



Article Micro, Small or Medium, New or Old—Are There Differences? Testing Business-Specific Difficulties

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Abstract: The use of various mathematical and statistical methods for modelling economic processes and phenomena requires compliance with certain conditions/rules. To formulate general conclusions or predictions, in economic research, large databases are often used, related to more or less homogeneous samples, without taking into account the spatial or structural differences of the analysed processes or phenomena. Starting from the results of previous research focused on the identification and evaluation of difficulties in the business environment, the present study is based on the principles of mathematical induction, with the objective of testing these results, in order to assess whether the conclusions formulated are valid for a limited number of cases. Based on the primary data collected and tested (using Cronbach alpha, Meyer-Olkin Measure of Sampling Adequacy and Bartlett tests) it was shown that the difficulties selected for evaluation are present in the analysed business environment. Then, factor analysis was applied to identify the most important groups of factors, which bring together one or more difficulties specific to the analysed population. After the validation of the factorial model and after a preliminary test of the normality of the variables, the Mann-Whitney U test was applied to assess whether, at the level of independent groups (constructed on the basis of three dichotomous variables), the difficulties identified are common or show significant differences. Contrary to the results of previous studies, the present study indicates that the difficulties analysed affect more new businesses (recently established), which have fewer employees and are classified as micro-enterprises.

Keywords: factor analysis; statistical tests; primary data; difficulties; perceptions of entrepreneurs

MSC: 62P20; 91B82

1. Introduction

Over time, numerous studies have signalled the structural changes at the level of economic systems under the impact of industrial revolutions. Numerically, large businesses (with foundations in the era of automation of production processes and expansion of scale production) are outranked by smaller businesses, considered to be more agile and ready to adapt to the new era of digital technologies that shape the relationship between human resources and machine (production equipment). Since the early days of Industry 4.0, small and medium-sized enterprises have been recognised as engines of economies. Currently, this vision is expanded.

Recent studies have shown that start-ups and small and medium-sized enterprises (SME) are entities invested with the responsibility of ensuring economic development, productivity growth and business prosperity. Although viewed as a whole, Wang and



Citation: Tudose, M.B.; Ionesi, S.D.; Dulgheriu, I.; Buhu, L.; Rusu, V.D. Micro, Small or Medium, New or Old—Are There Differences? Testing Business-Specific Difficulties. *Mathematics* 2024, *12*, 3912. https://doi.org/10.3390/ math12243912

Academic Editors: Pavol Durana and Katarina Valaskova

Received: 21 October 2024 Revised: 2 December 2024 Accepted: 9 December 2024 Published: 11 December 2024



Copyright: © 2024 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https:// creativecommons.org/licenses/by/ 4.0/). Guedes (2024) [1] pointed out that these entities differ in terms of their nature and the environment in which they operate, which "influences their choices and success". Civelek et al. (2016) [2] shown that the success of small and medium-sized businesses depends greatly on the qualitative and quantitative aspects of the business environment in which they operate. The authors considered the macroeconomic and microeconomic viewpoints, without excluding regional and local development perspectives.

In 2022, 24.3 million small and medium-sized enterprises (SMEs) were registered in the European Union, representing 99.8% of all enterprises in the non-financial business sector [3], contributing to:

(a) job creation; small and medium enterprises provide jobs for 64.4% of the working population; the biggest contribution in this direction is made by micro-enterprises, which provide jobs for 29.4% of the employed population; although they represent only 6.3% of all enterprises, small and medium enterprises provide 34.9% of jobs;

(b) creating added value; although they have modest economic power, through their important share (93.5%), micro-enterprises generate 18.5% of added value; small and medium enterprises participate with 33.1% in creating added value.

The same study [3] also reveals that the performance of large companies in the European Union was superior to SMEs' performance. In contrast, the analysis at the level of SME structure indicated that micro-enterprises performed better than small and medium-sized enterprises. Compared to the structure of the European economy, the Romanian economy model is characterised by more significant weights for medium and small enterprises. As for micro-enterprises, their share in the Romanian economy (90.8%) is lower than the share registered in the EU-27 (93.7%). Although the Romanian economic, technological, social and political context presents specific peculiarities (being less favourable to business compared to other states in the European Union), the annual growth rate of the number of SMEs is slightly higher than the rate recorded at the level of the European Union. The positive aspect associated with new business establishment rates (in Romania and the EU) is burdened by survival rates [4].

