically significance levels, respectively. *p*-values in ( ) parenthesis. Optimal lag (of 9) is selected using log-likelihood ratio, LR, AIC, FPR, SC and HQ information criteria. All residuals were checked for white noise using several misspecification tests.

Conclusion

This paper set out to examine the dynamics of causal relationships underlying the government revenue-expenditure nexus for Free State province, over the period 2004 Q2–2018 Q1, including real GDP and inflation rate as control variables, in a multivariate vector error correction model. To this end, we employ the Johansen's reduced-rank cointegration to establish the existence of a long relationship between variables being studies, while

both the nature and the direction of the long-run and intertemporal (short-run) causal links were uncovered, using appropriate tests in estimated error correction models, complemented with the VAR-based Toda-Yamamoto non-Granger causality test.

Our main findings are summarized as follows: First, the cointegration analysis confirms the existence of a stable long-run relationship between the selected variables. This evidence is further reinforced by the statistically significant, and negative coefficients of the one-period lagged error correction terms, in the error correction models. We also find slow adjustment rates, ranging from 11% to 26% every quarter, to restore fiscal disequilibrium (after a shock) in the provincial economy. Second, the causality analysis shows a bi-directional causality running from government revenue to government expenditure, and vice-versa in both the long-run and short-run, supporting the fiscal synchronization hypothesis. Interpretively, government revenue and expenditure are independent of one another, and the provincial government have control over generated revenue (via tax imposition) and expenditure as fiscal tools to restore budgetary equilibrium. Third, real GDP and inflation individually Granger-causes government revenue, in the long run. In the short run, there is a unidirectional causality running from real GDP to government revenue, whereas inflation Granger causes government revenue and expenditure, without any feedback effect. These causal flows are statistically significant, stressing the importance of economic growth and inflation rate on the level of provincial 'own' revenue.

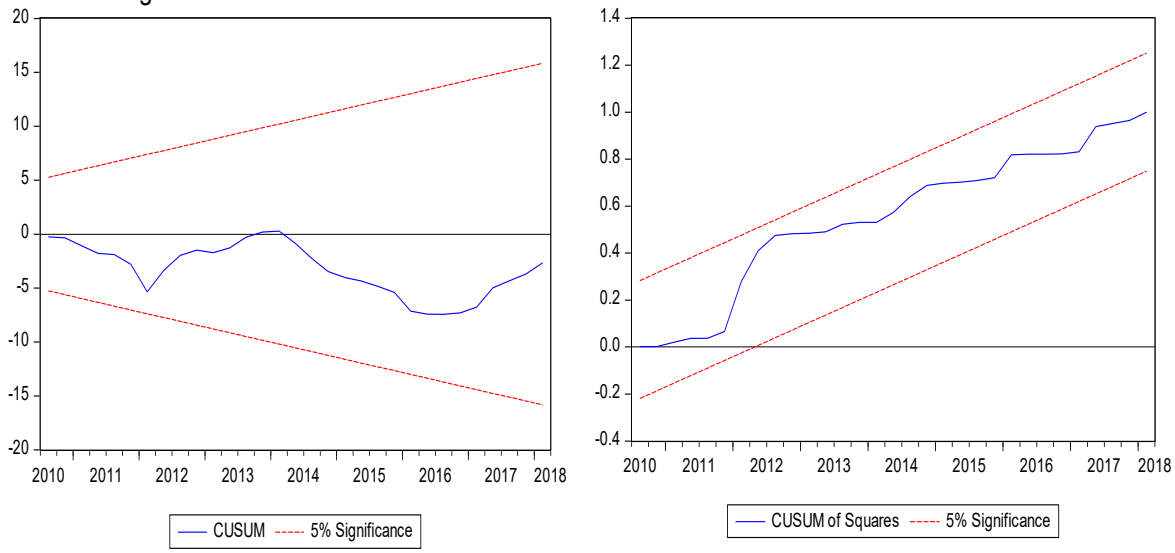
These findings have some important policy implications. Firstly, the evidence for fiscal synchronicity underlying the government revenue–expenditure nexus suggests that fiscal pressures or budget constraints linked to budget deficit could be alleviated by raising revenue via taxes (*i.e.,* surcharges and levies) and cut in government expenditure. Albeit, rapid growth in government expenditure relative to government revenue would not only limit fiscal space, cause fiscal imbalance and heightened (adverse) budgetary pressures at the provincial level, but can exacerbate fiscal debt at the national level. In the context, the Provincial Treasury should adopt stringent measures to improve the current budgetary stance of the province to facilitate fiscal prudence, sound financial management, adequate budget planning process, implementation of a credible budget and eradicate fruitless expenditure. Secondly, since empirical evidence shows that provincial government revenue and expenditure are dependent on the growth rate of economic activity level and inflation, policymakers and fiscal authorities should consider the implications of raising government revenue (via tax imposition) or expenditure, especially on economic activity level in the province. In this context, an accommodative fiscal stance that stimulates provincial economic growth has the potential to increase government revenue, whereas high government expenditure which heightens inflationary pressure would crowd out economic growth (or economic gains). Same policy prescription applies to a conservative fiscal stance to reduce government expenditure and revenue (by lowering taxes or phasing out certain surcharges and levies).

