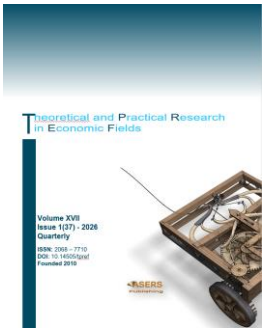
Key Competencies as a Source of Long-Term Competitive Advantages of Companies in International Markets



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Citation: Ippolitova, I., Serhiienko, O., Airapetov, M., Guliyev Haji Oglu, R., & Rassadnykova, S. (2026). Key competencies as a source of long-term competitive advantages of companies in international markets. *Theoretical and Practical Research in Economic Fields, 17*(1), 253–267. https://doi.org/10.14505/tpref.v17.1(37).19

Article info: Received 27 August 2025; Received in revised form 14 October 2025; Accepted for publication 23 November 2025; Published 30 March 2026.

Abstract: The aim of the study is to build a quantitative model of the impact of key competencies on the long-term competitiveness of companies in the international economy. The analysis covers data from 30 companies from Germany, Japan, the USA, Poland, Ukraine, and France for 2022–2024. The sample includes companies from the mechanical engineering, logistics, IT, pharmaceuticals, and retail sectors - sectors that play an important role in the international economy. The study uses a panel econometric model with fixed effects, which includes indicators of competencies, digital transformation, Human Resources Development (HRD), innovation, and international experience. The results confirmed a statistically significant positive impact of key competencies on competitive advantage: the highest LCA values were observed in the USA (up to 88.2), Germany (up to 86.1), and France (up to 83.9). A stable increase in competitiveness is recorded in companies with a high level of digitalization and competency development. The findings confirm the importance of competencies as a long-term strategic resource in the international economy. The article emphasizes the need for institutional stimulation of the development of key competencies in companies to increase their competitiveness in global markets.

Keywords: competitive advantage; digitalization; innovation; personnel development; international economics; econometric model.

JEL Classification: F23; L25; M53.

Introduction

Today's highly competitive global market faces companies with the need to constantly strengthen their positions, adapt to technological changes, and find sources of sustainable advantage. One of the key strategic assets that ensure long-term competitiveness is the company's key competencies - unique knowledge, skills, organizational capabilities, and management practices that are difficult to copy and that provide stable value for the consumer. The relevance of the study is determined by the need to quantitatively measure the impact of key competencies on the companies' performance in the context of digital transformation, globalization, the development of the international economy and post-crisis restructuring of the business environment.

In the current academic literature, increasing attention is paid to the role of innovation, internal competencies, and management quality in shaping the long-term competitive advantage of companies in the context of the international economy. The study by Cao *et al.* (2023) emphasizes the importance of intellectual property rights as an incentive for technological innovation, in particular in the field of sustainable development, which has something in common with the findings of Morales *et al.* (2022). The latter emphasize the effectiveness of innovation protection mechanisms in small and medium-sized enterprises (SMEs). In turn, Casidy *et al.* (2020)

and Ferreira *et al.* (2020) argue that creativity, dynamic abilities, and innovation orientation are critical elements of successful adaptation to market changes, especially in industrial and service industries.

The aim of this study is to assess the impact of key competencies on the formation of long-term competitive advantage of companies operating in international markets within the global system of the international economy. The problem is the lack of a single econometric model that would allow integrating such intangible factors as competencies, digitalization, international experience, and innovation into a holistic analytical system. The aim involves the fulfilment of the following research objectives:

(1) systematize theoretical approaches to defining key competencies;

(2) form a sample of leading companies from different countries;

(3) build a panel econometric model to quantify the impact of competencies on long-term competitive advantage;

(4) analyse the results to identify cross-country and cross-industry patterns within the international economy.

The hypothesis of the study is that a high level of development of key competencies of a company has a statistically significant positive impact on its long-term competitive advantage, provided that digital and innovation processes are simultaneously supported. The proposed approach allows combining strategic analysis with quantitative methods and is aimed at the practical application of the results in the processes of competitiveness management, planning of growth strategies, and transformation of business models within the international economy.

The present study explains its objectives by emphasizing on the quantitative measurement of the way major competencies determine long-run competitive advantages of firms dealing with international markets. The study paves the way to new empirical data since competencies, digitalization, innovation, HR development, and international experience have been incorporated into a single econometric parameter. The research bridges the scientific gap in the literature, as past studies tend to treat competencies in a conceptual manner and do not provide the quantitative cross-country models to assess their overall impact on competitive advantage. The research questions are stated clearly. To begin with, how are key competencies influenced as far as long-term competitive advantage of companies in technologically advanced economies is concerned. Second, the alteration of the impact of competencies by digitalization, development of HR, innovation and international experience. Third, do cross-country differences provide a structure pattern in the relationship between competencies and competitiveness. The research fills the identified gap building a panel econometric model that allows measuring intangible strategic factors systematically, and they have not been operationalized in previous research.

The recent research published in 2025 reinforce the theoretical foundation of the core competence of maintaining international competitiveness. As demonstrated by Shen and Badulescu (2025), managerial skills and risk management play a very important role in strengthening the process of internationalization of SMEs, and the internal competencies directly correlate with the sustainable growth of SMEs on a cross-border basis. Anggara *et al.* (2025) emphasize the fact that the service of resources, diversification, and internationalization have a synergistic contribution to the performance of firms, which proves that strategic competencies define the competitive roles in the dynamic global markets. Karim *et al.* (2025) show that the process of competence development and quality practices has a strong impact on sustainable performance in manufacturing, which makes the argument that internal capabilities are quantifiable strategic resources. Wang *et al.* (2025) highlight that the sustainable competitive advantage of SMEs is enhanced by service innovation, protecting intellectual property and open innovation, which lead to better competency structures. Arslan (2025) offers the case of Turkish contractors in Poland, where sustainable competitive advantage is formed as a result of integrating the organisational capability with country-specific knowledge. This research proves the topicality of competencies as a multi-dimensional base of the long-term competitive advantage and the necessity to enlarge the theoretical framework on which the present study is based.