Due to the important role they play in the national and global economy, micro and small enterprises have been analysed from different points of view. For example, Gherhes et al. (2016), noting that micro and small enterprises are poorly researched, conducted a literature review focused on growth challenges and showed that these entities are exposed to specific constraints [5]. Sadiku-Dushi et al. (2019) analysed the impact of entrepreneurial marketing dimensions on the overall performance of SMEs. Analyses conducted on a mixed sample (68% micro enterprises and 32% small and medium-sized enterprises) revealed that not all entrepreneurial marketing dimensions are positively related to performance, which led the authors to assume a new research direction (resuming the analyses separately for the two categories of entities) [6]. Váchal and Talír (2020) analysed the business architecture of SMEs and showed that micro and small enterprises present specific management systems, which particularizes their response to changes and challenges in the business environment [7]. Liñán et al. (2020) analysed the exposures of SMEs in the era of globalization and showed that smaller firms tend to face more challenges. They proposed a four-dimensional matrix to group the difficulties faced by SMEs [8].

As a rule, previous studies were based on assessments made on large samples (more or less homogeneous) without considering the spatial or structural differences of the analysed phenomena. This study complements the predecessor's research and is distinguished by the research topic and methodology addressed. The main objective was to identify and test the entrepreneur's perception regarding the most important difficulties in the business environment. A geographical area confined at the level of Romania was taken into account, which presents particularities from an economic and social point of view. To understand the context, it should be noted that Romania is divided into eight development regions, depending on the size of the gross domestic product per capita. In the framework of this research, a geographical area that is in third place in the ranking of the poorest regions in the European Union was taken into account. The purpose of the research was to evaluate the particularities of the business environment, which could serve as the basis for the most appropriate regional and local public policies.

The research methodology was based on the principles of mathematical induction, which required two stages. The first stage was verification. Capitalizing on the results of previous research, a database was established on the difficulties identified in the business environment. Only the difficulties that proved to be statistically significant (both at the local and European level) were selected. The second stage was demonstration, in which the following objectives were assumed: conducting primary research to confirm the presence of the selected difficulties at the level of the analysed sample; testing the results of the primary research; factorial analysis of the observed difficulties; validation of a set of difficulties faced by entrepreneurs in the targeted geographical area; structural analysis of the difficulties included in the factorial model.

The novelty element of the present study is represented by the fact that it reconfigures the importance of these difficulties, corresponding to the perceptions of entrepreneurs who manage micro-enterprises or small enterprises. Once the factorial organisation model of the analysed variables was validated, was considered the assessment of the differences regarding the perceptions of the selected difficulties. Different from the results of previous studies, the current research shows that the most significant from a statistical point of view were financial difficulties, difficulties generated by dysfunctions at the level of formal institutions and difficulties induced by macroeconomic imbalances. Using three dichotomous variables, it was shown that the analysed difficulties affect more newly established businesses, which have fewer employees and are classified as micro-enterprises. It was emphasised that the perceptions of the respondents' difficulties vary according to the particularities of the businesses they manage. The study provides useful evidence both for public authorities (which base and implement public policies for local economic development) and for current and/or potential entrepreneurs.

Given the methodology for selecting the difficulties (which involved exploring the European economic environment) and the particularities of the analysed region (less developed), the results of this research can be extrapolated to the other 18 less developed regions within the European Union. Due to the dynamism of the business environment, the representativeness of the present results remains relevant only at the level of the analysed period. Changes in the economic environment (induced by economic growth/decline, cyclicality, crises, macroeconomic imbalances, etc.) generate new contexts for business development, which can change the perception of the business environment.

The paper is organised into six sections. In the Section 1, the general context of the analysis was presented. The Section 2 presents the results of the literature review focused on analysing the difficulties identified in different business environments. The Section 3 presents the research methodology. In the Sections 4 and 5, the results are presented and discussions are initiated according to the results obtained. The Section 6 summarizes the conclusions and future research directions.

2. Literature Review

2.1. Overview of Business Difficulties

In the following, the results of the bibliographic and documentary research undertaken to identify the most important difficulties specific to different business environments are presented. In this study, the difficulties are represented by contexts and factors that negatively influence the operation and development of businesses, with a direct impact on their performance.