Finally, our findings stressed the need for implementation of effective policy to drive turn-around strategies in the short-term and medium-term, at the provincial level. In this regard, the Free State provincial government can consider, for example, intensifying its revenue-raising effort by prioritizing the implementation of fiscal measures to stimulate revenue collection, harness its revenue-generating autonomy by broadening revenue collection base to prevent revenue slippage, and improve the value of money spent on competing public projects, by undertaking thorough feasibility studies, as well as cost-benefit analysis model to determine the profitability of projects to be financed.

In future research, we intend to examine whether our results based on the cointegration and causality analysescarried out here are valid in a multivariate asymmetric (non-linear) model, as evidenced in recent studies investigating the same line of inquiry (see*, e.g.,* Raza *et al*. 2019; Tiwari and Mutascu 2016; Saunoris 2015).

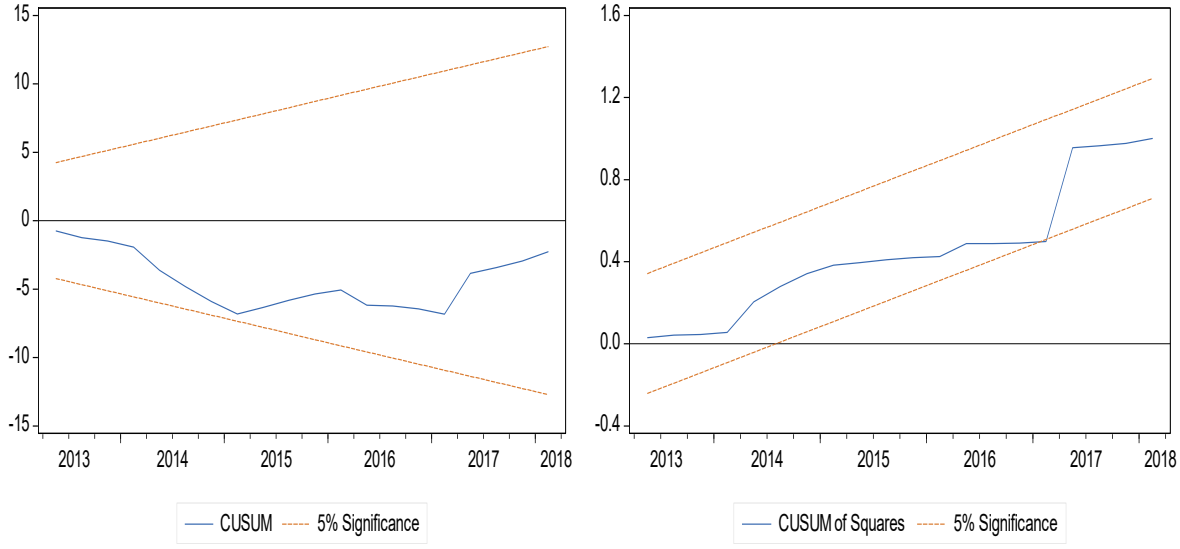
Appendix

See Figures 4 and 5 here.



Notes: The CUSUM parameter (and variance) stability test assess the robustness of the specified model. This graph shows that both parameters and variance of the model are stable under both cumulative sum (CUSUM) and CUSUM of the square tests, at a 5% significance level.