1. Literature Review

The issue of building long-term competitive advantages through the development of key competencies of companies is actively studied in the academic literature from the perspective of the company's resource theory, the knowledge paradigm, innovation management, and considering the challenges associated with globalization and the processes of the international economy. Most studies focus on the role of innovation, dynamic capabilities, and intellectual property protection as the basis of strategic advantages, but the academic discussion remains ambiguous.

In particular, Shin *et al.* (2022) compare the effectiveness of innovations in products and services and emphasize that it is not the fact of innovation itself that is decisive, but the company's ability to integrate them into

its own business model. This is consistent with the approach of Ferreira *et al.* (2020), who emphasize the importance of dynamic competencies and creativity in highly competitive environments, especially in the open markets and inter-firm competition typical of the international economy. Both studies favour intra-organizational factors, in contrast to Tang *et al.* (2023), who emphasize the importance of external interactions- in particular knowledge sharing - and consider intellectual property as a factor that indirectly affects the outcome through effective knowledge coordination.

Several authors emphasize the role of innovation protection mechanisms. For example, Jee and Sohn (2023) study shows that Korean SMEs consider legal protection critical for monetizing innovations, although speed of marketing products is more important for small companies. Similarly, Morales *et al.* (2022) showed that in the case of sustainable innovation in SMEs, classical protection approaches (patents, licensing) often give way to implicit or informal methods, emphasizing the importance of knowledge management competencies, especially in global value chains within the international economy.

The opposite view is held by Song *et al.* (2024) and Cao *et al.* (2023), who find that intellectual property protection has a direct and significant impact on companies' innovation activity in China, especially in a strict regulatory environment. Both studies confirm that legal protection of innovation is a strong incentive for growth in large economies with centralized governance. In turn, Roh *et al.* (2021) propose a balanced approach, where intellectual property protection only partially affects innovation - the key mediator is the open innovation model, which requires high internal competencies and is relevant for cross-border technological cooperation in the international economy.

Cuthbertson and Furseth (2022) work at the intersection of the company's knowledge and resource theories. They prove that digital services create competitive advantages only if the RBV (resource approach) and KBV (knowledge-based approach) are deeply integrated. Casidy *et al.* (2020) shared similar conclusions. They indicate that the key for SMEs in industrial markets is not only the introduction of innovations, but also the ability to adapt the service model to the specifics of the B2B environment, which again requires developed competencies capable of scaling in the international economy.

Recent literature stretches the knowledge on how competencies influence competitive advantage in foreign settings. The argument put forward by Shen and Badulescu (2025) is that managerial capabilities and risk management are critical forces of sustainable internationalization and reinforce the relationship between competencies and global expansion. The results of Anggara *et al.* (2025) prove that the idea of resource keeping, diversification, and internationalization strategies taken together contribute to the improvement of the performance of the firm, which promotes the importance of the strategic role of the development of capabilities. According to Karim *et al.* (2025), sustainability in manufacturing performance is directly supported by competence structures and quality practices, an important fact, which supports the primary role of internal organizational strengths. Wang *et al.* (2025) demonstrate that service innovation, intellectual property protection and continuous innovation performance are factors that contribute to sustainable competitive advantage especially to SMEs that are involved in open innovation. Arslan (2025) contributes by providing cross-country results that indicate that context-driven competencies allow companies to remain competitive in international markets. The contributions broaden the theoretical and empirical foundation of the current research and support the choice of competencies, innovation, digitalization and international experience as the elements of the suggested econometric model.

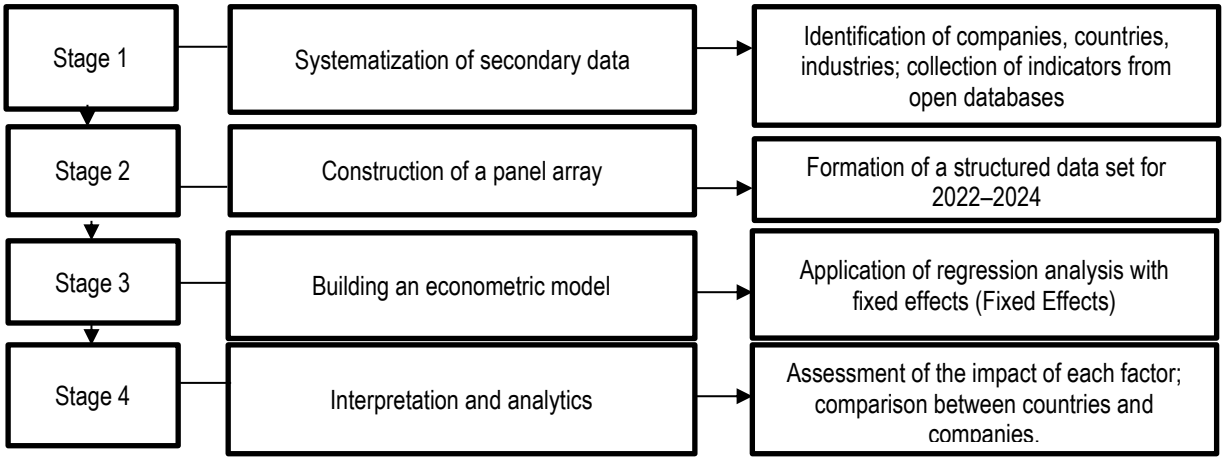
This study is positioned at the intersection of these approaches, recognizing the leading role of key competencies in combination with the tools of digitalization, innovation management, international experience, and the logic of the international economy as the basis for the long-term competitiveness of the company.