Stam and van de Ven (2021) [9] showed that high-growth businesses depend on the strength of the entrepreneurial environment. To obtain these results, the authors identified ten specific elements of the entrepreneurial ecosystem and their specific measures: (a) formal institutions (whose activity is correlated with the rule of law, effectiveness, voice and responsibility of the government, corruption); (b) entrepreneurial culture (reflected by the number of registered companies per 1000 inhabitants); (c) infrastructure networks (land and air); (d) demand power (assessed by purchasing power per capita, regional product, total population); (e) leadership (measured as prevalence of innovation project leaders); (f) networks (reflected by the infrastructure and the number of enterprises that collaborate for innovation); (g) talent (assessed through the prism of the number of people with higher education in the adult population); (h) financial strength (given by the amount of risk capital); (i) knowledge (assessed through the weight of investments in research and development); (j) intermediate services (assessed by the share of business service companies). The authors showed that the elements of the entrepreneurial ecosystem are mutually interdependent and co-evolve in a territory. For example, they are interdependent in time and space; (a) talent, entrepreneurial culture and support services; (b) knowledge and leadership; (c) physical infrastructure and demand.

Recent studies [10], which aimed to analyse the challenges faced by businesses in the European Union, identified a series of disparities in the development of the macroeconomic environment. To identify these disparities, the macroeconomic factors that influence the business climate were analysed: the gross domestic product (its size and dynamics); unemployment rate; inflation rate; foreign direct investments; tax rate; the opening of the economy (the intensity of foreign trade); business freedom; infrastructure; the level of innovation; corruption. The analysis in the context of the sustainability and competitiveness of EU businesses confirmed that there are certain competitiveness gaps, and the business environment is not always favourable for SMEs. The authors showed that the economic and commercial environment is influenced by several primary factors, such as: the competitiveness of the economy, economic freedom, innovation, corruption, environmental performance and the number of active businesses. The authors summarize that improving performance and competitiveness depends on the extent to which governments manage to support the domestic business environment, including by stimulating foreign direct investment.

Other studies [11], consider SMEs responsible for promoting the economic well-being of the regions and achieving climate neutrality (in the context of the cohesion policy and the objective of sustainable development promoted at Union level), investigated the measure in which loans granted to SMEs (both by private and public entities) can contribute to inclusive growth and ensure environmental sustainability in the EU-27 Member States. The study starts from the premise that when SMEs face external obstacles related to financing, excessive regulation, poor business development scores or other obstacles, they (SMEs) lose competitive ability, being exposed to risks associated with globalization and technological changes.

Broyer et al. (2021) [12] concerned with financing faster EU SME growth, reiterated the issue of business size and access to SME finance. They argue that SMEs face financing difficulties due to their size, age and modest profitability. However, the authors conclude that in the last decade (the pre-pandemic period), access to finance for European SMEs has improved (on the back of looser monetary policy and bank capital regulations). Moreover, the authors showed that, in the financing structure of SMEs, the share of debt has decreased. However, equity financing did not increase significantly. As a consequence of these dynamics, only a slower increase in income was recorded. The fine message of the authors is that financing should not be approached only from the perspective of size, but also of the associated costs, respectively of the available sources/alternatives. The financing alternatives are diverse. Both direct financing (through commercial banks, the European Investment Bank, the European Central Bank, and the European Commission) and indirect financing (such as loan guarantees—by national governments or the European Commission) are considered.

Admitting that the activities of SMEs in the EU are a significant and positive predictor of environmental pollution in the EU, Okolo et al. (2023) [11] pointed out that difficulties regarding access to finance for SMEs are due to the small size of businesses, lack of transparency (SMEs not being obliged to make periodic public reports), as well as lower profitability. From the lender's perspective, these are all risks. At the same time, the authors also pointed out the following: (a) in countries with inclusive growth, credit financing (contracted both from private sector financing institutions and from government entities) has a positive impact on the growth of SMEs, but also on environmental sustainability; (b) in the case of countries with non-inclusive growth, financing on account of loans contracted from private sector financing institutions has the same double positive effect; on the other hand, financing through contracted credits from government entities intensifies the negative impact of SME growth on environmental sustainability. For these reasons, it is recommended that banks/financiers develop green credit policies. These policies must no longer be limited to the insufficient track record to prove the creditworthiness and lack of financial evidence of SMEs, but must also capitalise on the quality of management, managerial skills, financial forecasts, industry particularities, product uniqueness, as well as the impact of SME activities on the environment.