Figure 4. Graphical display of the dynamic stability test for $F(GR|GE)$ model



Notes: See Figure 4.

Figure 5. Graphical display of the dynamic stability test for $F(GE|GR)$ model

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EUROPEAN UNION - MODEL OF GLOBAL INTEGRATION -IDENTITY THROUGH CULTURAL DIVERSITY

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Abstract: *Cultural identity at both levels - national and international - remains one of the main psychological and spiritual needs. The inability to preserve their own identity automatically and naturally leads to conflicts within a society or within societies in a particular region.*

There is tolerance, but not sincere acceptance by peoples on a higher stage of technological and civilization advancement, the values of the new countries that have entered or will enter the European Union. Harmonizing the different cultural systems within the European Union gives the European integration model itself a long-term perspective. This process involves knowledge and respect for cultures and awareness of the European and global interdependence phenomenon, based on the elements and specifics of cultural pluralism, excluding the imposition of a unique learning model while recognizing the importance of respect for the values of other cultures in the spirit of the cultivation of universal values, giving a greater role to international exchanges so that people can move to the European space.

Understanding the implications of cultural diversity is one of the challenges of the contemporary world, being one of the main objectives of a new orientation in the globalization process.

Keywords: globalization; cultural diversity; integration model; European integration.

JEL Classification: F02; M14.

Introduction

The State as a topic of international law, defined by the Convention on the Rights and Duties of the States of Montevideo, must be characterized by:

(a) a permanent population;
(b) a delimited territory;
(c) government; and
(d) ability to enter into relations with other states.

The European integration model is a very appreciable model from a technical point of view, but at the moment of transposition in the daily life of Europe it causes not frequently splits and rumors, as it omits an essential aspect: the importance of cultural specificity in Europe, of the European context as such, so generous in the manifestation of the entities.

From this European perspective, the concept of sovereignty feels like a prisoner of the rigid notion of state.

Thus, considering that Europe cannot admit the existence of a culture without peoples, that it belongs to the peoples, to the detriment of the state, which at the same time does not give the dimension of sovereignty, a state-sovereignty-people conflict is created to validate the European "technical" integration paradigm. is fully manifested in the present.

The theory of culture is considered to be extremely complex, being built on the idea of cultural models that start from a certain perception, significance, mission attributed to culture. Culture can be represented in the form of intelligible structures, loaded with a reality that can be known, learned, transmitted. Culture must be seen as a product of human activity, of the human individual who critically looks at both nature and society.

The anthropological perspective approaches the concept of culture from the perspective of a human world, and in order to understand the diversity of culture and its unbroken chain of transformations, the description of culture as an organic phenomenon must be understood and accepted. The comparison of culture with a living organism is an expression of an analogy peculiar to human way of thinking.

In the conception of other researchers, culture deals only with sophisticated spiritual problems, requiring a special initiation in order to understand these aspects.

Culture, in general, aims to create an effect on the surrounding reality and perfect human paths to action. Culture describes the approach of human action, being forced to adapt, correct, reconstruct according to this approach, allowing even local and temporal divisions.

Cultural models involve the presence of particular, flexible structures that distinguish between certain cultural experiences. The cultural model and the versions of cultural models must be analyzed very carefully, precisely in order to emphasize not only the variety of cultures existing in modernity, but also the possibility of knowing the causes of cultural antagonisms, current or latent conflicts. The culture has in fact always been current, even if in camouflaged forms. An introduction to the theory of cultural models emphasizes the cultural context in which man lives, the presence of a cultural canon specific to one community and not found in another. There is a great interest shown by individuals for information on the identities that cultural theories can provide, on the means of contemporary cultural technology, on the perspective of cultural becoming in a world that is declaring change. What is considered to be an extremely important factor is the desire of individuals to find common elements in several cultures, precisely to be able to identify either with other individuals belonging to another nation, or to be aware of their true origins.

It must also be considered that the existence of culture is a complex of practices whose theoretical level has a symbolically accentuated character of representation. Culture is associated with social existence, but it must not be reduced to a strictly community-type explanation.