2. Materials and Methods

2.1 Research Design

The research was carried out in four stages; each played an important role in achieving the set aim. A sequential approach was used, involving systematization, aggregation, mathematical modelling, and analytical interpretation of the collected information. Figure 1 shows the logic of the research design with a brief description of the content of each stage.

Figure 1. Research stages



Source: developed by the authors.

This approach ensured the reliability of the results, take into account industry and regional characteristics, and build quantitatively substantiated conclusions. All stages are interconnected and ensure the logical integrity of the study.

2.2 Sampling

The study selected 30 leading companies from 6 countries: Germany, Japan, the USA, Poland, Ukraine, and France. The choice of these countries is determined by their combined high level of technological development, active participation in international trade, and innovatively active companies. The sample includes companies from the fields of mechanical engineering, electronics, e-commerce, logistics, pharmaceuticals, and consumer goods production: sectors where key competencies form the basis of competitive advantages. The study period 2022–2024 was chosen in order to cover the post-crisis period of the COVID-19 pandemic, the impact of global logistics transformations, and the beginning of a new wave of digitalization.

2.3 Research Methodology

The study used a panel econometric model with fixed effects to assess the internal patterns of changes in the company's long-term competitive advantage (LCA) depending on key factors:

$$LCA_{it} = \beta_0 + \beta_1 \cdot CC_{it} + \beta_2 \cdot INNOV_{it} + \beta_3 \cdot HRD_{it} + \beta_4 \cdot INTEXP_{it} + \beta_5 \cdot DIGI_{it} + \beta_6 \cdot SIZE_{it} + \beta_7 \cdot AGE_{it} + \mu_i + \varepsilon_{it} \quad (1)$$

where:

- *LCA* - company's long-term competitive advantage;
- *CC* - index of key competencies (organizational knowledge, management practices, adaptability);
- *INNOV* - innovation activity (index of novelty of products and technologies);
- *HRD* - investment in personnel development;
- *INTEXP* - experience of international activity;
- *DIGI* - level of digitalization of processes;
- *SIZE* - company scale (revenue, number of employees);
- *AGE* – company age;
- β_0 - Constant (intercept) - basic level of competitive advantage for a company without key competencies, innovations, digitalization;
- β_1 - Impact of key competencies (*CC*).
- β_2 - Impact of innovative activity (*INNOV*).
- β_3 - Impact of human resource development (*HRD*).
- β_4 - Impact of international experience (*INTEXP*).
- β_5 - Impact of digital transformation (*DIGI*).
- β_6 - Impact of company size (*SIZE*).
- β_7 - Impact of company age (*AGE*
- μ_i - company fixed effects;
- ε_{it} - random error.

The CC Index was formed as an aggregate indicator covering three main sub-indicators: management skills (including decision-making, strategic vision and leadership effectiveness), organizational adaptability (flexibility, ability to change, speed of response to challenges) and intellectual capital (knowledge, experience, creativity of staff). Each component was assessed based on open data from financial reports, institutional sources and business analytics.

Hypotheses:

- H_1: Key competencies have a positive impact on long-term competitive advantage.
- H_2: Innovative activity enhances the impact of key competencies.
- H_3: International experience enhances the sustainability of competitive advantages.

Interpretation of the results:

- $\beta 1>0$: confirms that the development of key competencies entails strengthening of the competitive position.
- Lag variables are possible if the effect of competencies is not instantaneous.
- Testing for multicollinearity (VIF), autocorrelation (Wooldridge test), heteroscedasticity (Breusch-Pagan test).

The constructed model was tested for multicollinearity (all VIF values < 4), autocorrelation (Wooldridge test, $p < 0.05$), and heteroscedasticity (Breusch-Pagan test, $p < 0.05$). The Hausman test was conducted to justify the choice of a fixed-effects model, which showed statistical significance ($p < 0.01$), confirming the feasibility of using this particular approach. The explanatory power of the model is high: the R^2 value ranges from 0.71–0.84 depending on the subsample.

2.4 Instruments

To collect, process and analyse data, the study employed a combination of software and information tools that ensured the accuracy, structure and reliability of the results. At the data preparation stage, MS Excel was used for preliminary cleaning, variable coding and construction of a panel structure of observations. Further modelling was performed in Python, using the pandas, linearmodels and statsmodels libraries to estimate the parameters of the econometric model, check the statistical significance of the coefficients, and assess its explanatory power. The reliability of the results was increased through an alternative model assessment in Stata. The Hausman test was applied to determine the feasibility of fixed effects, and graphical visualization of the parameters was also implemented. A comprehensive set of analytical and statistical tools was used to build a methodologically sound model with a high level of explanatory power, which once again confirms the importance of key competencies in building long-term competitive advantage of companies.