Okolo et al. (2023) [11], Akande et al. (2023) [13] and Fura et al. (2023) [14] carried out analyses at the EU level and showed that countries in South-East Europe, especially in Romania and Bulgaria have not yet achieved smart and sustainable growth. Because in Bulgaria and Romania, the poverty rate is higher than the EU average, European decision-making institutions have prioritized supporting these countries, ensuring financial support based on the European Social Fund (ESF+), the European Regional Development Fund (ERDF), the Cohesion (FC) and the Just Transition Fund (JTF).

Other authors [15] have reported that, for EU SMEs, the tax burden is high and discouraging. Carrying out an analysis at the level of the 27 member countries (grouped into 4 areas: countries that adopted the euro currency, countries that did not adopt the euro currency, Western European countries and Eastern European countries), the authors highlighted that the taxes paid by SMEs significantly influence their performance. Specifically, the number of taxes paid was shown to negatively influence SME performance in all country groups. Then, it was shown that the profit tax paid by SMEs harms their performance (especially in Western European countries). Time to prepare and pay taxes negatively influenced the performance of non-euro area SMEs.

In the context of the elaboration of this study, in parallel with the literature review, documentary research was also carried out regarding SMEs in the EU. According to the report of the European executive [3], the main challenges faced by SMEs in the EU in the period 2021–2022 are:

- the increase in salary costs—which represented both a cause and a consequence of the increase in inflation and, implicitly, in prices;
- shortage of raw materials and components, generated by interruptions in supply chains;
- the decrease in demand in the post-pandemic context, but also as a result of the increase in prices;
- inflation—which increased rapidly, especially due to the increase in energy costs (which affected all industrial ecosystems);
- the increase in interest rates and the depreciation of the European currency;
- the increase in the number of days for the collection of payments (64 days for small, medium and large companies in the EU in 2021) by 1.5 days as a result of inflation and by 1.6 days due to the decrease in the growth rate of the gross domestic product (GDP) (in 2022); the delay in collecting payments had the effect of disrupting the cash flow of enterprises; these disruptions were amplified by the difficulties in accessing financing against the backdrop of rising credit interest rates.

The analysis from the perspective of the most important problems and challenges faced by SMEs (evaluation based on a scale from 1 to 10) reveals that the availability of human resources and production costs, respectively, and the costs related to human resources influence the activity of economic operators the most. With a not inconsiderable impact are the challenges related to sales, competition, regulation and access to finance.

The cumulative effect of all the difficulties that hindered the activity of the companies was embodied in:

- reducing the volume of investments for business development; businesses focused more on investments to counterbalance energy price increases (by creating capacities for alternative/renewable resources to become more energy efficient), but also on investments to limit the increase in wage costs (context in which companies have turned to the automation of production processes, substituting the labour production factor with automated machines);
- the decrease in business profitability as a result of the propagation of the effects of the price-wage inflationary spiral; against the background of inflation, at the level of enterprises that cannot transfer cost increases to the consumer (through price), profitability decreases; the ability to transfer cost increases to consumers depends on the size of the enterprise, but also the elasticity of demand for the products/services offered to the market; due to their size, SMEs have a lower capacity to transfer cost increases;
- the increase in the number of bankruptcies (at the end of 2022 and the beginning of 2023); the reduction of profitability (at the microeconomic level), the financial difficulties encountered and the increase in interest rates (at the macroeconomic level) contributed to the increase in the number of bankruptcies.

In this economic context, member states adopted policies aimed to control inflation and ensure security and continuity in the supply of energy and raw materials. To reduce the number of bankruptcies, it was considered to facilitate access to financing for SMEs and monitor insolvency risks. At the level of the member states, temporary programs dedicated to vulnerable businesses have been adopted, focused on streamlining payments (both at the business level and in the relationship with public entities). Specifically, the possibilities of rescheduling or deferring loans for companies with short-term liquidity problems were considered. Table 1 summarises the difficulties identified at both the European and national levels.

Table 1. Difficulties faced by SMEs.