The following aspects must be considered as essential elements for the study of culture:

(a) The relationship between tradition and change is present in the oldest cultural forms;
(b) Culture must be understood as a living entity, a fundamental feature that makes the society in which people live, a responsible one;
(c) Trying to understand the current meanings of culture, closeness to other cultures, awareness of their own cultural values;
(d) Knowing and familiarizing individuals with the meanings of the concept of culture to the dimensions of the current period of globalization.

The discontinuity of cultural representations proposes a multicultural vision, in that there can be several sources of a temporal evolution, such as those of regionalization or globalization.The cultural symbol occupies a major place in the life of a community, being able to define and shape the complexity of a society. The cultural symbol is a sum of experiences through which the community expresses itself, ensures the continuity of the experience of living together through its various institutions. Cultural symbols can be material or spiritual, regional or generally human, depending on the means by which they are disseminated.

The variation of cultures in the new times has been gradually recognized precisely from this felt need to democratize cultural hierarchies, and to ensure access to culture by formulating a difference, even admitting divergences that are not so antagonistic as to prevents a cultural dialogue between nations.

Defining culture as a universal attribute of humanity, while at the same time having a national root, is no longer a novelty today.

National culture is in a relationship of cultural contextualization with what we would call universal or rather global culture.

The impact of the novelty that European democracy has imposed is extremely great. Democratization redefines the role of culture. Therefore, culture must contain the defining elements of democratization itself, but also the ways necessary for their transposition into practice. The transition from a normative democracy by creating the political means to achieve access to wider categories of citizens has become an achievement of recent decades.

Globalization is a frequently used concept, with major connotations and implications in the culture of a country. Globalization cannot take place outside a high-performing cultural structure that has the capacity to

adapt, allowing cultural transfer, exchange of material and spiritual values. Only such a society can evolve rapidly in order to capitalize on the cultural model in the form of a permanent change. Cultural fashion is related to the existence of a model that can be expressed in different ways.

In the complex process of globalization, the problem of preserving cultural identity presents two closely related aspects:

- the danger of cultural homogenization, the emergence or recognition of a unique form of culture;
- the appearance of the phenomenon of cultural and psychological disintegration, both for individuals and for national societies.

There is a form of behavior, often unconscious, that appears as a form of cultural aggression: ethnocentrism. This behavior, which is particularly characteristic of developed countries, is a threat to European understanding and must be corrected.

Cultural identity at both levels - national and international or global - remains one of the main psychological and spiritual needs. The impossibility of being able to preserve one's own identity automatically and naturally leads to conflicts within a society, or within the societies of a certain region.

There is tolerance, but not sincere acceptance on the part of some peoples located on a higher level of technological progress and civilization, of the values of the new countries that have entered or will enter the European Union.

Two fundamental issues need to be considered:

- a problem of polarization (the individual's tendency to emphasize diversity without perceiving the implications and importance of unity). The basic idea is to realize that the right to diversity implies the need for global solidarity. Cultural identity is what gives individuals dignity and strength, the strength of character necessary to survive. There is a common cultural heritage of mankind, whose protection and capitalization is one of the great responsibilities at the moment. This conception, which emphasizes the role of various societies in creating culture, could become the backbone of the concept of "European interdependence". Interdependence does not only imply the existence of a single European government, but also implies global understanding and cooperation, based on a set of ethical rules, which prevent the transformation of the act of limiting national sovereignty into a cultural aggression.
- a problem of redistribution. The problems involved in cultural identity cannot be solved by a simple process of redistribution. Cultural autonomy is not guaranteed, as desired, by international agreements for the redistribution of resources.

Cultural identity is a way of perceiving the importance of a set of human relationships and values.

Understanding the implications of cultural diversity is one of the challenges of the contemporary world, being one of the main objectives of a new orientation in the process of globalization.

The harmonization of different culture systems within the European Union gives the European integration model itself a long-term perspective. This process involves the knowledge and respect of cultures and the awareness of the phenomenon of global interdependence, based on the elements and specificities of cultural pluralities, excluding the imposition of a unique model of learning.

Western Europe, under the banner of "freedom, equality, fraternity", has established itself as a space of freedom and implicitly of pluralism of opinion. It was easier to approach the issue of integration from a technical point of view, especially legally, involving institutions, than from a cultural point of view, ie involving peoples, which was achieved, including within the European Union.