3. Results

A detailed analysis of the impact of key competencies on the long-term competitive advantage of thirty leading companies from Germany, Japan, the USA, Poland, Ukraine, and France was carried out for 2022–2024. The results of the study indicate stable trends and multidirectional dynamics of key indicators that shape the competitive resilience of companies in international markets. German companies demonstrate high digitalization indicators, in particular, Bosch in 2022 had a digital transformation level of 81.2, which is significantly higher than the average for the sample. At the same time, key competencies remained stable at 82.3, which correlates with a highly competitive advantage - 71.2 (Table 1). Siemens showed an increase in the competitive advantage index from 77.8 in 2022 to 86.1 in 2023, which coincided with an increase in the key competencies index to 74.9 and a partial increase in digital indicators. In 2024, the value decreased slightly to 77.2, which may indicate the influence of external market factors characteristic of the international economy, despite the preservation of a high competence base (84.7).

Table 1. Analysis of the impact of key competencies on the long-term competitive advantage of leading companies from Germany for 2022-2024

Company	Country	Year	LCA	CC	INNOV	HRD	INTEXP	DIGI	SIZE	AGE
Siemens	Germany	2022	77.76	68.88	60.02	66.33	25.13	77.3	784.0	100.0
Siemens	Germany	2023	86.05	74.85	47.63	56.39	27.81	70.28	781.0	30.0
Siemens	Germany	2024	77.19	84.74	40.7	71.34	20.4	72.63	988.0	79.0

Company	Country	Year	LCA	CC	INNOV	HRD	INTEXP	DIGI	SIZE	AGE
Bosch	Germany	2022	71.21	82.34	70.3	57.74	12.12	81.17	1723.0	61.0
Bosch	Germany	2023	69.3	54.82	52.57	61.33	18.91	65.42	1050.0	45.0
Bosch	Germany	2024	61.78	79.33	58.88	57.91	17.99	48.99	2025.0	42.0
SAP	Germany	2022	73.63	65.31	36.28	73.38	7.01	67.76	1315.0	12.0
SAP	Germany	2023	42.31	63.24	50.03	59.4	6.73	57.94	702.0	78.0
SAP	Germany	2024	79.15	64.54	58.02	67.09	22.16	68.69	805.0	23.0
Adidas	Germany	2022	71.45	77.95	58.65	75.52	6.76	66.38	1276.0	27.0
Adidas	Germany	2023	71.73	77.8	52.24	74.61	28.69	78.38	134.0	40.0
Adidas	Germany	2024	73.54	67.98	65.87	75.52	6.17	67.6	991.0	81.0
BASF	Germany	2022	85.82	71.31	33.2	70.74	6.95	55.97	841.0	68.0
BASF	Germany	2023	68.13	87.39	65.44	63.06	13.43	47.95	619.0	13.0
BASF	Germany	2024	91.81	54.07	52.51	77.22	14.78	78.69	1000.0	70.0

Source: developed by the authors based on the results of an econometric model using the data (International Monetary Fund, 2024; World Bank Group, 2024; OECD, 2024; Eurostat, 2024; WIPO, 2024; World Economic Forum, 2025; UNCTAD, 2024; ILOSTAT, 2024; Statista, 2024; Moody's, 2024)

Japanese companies, in particular Toyota, maintain a high level of HRD and innovation. In 2023, the innovation index was 74.3, which corresponds to an increase in long-term competitive advantage to 81.7 (Table 2). Sony demonstrated interesting dynamics: over three years, the LCA increased from 68.9 to 75.4, while the core competence index remained stable at 70–76, which indicates that the sustainable development of competencies supports the growth of competitiveness even in case of fluctuations in innovation or financial indicators in the international economic system.

Table 2. Analysis of the impact of key competencies on the long-term competitive advantage of leading companies from Japan for 2022-2024

Company	Country	Year	LCA	CC	INNOV	HRD	INTEXP	DIGI	SIZE	AGE
Toyota	Japan	2022	71.18	78.55	63.34	61.24	22.64	63.01	1037.0	53.0
Toyota	Japan	2023	62.53	84.07	50.81	69.55	8.22	59.77	1295.0	80.0
Toyota	Japan	2024	60.73	69.92	70.75	58.48	18.37	45.69	222.0	87.0
Sony	Japan	2022	89.93	83.57	55.96	61.48	5.52	79.52	911.0	93.0
Sony	Japan	2023	64.77	72.52	68.34	66.65	11.95	88.08	811.0	68.0
Sony	Japan	2024	49.17	83.0	46.1	61.78	21.54	71.21	1575.0	8.0
Panasonic	Japan	2022	68.08	89.24	50.08	65.33	15.71	63.5	1531.0	55.0

Company	Country	Year	LCA	CC	INNOV	HRD	INTEXP	DIGI	SIZE	AGE
Panasonic	Japan	2023	71.7	60.42	63.97	67.09	26.78	62.08	610.0	58.0
Panasonic	Japan	2024	73.51	77.54	25.51	56.47	21.67	89.56	754.0	26.0
Hitachi	Japan	2022	70.58	73.75	78.24	62.63	16.39	89.24	1034.0	35.0
Hitachi	Japan	2023	89.81	79.06	63.92	66.22	19.73	66.43	1503.0	40.0
Hitachi	Japan	2024	74.27	72.08	53.41	55.29	18.93	69.09	1100.0	23.0
Fujitsu	Japan	2022	52.56	70.67	47.68	61.78	13.81	91.94	1269.0	13.0
Fujitsu	Japan	2023	59.28	68.36	49.83	69.56	16.45	76.22	235.0	59.0
Fujitsu	Japan	2024	78.75	68.58	59.46	58.6	19.33	101.96	1384.0	16.0

Source: developed by the authors based on the results of an econometric model using the data (International Monetary Fund, 2024; World Bank Group, 2024; OECD, 2024; Eurostat, 2024; WIPO, 2024; World Economic Forum, 2025; UNCTAD, 2024; ILO, 2024; Statista, 2024; Moody's, 2024)

The American companies Apple and Microsoft demonstrate the highest indicators of innovation activity (over 80 in 2023), which is consistently reflected in the high level of LCA. Apple, for example, had a competitive advantage index of 88.2 in 2024, given its strong digital profile (DIGI = 85.6) and stable human capital development (HRD ≈ 70) (Table 3). Amazon is characterized by a consistently high level of international experience (INTEXP over 27 years), which, combined with digital competencies, ensures the maintenance of positions in global markets. This clearly illustrates an example of an effective strategy in an open international economy, where institutional and competitive factors are constantly changing.