Bibliographic Sources	Difficulties Identified
Stam and van de Ven (2021) [9]	 (a) the rule of law, effectiveness, voice and responsibility of the government, corruption; (b) entrepreneurial culture; (c) infrastructure networks (land and air); (d) the strength of the request; (e) leadership; (f) the infrastructure and the number of enterprises that collaborate for innovation; (g) talent; (h) financial strength (risk capital value); (i) the share of investments in research and development; (j) the share of business service companies.
Valaskova and Marek (2023) [10]	(a) the size and dynamics of the gross domestic product; (b) the unemployment rate; (c) the inflation rate; (d) foreign direct investments; (e) taxation rate; (f) intensity of foreign trade;(g) freedom of business; (h) infrastructure; (i) the level of innovation; (j) corruption.
Okolo et al. (2023) [11]	 (a) access to financing; (b) excessive regulation; (c) the level of business development; (d) globalization and technological changes; Difficulties specific to SMEs: (a) business size; (b) lack of transparency (specific to SMEs); (c) the financing structure (and the nature of economic growth—inclusive/non-inclusive).
Nicolescu (2022a) [16]	 (a) decrease in domestic demand; (b) competition of imported products; (c) decrease in export demand; (d) the high costs of loans; (e) inflation; (f) unfair competition; (g) non-payment of invoices by state institutions; (h) delays in collecting the counter value of invoices from private companies; (i) obtaining the consultancy and training necessary for the company; (j) staff training and maintenance; (k) supply of raw materials/products; (l) the uncertainties of future developments; (m) the relative instability of the national currency; (n) knowing/adopting the community acquis; (o) increasing the level of salary expenses; (p) poor infrastructure quality (roads, networks, utilities); (q) difficult access to credits; (r) corruption; (s) bureaucracy; (t) excessive taxation; (u) excessive controls.
Akande et al. (2023) [13]; Fura et al. (2023) [14]	(a) poverty rate; (b) dependence on non-refundable financial support.

Bibliographic Sources	Difficulties Identified
Broyer et al. (2022) [12]; Roman et al. (2023) [15]	(a) the size of the companies; (b) access to financing; (c) taxation; (d) the growth rate of the gross domestic product; (e) inflation; (f) unemployment rate.
Wang and Guedes, 2024 [1] Haiyang and Zhuang (2022) [17]	 (a) limited access to credits; (b) higher costs for the funds attracted; (c) smaller investments; (d) difficulties in achieving economies of scale; (e) difficulties in securing qualified personnel; (f) insufficiency of material resources; All of these are specific to small businesses.
Di Bella et al. (2023) [3]	 (a) inflation; (b) increase in production costs and salary costs; (c) decrease in demand; (d) difficulties related to access to financing; (e) increasing the cost of external financing; (f) increasing the number of days for the collection of payments; (g) competition; (h) the availability of human resources; (i) difficulties in identifying customers; (j) regulations; (k) shortage of raw materials and components, generated by interruptions in supply chains.
Fedulova et al., 2018 [18]	(a) low demand; (b) the high level of competition; (c) difficult access to loans; (d) high tax rates; (e) inflation; (f) rigid fiscal administration; (g) unstable political situation; (h) rigid legal framework; (i) corruption; (j) frequent changes in economic legislation; (k) governmental ineffectiveness.
The national competitiveness strategy (2021–2027) [19]	(a) low technological level; (b) limited access to financing for newly created and developing companies; (c) the lacunar regulatory environment.
National Institute of Statistics (2021) [20]	(a) lack of funds, an important factor both in carrying out the activity and in the survival and development of an enterprise; (b) limited access to well-trained workers; (c) late payment of invoices issued to customers; (d) limited access to credits; (e) lack of technology; (f) clients with low funds; (g) competition; (h) market price (too low).

Table 1. Cont.

Source: Own processing.

Based on the bibliographic and documentary research carried out beforehand, a list of the main difficulties faced by SMEs was created. Thus, 20 difficulties were selected for which evidence was identified regarding the impact on the activity of SMEs in the analysed geographical area. The difficulties selected were grouped into five classes: financial difficulties; difficulties associated with supply and distribution markets; difficulties generated by labour market imperfections; difficulties induced by macroeconomic imbalances; and difficulties generated by dysfunctions at the level of formal institutions.