The European Union was born with the decisive vision of the integrative message it promotes even today, through Schuman's declaration on May 9, 1950[27]: "Europe will not be formed suddenly or as a result of a single plan, but through concrete achievements that will generate first of all a real solidarity… ". It also states that "world peace cannot be secured without making creative efforts commensurate with the periods that threaten it."

It is not the first time that history shows us that the ambitions of states are inferior to the aspirations of people with visions, belonging to peoples. On the other hand, it may require too much of a Europe harassed by wars or American hegemony, obsessed with the possibility of the rebirth of the German danger and forced to find itself, among these forces, in record time.

Thus, if we admit in the context of the time Paris 1952, or Rome 1957, the fact that the signatory "political families" were not only "descendants" but also protagonists of the great wars of the twentieth century, it is no less

[27]The statement made on May 9, 1950 by Robert Schuman, the French Minister of Foreign Affairs, remained inscribed in the history of European construction as the "Schuman Declaration".

important that they were able to predict French viewers the magnitude of the integrative message. France and Germany will be joined by Italy, Belgium, the Netherlands and Luxembourg, in a Europe of 6. On March 25, 1957, the establishment of the European Economic Community will open a new stage of the integration process that proposed, among other things, economic balance, the customs union, common policies in agriculture, raising the standard of living and increasing the climate of peace.

From Europe of the 6, through periods of progress and crisis, it will be reached in 1973 the enlargement of the European communities, Great Britain, Ireland and Denmark becoming members. Greece joined in 1981, Spain and Portugal in 1986, Finland and Sweden in 1992. The 1992 Maastricht Treaty would define the European Union.Practically from this moment we can question the integrative approach, around the European Community, which, through Maastricht, receives verticality and detaches itself as such from the political context in which it was formed.

The Maastricht Treaty represents the 0 km mark of cultural identity in the process of European integration. He recreated the European consciousness, managed to speculate on the reason for the unitary space, while leaving the right of peoples to adhere to the European identity. The Maastricht Treaty strengthens the prospects of the alternative in rethinking the European space through a common security policy proposed in Title V, or economic, through monetary union, considered as "an unprecedented event in human history."

The treaty contains several provisions that emphasize the importance of the peoples of Europe in building the European identity: Common provisions, art. A, This Treaty marks a new stage in the process of creating an ever closer union among the peoples of Europe, in which decisions are taken as closely as possible to the citizen. Article F, 1. The Union shall respect the national identities of its Member States, whose systems of government are founded on the principles of democracy. 2. The Union shal respect fundamental rights, as guaranteed by the European Convention for the Protection of Human Rights and Fundamental.

Monetary union, the abolition of borders, a policy of social and economic cohesion and the protection of the interests of member nations, will be, together with the European Union's international assertion, the objectives of the Maastricht Treaty, in the spirit of respecting national identities and human rights and fundamental freedoms. Most important, however, is the fact that the Maastricht moment regulates the subject of cultures, apparently forgotten in Rome; Article 151 calls into question culture as a responsibility of the community. For the first time, European cultural heritage and its implementation shall be considered, paragraph 1 providing: 1. The Community shall contribute to the flowering of the cultures of the Member States, while respecting their national and regional diversity and at the same time bringing the common cultural heritage to the fore.

The Amsterdam Treaty, which entered into force on 1 May 1999, seeks to shape a community feasible for the identity created by Maastricht. In fact, it is an awareness of the European identity of the citizen. If in 1992 the European Union was affirmed as being the first moment from which one could speak singularly about the European Community, through Amsterdam an attempt was made to implement this reality within the member states. The increase of the role of the Parliament, as a representative of the community peoples, the entry into force of the Schengen agreement in 1995 and its incorporation in the union treaties, the substantiation of the notion of "citizen of the European Union" also discussed in Maastricht, free movement of labor are several landmarks that highlight the evolution of European integration.

The Constitution of the European Union, following the Treaty of Nice, the Laeken Declaration, until the Intergovernmental Conferences is the culmination of the integration process, in terms of European cultural diversity as an integral part of the European integration model.