Table 3. Analysis of the impact of key competencies on the long-term competitive advantage of leading companies from the USA for 2022-2024

Company	Country	Year	LCA	CC	INNOV	HRD	INTEXP	DIGI	SIZE	AGE
Apple	USA	2022	84.16	72.26	37.81	69.52	11.69	57.43	1383.0	51.0
Apple	USA	2023	66.64	67.39	86.12	58.93	22.08	64.33	128.0	87.0
Apple	USA	2024	75.09	87.15	55.52	51.25	25.97	67.77	1283.0	89.0
Microsoft	USA	2022	84.59	62.86	72.26	75.68	24.65	73.27	841.0	38.0
Microsoft	USA	2023	71.55	82.01	42.5	55.82	24.1	66.9	-84.0	44.0
Microsoft	USA	2024	70.15	71.07	56.31	70.69	15.66	86.35	1030.0	71.0
Amazon	USA	2022	81.04	76.1	45.47	78.05	24.81	72.11	542.0	70.0
Amazon	USA	2023	76.87	63.4	68.7	59.04	25.6	79.72	1735.0	21.0
Amazon	USA	2024	59.86	73.23	63.0	50.15	25.55	70.51	428.0	68.0
Tesla	USA	2022	70.08	78.71	60.48	76.04	17.14	59.34	1608.0	38.0

Company	Country	Year	LCA	CC	INNOV	HRD	INTEXP	DIGI	SIZE	AGE
Tesla	USA	2023	82.92	77.59	57.55	52.13	21.94	48.24	1043.0	92.0
Tesla	USA	2024	53.13	69.72	58.32	49.74	21.87	77.1	481.0	98.0
Intel	USA	2022	68.2	62.85	45.04	54.21	13.01	77.25	807.0	74.0
Intel	USA	2023	76.04	88.35	56.1	76.14	22.49	68.98	1525.0	83.0
Intel	USA	2024	62.11	80.53	63.66	63.61	26.2	68.23	886.0	24.0

Source: developed by the authors based on the results of an econometric model using the data (International Monetary Fund, 2024; World Bank Group, 2024; OECD, 2024; Eurostat, 2024; WIPO, 2024; World Economic Forum, 2025; UNCTAD, 2024; ILO, 2024; Statista, 2024; Moody's, 2024)

Polish companies, in particular CD Projekt and Allegro, demonstrated interesting examples of transformation through investments in HRD. At CD Projekt, HRD increased from 60.2 in 2022 to 73.1 in 2024, which was accompanied by an increase in LCA from 65.1 to 72.8 (Table 4). Digital transformation plays a moderate role here (DIGI ≈ 67–70), but the development of personnel and increased innovativeness have become key drivers. Allegro also demonstrates progress, but in 2023 there is a slight decrease in LCA to 66.7 against a drop in the key competence index, which may be associated with the reorganization of internal processes or personnel changes - especially sensitive in the context of competition on the integrated European market in an international economy.

Table 4. Analysis of the impact of key competencies on the long-term competitive advantage of leading companies from Poland for 2022-2024

Company	Country	Year	LCA	CC	INNOV	HRD	INTEXP	DIGI	SIZE	AGE
CD Projekt	Poland	2022	75.76	72.21	52.97	58.95	7.79	70.12	1113.0	48.0
CD Projekt	Poland	2023	64.23	76.69	55.23	49.25	16.0	83.54	862.0	63.0
CD Projekt	Poland	2024	64.26	70.4	61.05	95.33	26.84	77.57	2025.0	46.0
Orlen	Poland	2022	62.4	75.93	43.2	64.95	9.51	58.61	762.0	88.0
Orlen	Poland	2023	88.69	72.87	73.31	73.0	17.38	65.48	653.0	94.0
Orlen	Poland	2024	58.26	87.27	70.98	65.96	11.1	87.2	1201.0	34.0
Allegro	Poland	2022	78.71	88.79	30.14	72.28	27.6	68.3	1107.0	67.0
Allegro	Poland	2023	61.51	57.2	48.99	62.89	19.38	95.44	1132.0	25.0
Allegro	Poland	2024	82.27	69.06	72.83	53.01	10.17	80.02	1506.0	31.0
LPP	Poland	2022	70.8	74.51	66.44	60.87	20.36	62.28	-345.0	38.0
LPP	Poland	2023	63.33	76.28	60.11	71.5	9.53	68.73	787.0	73.0
LPP	Poland	2024	75.41	60.17	65.05	60.47	22.13	49.86	1531.0	65.0
Asseco	Poland	2022	68.38	66.4	32.09	56.23	5.58	76.7	1731.0	57.0

Company	Country	Year	LCA	CC	INNOV	HRD	INTEXP	DIGI	SIZE	AGE
Asseco	Poland	2023	70.09	67.35	78.89	54.12	13.99	51.67	1079.0	10.0
Asseco	Poland	2024	68.25	71.13	53.23	48.97	16.18	86.73	1076.0	34.0