2.2. Financial Difficulties

Economies (and by implication businesses) evolve in a dynamic environment, being forced to respond to all challenges, such as those induced by technological advances, climate change and geopolitical turbulence. The power of entrepreneurs to ensure the competitiveness of their businesses depends on the ability to identify financing alternatives appropriate to the object of activity and the life cycle of the business. Business financing depends on several variables such as: the financial skills of the entrepreneurs (financial decision makers), the age and size of the business, the opacity of financing alternatives, the cost of financing, the life cycle of the business, etc. Liang et al. (2018) [21] classify these difficulties according to their origin. The authors identify difficulties generated by internal factors, such as cash holdings, the size of the business, and the stage of the life cycle in which the business is located. In the list of difficulties generated by external factors, the authors include: the lack of financing policies aimed at explicitly supporting small businesses, the lack of adequate financing mechanisms through the capital market and the lack of mechanisms of guarantee specific to the credit system.

As a rule, small businesses face greater difficulties in obtaining financial resources, especially credits. At the same time, they record higher financing costs, especially for debt financing [1]. Access to financing is often hampered by the constraints imposed by financiers: volume, cost and period of financing, required guarantees, method of repayment,

etc. Cheng et al. (2013) [22] concatenated these variables into the list of idiosyncratic constraints that a firm faces when seeking financial resources for strategic projects.

Regarding access to finance, Zhang et al. (2023) [23] postulated that adequate financing is a prerequisite and a crucial condition for business development. Rusu, Roman and Tudose (2022) [24] showed that entrepreneurial intentions are directly influenced by easy access to financial resources.

Focusing on the analysis of organisations in Southeast Europe, Schebesch et al. (2016) [25] showed that entrepreneurship development and financial skills of enterprises are prerequisites for regional development. Other studies have shown that financial education has a positive impact on business performance [26] stimulating innovation [27]. Recent studies have indicated that low financial literacy is a cause of poor/inappropriate financial decisions, increasing business failure rates [28].

Even though financing theories have shared a common end goal (identifying an optimal level of debt to ensure the highest level of performance), studies have provided mixed results. Some studies have provided evidence in favour of a direct and positive link between debt and business performance/value [29,30]. Other studies have provided evidence supporting the inverse (negative) link [31–33].

2.3. Difficulties Associated with Supply and Outlet Markets

Smaller enterprises/businesses are at a competitive disadvantage due to the following considerations: they have difficulties in accessing new markets (either for supply or for sale); they face greater difficulties in attracting the resources (material, financial, human) necessary for their activities; they cannot achieve economies of scale due to their small production capacities. Thus, Zhou et al. 2023 [34] reported that start-ups in the early stages of their life cycle are more unstable in terms of performance because they do not have a well-defined business model. This business model includes the relationship with all stakeholders (including suppliers and customers). Sometimes, certain external barriers intervene in business relations, and the honouring/payment of contractual obligations requires these barriers to be overcome. The most relevant example is infrastructure, which can affect commercial relationships in a given business environment.

Compared to large enterprises with several years of activity, already established in the economy and the market, small enterprises (many of them being recently established) are more vulnerable to changes [35] and face several obstacles, such as: barriers (commercial, technical, legal) to entering new markets, difficulties in identifying alternative suppliers, insufficiently qualified personnel, low integration at the level of business associative systems, poor financing conditions [36].

Patel et al. (2021) [37] provide a more comprehensive picture of young enterprises in the early stages of development. The authors showed that these businesses face greater challenges in securing resources precisely because of their modest economic power and reduced visibility in the markets. Other authors have analysed the importance of clusters for overcoming difficulties and increasing regional competitiveness and showed that disparities in regional development are due to the fact that, at the cluster level, co-located enterprises have more opportunities: increasing productivity, creating new jobs, stimulating innovation, stimulating the establishment of new business and small business growth [38].

Based on a primary research, Tanco et al. (2018) [39] showed that the most important difficulties associated with supply and distribution chains are related to: infrastructure quality (telecommunications, air/sea/land transport, storage); the efficiency of the flow of documents related to customs, administrative and legal processes; changes in government policies that affect the business environment; political instability; macroeconomic instability; the unavailability of the labour force (respectively, the productivity of the human resource); problems specific to suppliers of raw materials and materials; distributional pressures (regarding products/services, information, financial and time resources); problems specific to the economic operator himself; the degree of internal and external integration of each economic operator; the knowledge and skills of those responsible for the proper

functioning of supply and sales channels; top management commitment; the degree of use of information technologies.

During the bibliographic research carried out for the preparation of this study, it was observed that many recent studies address aspects related to the financing of sustainable supply chains. For example, Liang et al. (2018) [21], with the triple bottom line theory as their starting point, were concerned with increasing the performance of supply chain finance. They developed an evaluation system for supply chain financing of small and medium-sized enterprises based on the enterprises' economic growth, social responsibility and environmental governance.