But the theme of culture, of Christianity as a cultural heritage, seems to be more a sensitive subject than a unifying policy. The Treaty establishing a Constitution for Europe is the latest European act that is fundamentally intended to guide tomorrow's Europe.

However, the legislative discourse focuses mainly on guaranteeing cultural diversity, given the regulations of the draft European constitution which lamentably revolve around the notion of "humanism"; and in this way, globalization can understand what it wants, and Europe exults under the banners of man without borders, non-cultural but at the same time ultra-democratic, ethical and rational towards a "common destiny".

Europe is more segmented than ever from the perspective of the constitutional treaty. Culture is close to its motor function. It remains suspended somewhere in an indefinite space, guaranteed only in diversity, conserved and safeguarded generically. Thus, starting with art. II -1 8, the legislator enters the taboo space of an unidentifiable culture, providing:

(1) The Union contributes to the flourishing of the cultures of the Member States, while respecting their national and regional diversity and, at the same time, highlights the common cultural heritage;

(2) Union action shall aim to encourage cooperation between Member States and, if necessary, to support and complement their action in the following areas:
(a) better knowledge and dissemination of the culture and history of the peoples of Europe;
(b) conservation and safeguarding of the cultural heritage of European importance;
(c) non-commercial cultural exchanges;
(d) artistic and literary creation, including in the audiovisual sector.

It is clear that from the point of view of the constituent legislator, the cultural identity of the European citizen did not exist. Paradoxically, we believe that in this case, we can no longer speak of a cultural diversity, which we have identified between East and West only on a Christian basis, of spiritual evolution, over time. A cultural diversity presupposes a starting point, a kind of common denominator, in the most mathematical sense of the word, from which something becomes different from something else. What needs to be shown is that Europe has a common cultural heritage. This legacy must finally be somehow defined, Christianity allows unity in diversity after the model of the Holy Trinity, and only in this way can we understand the motto of the European Union.

This presentation of how integration mechanisms work within the European Union is necessary to bring us closer to the cultural aspect of the European integration model.

In the process of European integration, the technical aspects are mainly approached. The European Union, as the doctrine acknowledges, was created "from top to bottom".

It is generally argued that “community integration has been qualified and, consequently, studied as political, economic or legal integration, but ultimately any type of integration can be reduced to legal integration. The phenomena of economic and political integration need minimal legal rules to order the development of the process ", with the only observation that the theory of bottomless forms is not new and that an approach from the cultural perspective of European integration cannot be minimized, given that we believe that the success of the process requires a pre-determined cultural compatibility, which can only be found in the European space, and which, we emphasize, does not imply uniformity.

The cultural aspect is very important because it facilitates communication. Apart from the awareness of belonging to the same space, it is very difficult to legally coordinate a community made up today of 27 nations.

The mirage of well-being will not be able to keep the enthusiasm of the new member states for long. This is known to the older communities, which apart from the fact that they are already going through a more difficult economic period, is worrying about the significance of the new wave in terms of costs. In addition, the acquis communautaire, insofar as it is non-negotiable, requires less stringent requirements than previous enlargements, and yet depletes candidates' energy resources.

European integration is not a legal issue. European integration is also a cultural issue, and if, due to the geopolitical context, this dimension could not be addressed initially, it should be noted that European architecture cannot avoid it in its integrative approach.

The Romanian national cultural model integrated in the European culture is considered to be a modern model, a reformist model. It is unanimously recognized and accepted that the reforms must come from within the civil society, precisely for the Romanian society to become aware of its modernity, trying, at the same time, to improve it.

The membership of the European Union offers the citizens the possibility to have access to a series of facilities, one of them being the education and culture of the European space.

Universities around the world, and especially those in multicultural Europe, must take into account cultural diversity, built on two pillars, namely:

(1) protecting and stimulating knowledge and appreciation for one's own culture, roots and identity;
(2) encouraging openness and real interest in other cultures, in a spirit of tolerance and mutual respect.

The concept of cultural diversity is based on flows and exchanges, namely:

- exchange of people;
- exchange of ideas;
- exchange of cultural goods and services

Both the recognition and the awareness of the differences and identities between cultures are considered to be extremely important, trying to achieve an enrichment of the intercultural dialogue. The process of European integration obviously presupposes the existence of different forms of dialogue. The enlargement of the European Union represents an opportunity to know the culture of the different countries and an attempt to understand each other, beyond the economic advantages.