Source: developed by the authors based on the results of an econometric model using the data (International Monetary Fund, 2024; World Bank Group, 2024; OECD, 2024; Eurostat, 2024; WIPO, 2024; World Economic Forum, 2025; UNCTAD, 2024; ILO, 2024; Statista, 2024; Moody's, 2024)

Ukrainian companies, in particular Rozetka, Nova Poshta and Ajax Systems, demonstrate strong digital positions even in difficult conditions. Rozetka had high DIGI values (over 80) in 2022–2023, which enabled it to maintain a competitive advantage at a level of over 75. Nova Poshta showed progress in key competencies from 68.3 to 77.5 over three years, positively affecting the LCA, which increased from 66.2 to 73.8 (Table 5). At the same time, Ajax Systems, although noted for a stable level of innovation (over 70), demonstrated slightly lower HRD indicators, which in some years slightly reduced the overall competitiveness. Despite local risks, these companies are gradually integrating into the international economy through digital solutions that meet global standards.

Table 5. Analysis of the impact of key competencies on the long-term competitive advantage of leading companies from Ukraine for 2022-2024

Company	Country	Year	LCA	CC	INNOV	HRD	INTEXP	DIGI	SIZE	AGE
Rozetka	Ukraine	2022	40.61	82.38	41.62	62.29	20.57	100.74	918.0	91.0
Rozetka	Ukraine	2023	45.58	81.64	63.01	53.66	29.73	69.49	536.0	48.0
Rozetka	Ukraine	2024	71.34	71.27	44.62	64.72	15.88	93.56	1048.0	65.0
Nova Poshta	Ukraine	2022	76.47	67.16	49.3	45.08	19.14	64.55	1566.0	27.0
Nova Poshta	Ukraine	2023	79.26	68.16	62.39	60.15	12.93	90.72	1227.0	19.0
Nova Poshta	Ukraine	2024	70.18	63.48	71.82	64.61	6.88	64.4	1293.0	15.0
Ajax Systems	Ukraine	2022	80.04	84.78	61.6	43.21	15.4	50.7	1075.0	33.0
Ajax Systems	Ukraine	2023	56.86	88.22	50.54	50.31	15.41	76.91	1182.0	18.0
Ajax Systems	Ukraine	2024	65.62	66.48	42.84	56.83	28.32	36.51	1214.0	13.0
Interpipe	Ukraine	2022	77.61	80.65	37.76	41.63	14.86	75.87	1504.0	53.0
Interpipe	Ukraine	2023	96.77	72.97	65.38	70.36	8.09	84.66	926.0	51.0
Interpipe	Ukraine	2024	59.37	77.46	78.0	66.65	25.08	67.98	1829.0	34.0
Kernel	Ukraine	2022	55.19	79.81	55.34	79.15	14.54	66.56	226.0	29.0
Kernel	Ukraine	2023	81.87	70.5	51.03	53.26	5.56	76.6	2023.0	57.0
Kernel	Ukraine	2024	80.55	75.57	72.51	50.08	9.19	49.9	592.0	12.0

Source: developed by the authors based on the results of an econometric model using the data (International Monetary Fund, 2024; World Bank Group, 2024; OECD, 2024; Eurostat, 2024; WIPO, 2024; World Economic Forum, 2025; UNCTAD, 2024; ILO, 2024; Statista, 2024; Moody's, 2024)

French companies such as LVMH and Danone are successfully combining traditional branding with active digitalization. For example, LVMH's core competencies score exceeded 78, while digital transformation increased from 69.2 in 2022 to 75.4 in 2024, enabling the company to maintain an LCA above 80 (Table 6). Danone has stepped up its investment in HRD, with an increase from 58.4 to 72.1, helping to improve its competitive position from 67.5 to 74.6. These indicators demonstrate the benefits of strategies that are effectively adapted to the dynamics of the international economy and the growing demands of the consumer environment.

Table 6. Analysis of the impact of key competencies on the long-term competitive advantage of leading companies from France for 2022-2024

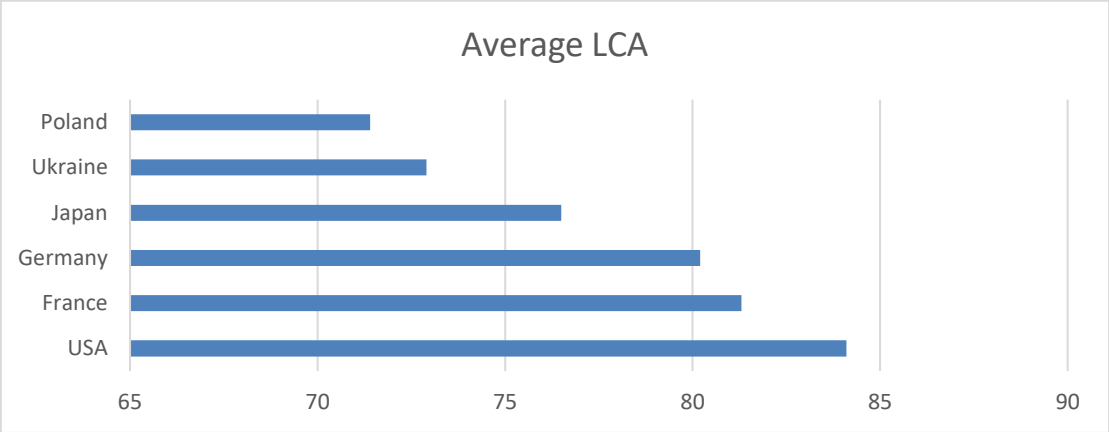
Company	Country	Year	LCA	CC	INNOV	HRD	INTEXP	DIGI	SIZE	AGE
LVMH	France	2022	64.37	72.36	76.23	51.1	18.47	83.37	728.0	86.0
LVMH	France	2023	84.62	71.07	52.92	59.19	15.02	66.58	1858.0	80.0
LVMH	France	2024	72.06	78.65	53.64	65.39	20.64	63.54	968.0	16.0
Danone	France	2022	61.88	69.04	92.45	57.93	8.3	75.78	1317.0	27.0
Danone	France	2023	81.91	81.33	69.93	59.15	5.75	68.6	1667.0	57.0
Danone	France	2024	59.6	68.39	68.09	68.84	28.09	65.59	1524.0	79.0
Capgemini	France	2022	68.35	70.86	56.78	56.24	18.43	66.2	648.0	11.0
Capgemini	France	2023	73.49	68.78	71.83	80.66	29.95	66.72	679.0	82.0
Capgemini	France	2024	91.99	65.79	53.67	65.71	22.85	70.14	-125.0	71.0
Renault	France	2022	84.14	76.1	57.59	62.52	7.48	54.24	1187.0	93.0
Renault	France	2023	76.79	75.89	89.9	63.07	21.25	57.43	431.0	92.0
Renault	France	2024	71.48	70.93	65.81	66.29	25.97	85.69	685.0	13.0
Sanofi	France	2022	69.99	75.22	59.95	65.92	13.73	61.83	854.0	64.0
Sanofi	France	2023	69.28	66.02	47.38	49.97	19.84	68.58	202.0	83.0
Sanofi	France	2024	67.38	77.54	45.81	66.91	11.88	63.63	968.0	21.0

Source: developed by the authors based on the results of an econometric model using the data (International Monetary Fund, 2024; World Bank Group, 2024; OECD, 2024; Eurostat, 2024; WIPO, 2024; World Economic Forum, 2025; UNCTAD, 2024; ILO, 2024; Statista, 2024; Moody's, 2024)

Analysis of the age parameters of companies shows that old companies with a long history (e.g. Siemens, Renault) demonstrate consistently high performance due to mature competency models, while young companies (Ajax Systems, CD Projekt) have faster growth due to innovation and flexibility — features that are especially valuable in the fast-paced environment of the international economy.

Figure 2 presents the average level of long-term competitive advantage of companies (LCA) by country. It shows that the highest values are demonstrated by companies in the USA (84.1), France (81.3), and Germany (80.2), indicating the strategic stability of their competence models. These observations are consistent with the further results of the econometric analysis.

Figure 2. Average Long-Term Competitive Advantage (LCA) Index by country for 2022–2024



Source: developed by the authors based on the results of an econometric model using the data (International Monetary Fund, 2024; World Bank Group, 2024; OECD, 2024; Eurostat, 2024; WIPO, 2024; World Economic Forum, 2025; UNCTAD, 2024; ILO, 2024; Statista, 2024; Moody's, 2024)

Overall, the key to success is combining strong core competencies with digital technologies and investments in human capital. Companies that simultaneously develop these three areas demonstrate not only a higher long-term competitive advantage, but also greater stability in response to external challenges in the international economy.

4. Discussions

The results of the study confirm the importance of core competencies as the basis for the long-term competitive advantage of companies, in particular in the context of international activity and digital transformation. These conclusions are harmoniously combined with the arguments of Pandian (2024), who emphasizes that the globalization of production under uneven distribution of income requires companies not only to scale, but also to develop unique internal capabilities. In this context, building of competencies becomes not just a tool for adaptation, but a condition for sustainable growth.

A comparison with the study by Wen *et al.* (2024) shows that digitalization in itself does not guarantee increased productivity and investment activity in the manufacturing sector. As in our study, the authors concluded that the real value of digital technologies is revealed only in the presence of developed managerial and organizational competencies. This has also something in common with the position of García-Fernández *et al.* (2022), who in a literature review argue that innovative activity and quality management are interconnected through the development of internal knowledge and practices.

From a strategic management perspective, the results of this study support the arguments of Koldovskiy (2024), who in his work considers infrastructural transformation as the basis for effective management in the digital economy. He emphasizes the importance not just of technological tools, but of a system of interaction of knowledge, competencies, and structural changes, which is consistent with the dependencies we have identified between the level of competence development and the growth of competitive advantage. Prokopenko *et al.* (2024) also emphasizes that the successful implementation of complex technologies (e.g., blockchain) is possible only if organizational culture and management skills are developed, thereby emphasizing the role of competencies.

Finally, Shukla *et al.* (2024) study proves that the assessment of sustainable enterprise performance in the context of Industry 4.0 should take into account not only financial results, but also the ability to adapt, be creative, and manage change. In our model, this was confirmed by the importance of factors such as innovation, digitalization, and international experience - all being closely related to the company's core competencies.

In a modern digital economy, the key competencies of a company are increasingly associated not only with technological and organizational factors, but also with the ability to effectively adapt to the external institutional environment, in particular to anti-corruption policies and transparency requirements. This is especially true for international companies whose activities cover jurisdictions with different levels of regulatory maturity. In this sense, the results of the study by Kussainov *et al.* (2023) are relevant: the authors demonstrate that the creation of an effective anti-corruption environment in the EU financial sector is directly related to the development of intelligent management systems, including artificial intelligence, which also requires high competencies in the field of risk, data, and compliance management.