Since the adoption of the Bologna Declaration in 1999, higher education in Europe has entered a new phase of reform. The aim is to build a coherent, compatible and attractive European Higher Education Area. The

reforms will be successful only in those universities that give importance to their role in society and that have the capacity to react quickly and flexibly.

The preservation and promotion of cultural diversity also applies to the external dimension of Community action. The European Union promotes this model in its international relations, considering it a contribution to the world order based on sustainable development, peaceful coexistence and intercultural dialogue.

Cultural diversity involves exchanges, including through trade in cultural goods and services. It also implies that such a trade be balanced, so as to allow the preservation and promotion of various cultural manifestations globally.

Since then, the issue of developing an international legal instrument on cultural diversity has become a central topic of international debate.

This debate is essential for the European Community and for the European Union as a whole. The aim is to establish a new basis for global governance in terms of cultural diversity.

Cultural diversity, seen as a challenge to the progress of the contemporary world, must take into account a number of criteria and ways of promotion and development, such as:

Access to education, science and culture - policies and strategies;

- Human, cultural, social capital;
- Organizational culture, changing institutional culture;
- Poly-centric development and new urban-rural relations;
- Socio-cultural diversity and identity in the context of development;
- Emigration and immigration in Romania;
- Cultural industries - production and consumption;
- Material heritage, intangible heritage and cultural tourism;
- Property, household and social structure in rural areas;
- Reducing regional disparities;
- Social, economic and cultural changes in the context of globalization;
- Family systems, demographic processes and cultural practices;
- Society, technology and cultural change;
- Cultural stratification, social stratification and equal opportunities;
- Study of the determinants of political and social participation.

Culture must be seen as an essential component of European integration, especially from the perspective of the enlargement of the European Union in the new conditions of increasing globalization trends.

Conclusion

Romania, as a component part of the European space, represents a certainty regarding the role it can play in the context of a United Europe. In the same sense, however, Romania has much to offer and much to receive.

The European trend is that of change, of modernism, of the absorption of extinctions, of the collaboration of all races, ethnicities, religious denominations, of mutual trust as well as of the power to take over all the needs of the European population and turn them into reality.

Romania has the capacity to face this new historical challenge, starting with dynamism and confidence, offered by its citizens, who are much more confident in the European Union and in the chance offered by it, compared to many other citizens with old states in the European space.

The European Union constantly provides specialized training to the Romanian population (represented by individuals and / or legal entities) through a wide variety of trainings, workshops, seminars and conferences in many fields, for its new European citizens, just to be displayed in detail the European reality, the tendencies, the expectations, the ways of contacting and contracting the European funds, of the partners, of the investment projects, of the rehabilitation and resuscitation of the different sectors of activity from Romania.

Romania has benefited and will continue to benefit from many advantages as a result of joining the EU, important to mention being the financial resources that will be allocated. In addition to all these benefits mentioned, but which represent only a part of the U.E. panel, Romania will have to fulfill even more obligations, but all these have the gift of aligning our country with the U.E. norms. and to normalize the political-economic-social framework, far too often troubled by internal conflicts. Also, all these duties of Romania are normal, individualized to each state, which were fulfilled by other already EU member states, of course referring to the de facto conditions in those historical moments.

Taking into account the sense of movement of the Union, it is noteworthy that in a constantly changing Europe a certain dose of naturalness is needed among all the factors of the European Union in general, but of

Romania in particular. This dose of naturalness is given by the changes that have occurred and that will appear gradually and to which Romanians will have to adapt.

In this sense, the social and cultural aspect of different nations and citizens will interfere with the national, regional and local specifics, as a result of the existing mobility in the EU. So, for example, Romanians must look equally at Hungarians, Turks, Germans, Szeklers, etc. but also religious denominations must coexist in peace and quiet: Orthodox with Catholics, with neo-Protestants, with Islamists, but also by any other sects that are, will appear or will be formed.

The integrative cultural aspect of Romania 's unification in the European Union is much more related to that of the social aspect, the culture and the citizen being closely related. The population of Romania has a certain openness, flexibility, which comes from its past as a state, in understanding and managing the regime of all cultures that will interact inRomania.