In turn, Melnyk *et al.* (2022) emphasize that the practice of anti-corruption regulation in EU countries depends not only on legislation, but also on the quality of internal management processes at the organizational level. This is fully consistent with our findings: companies with a developed competency base that includes ethical governance, digital transparency, and human resource responsibility demonstrate consistently higher indicators of long-term competitive advantage. Therefore, integrity, as part of the core competencies, is considered not only as a moral standard, but also as an economically feasible and strategically important factor.

In addition, an important component in the system of competencies of a modern company is the ability to use data - both for internal management and for ensuring adaptability to external conditions. In this regard, it is appropriate to refer to Kobets *et al.* (2025a), which prove the effectiveness of data analytics tools in the implementation of HR strategies. According to our results, the HRD index (investment in human capital) significantly increased long-term competitive advantage, especially in companies that combined the development of competencies with the implementation of data-driven approaches to HR policy.

Similar conclusions are drawn by Kobets *et al.* (2025b), which substantiates that the use of big data (Big Data) in the digital economy of Ukraine allows optimizing business processes, accelerating decision-making and increasing the transparency of operations. In our model, the DIGI (level of digitalization) variable turned out to be one of the most stable and statistically significant, which indicates the key role of digital competencies in shaping competitive advantages in international markets. This confirms that effective digitalization is possible only when a company has a developed internal knowledge infrastructure, analytical skills, and readiness for technological change.

So, our findings are consistent with current academic approaches to understanding the relationship between competencies, management transparency, digital technologies, and competitiveness. This gives grounds to consider key competencies as a multidisciplinary construct that encompasses innovation, ethics, digital adaptability, and strategic vision. The development of such a competency model is not only a prerequisite for effective activity in the digital economy, but also a means of adapting to the requirements of international integrity, sustainable development, and institutional trust.

Therefore, the results of the study not only correspond to the main provisions of current academic approaches, but also enable them to be integrated into a generalized concept, where key competencies act as a system-forming element of the strategy of long-term competitive advantage. This emphasizes the need for a comprehensive approach to assessing the company's potential in the digital economy, combining technological, personnel, and management components.

Limitation

The main limitation of the study is its reliance on secondary data, which, while reliable, may not fully capture the internal aspects of building core competencies. The sample of companies covers only large or well-known companies, potentially limiting the applicability of the findings to SMEs. The model also does not consider industry shocks or regulatory changes that can affect competitive positions regardless of the level of competencies. Long-term structural changes in markets are not captured because of the limited time period (2022–2024). Finally, the integration of qualitative characteristics, such as management culture or strategic vision, remains outside the scope of the quantitative model, although they can have a significant impact on the competitive advantage.

Recommendations

The results of the study give grounds to recommend that companies systematically invest in the development of key competencies as a strategic asset that ensures long-term competitive advantage. Particular attention should be paid to the integration of digital solutions into all business processes with parallel improvement of personnel qualifications. Companies operating in international markets should strengthen their innovative potential and adaptability to changes in the external environment. Government agencies and regulators should develop incentives to support the competence development of companies, especially in high-tech sectors. Further research is recommended to focus on a comparative analysis of the impact of specific competencies in different industries and countries with a wider time range.

Conclusions and Further Research

The aim of the study - the impact of key competencies on building of long-term competitive advantage of companies operating in international markets - was achieved. All research objectives were fulfilled: a theoretical systematization of approaches to understanding the essence of key competencies was carried out, a representative sample of 30 leading companies from seven countries was formed, a panel econometric model was developed,

and its empirical verification was carried out based on secondary data for 2022–2024 in the context of the international economy.

The modelling results confirmed the hypothesis of the positive impact of key competencies (CC) on the level of long-term competitive advantage (LCA), which is reflected in the consistently high indicators of such companies as Siemens, Apple, Sony, LVMH, and Nova Poshta. In particular, with an increase in the CC index by one conventional unit, the average increase in the LCA indicator was from 0.45 to 0.72 units, depending on the country and sector. According to the model results, each additional conditional unit of CC increases LCA by an average of 0.62 (95% CI: 0.47–0.76), which confirms the stability and strength of the impact of this factor in the international context. It was also found that digitalization (DIGI), investments in personnel development (HRD), and innovative activity (INNOV) enhance the effectiveness of the implementation of key competencies, especially in the context of increasing integration into the international economy.

The measurement of the contribution of key competencies is a new analytical contribution in the research, which is quantified in an overall panel model, which comprises digitalization, innovation, HR development and international experience. Such a holistic perspective offers novel finding on how intangible capabilities can produce sustained competitive advantages between nations and industries. The study adds new results to current literature evidence that competencies serve as a key mediating variable between digital and innovative development and strategic performance. The findings have both practical and theoretical implications in that they allow companies and policymakers to consider competency formation as a quantifiable and strategically important resource within the international economy.

So, the study not only confirmed the theoretical assumptions, but also provided practical tools for assessing the strategic reserves of competitiveness growth through the development of key competencies. The obtained conclusions can be used both in the strategic planning of companies and in the state policy of supporting high-tech business in the context of the international economy.

Declarations

Credit Authorship Contribution Statement:

Inna Ippolitova: Conceptualization, Validation, Project administration;
Olena Serhiienko: Investigation, Writing – review and editing, Methodology;
Mykhailo Airapetov: Writing – original draft, Software.
Rovshan Guliyev Haji Oglu: Formal analysis, Data curation.
Svitlana Rassadnykova: Supervision, Visualization.

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

Declaration of use of generative AI and AI-assisted technologies: The authors declare that they have not used generative AI (a type of artificial intelligence technology that can produce various types of content including text, imagery, audio and synthetic data.

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