Romania has shown that it has potential, that it has capable, dynamic citizens, but also that it has the desire to be part of a big family - the European family.

Romania can surprise, not only to face the economic rigors of a United Europe, but it can even become a reference country of the EU, not only from an economic point of view but also culturally.

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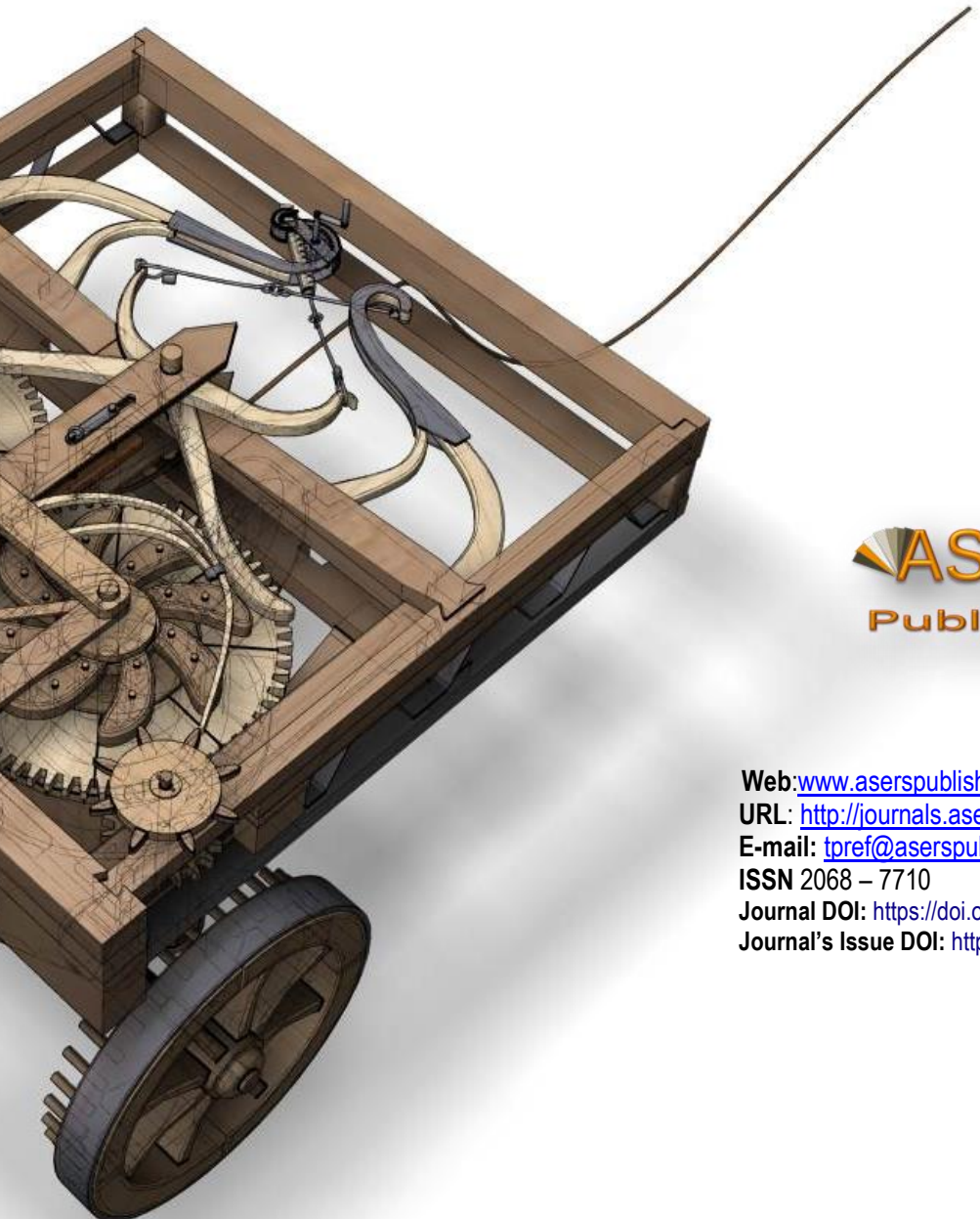

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