Sun et al. (2024) [40] sought to evaluate the particularities of financing traditional supply chains, on the one hand, and digital ones, on the other. They showed that a higher pledge rate and lower default loss stimulate SMEs' interest in digital supply chain financing. A few years earlier, Song et al. (2020) [41] reported that traditional (credit-based) financing has been replaced by supply chain financing, which facilitates the reduction of information asymmetry and increases the ability of small and medium-sized enterprises to mobilize capital working capital. Partanen et al. (2020) [42] started from the premise that small and medium-sized enterprises suffer from resource constraints and proposed the analysis of supply chain ambidexterity as a representation of the efforts of manufacturing enterprises to identify new resources and to develop new skills that generate superior benefits. Starting from the premise that the operational effectiveness of a business depends on resource providers, the authors showed that manufacturing organisations (small and medium-sized), which use information technologies to share strategic information, can ameliorate the adverse effects of supply chain ambidexterity.

2.4. Difficulties Generated by Labour Market Imperfections

Entrepreneurs must adapt to the environment in which they start and develop their businesses. Therefore, strategies regarding human resources, marketing, financing, and information technologies must be adapted to the internal conditions and the business's external environment. One of the most important resources that entrepreneurs employ is human resources [43]. The effectiveness of the use of human resources depends on the skills of managers to motivate and develop human resources so that they effectively participate in achieving business objectives.

Concerned with the implementation of Green-Lean at the level of micro-enterprises, Siegel et al. (2024) [44] identified three main difficulties specific to small and mediumsized businesses: difficulties in securing qualified personnel (including those associated with the constitution of reserve human resources), insufficiency of financial resources and prioritizing short-term goals to achieve quick results.

According to the opinions of the research predecessors, in the conditions of an imperfect labour market, the costs of training the skills necessary to carry out activities are transferred to the burden of employers (businesses). Imbalances in the labour market influence the structure of human resources, directly influencing the volume of investments in human capital, and putting pressure on the business budget [45].

Compared to small businesses, large companies can financially support effective human resource management techniques, which allows the recruitment and selection of the most talented workers [46]. Later, as a result of the technologization of companies, the human resource migrates, always moving towards large companies. A relatively modest share agrees to turn to smaller businesses. Even if it is not significant, according to Wang et al. (2011) [47], this migration has a multiplier effect because the labour force is oriented towards the creation of surplus value at the level of regions and local economies.

In the context of these frictions in the labour market, a market that allows the free movement of labour, employers (especially small and medium-sized ones) face challenges related to the unavailability, quality and stability of the workforce. The main causes of these challenges are the lack of job security, the number of hours worked and related remuneration and poor social protection [48]. Frohm [49] analysed a specific phenomenon—

labour shortages—and showed that demands for wage increases and shortages of workers in a certain occupation or skill level can hinder the expansion of firms.

2.5. Difficulties Induced by Macroeconomic Imbalances

Macroeconomic imbalances, understood as situations/tendencies that affect/have the potential to negatively affect the proper functioning of economic activities, are generated/maintained by the difficulties encountered at the level of the economy, by the stage of the economic cycle, by the situation on the financial markets, by the behaviour of businesses or the monetary and fiscal policy applicable at the level of different economies [50].

Because of their adverse effects, theorists and practitioners have developed various frameworks for the assessment and early detection of macroeconomic imbalances. For example, Alberola et al. (2014) [51] concatenated the indicators for assessing imbalances into three groups: indicators that reflect the behaviour of prices (here also integrating inflation, assessed by the consumer price index), indicators that reflect real flows (reflected in the current account imbalance—measured as a percentage of gross domestic product), indicators that reflect real stocks (such as public and private debt, measured as a percentage of gross domestic product). These imbalances affect both large and small businesses. Inflation, excessive taxation and uncertainties are three of the most important macroeconomic phenomena that influences directly the business.

Concerned with increasing the sustainability of small and medium-sized businesses, dos Santos Oliveira et al. (2021) [52] evaluated the extent to which accounting consulting could help the survival/development of these businesses. The authors identified the most important difficulties that can reduce the chances of business survival: bureaucracy; insufficient financial resources; fiscal burden; lack of entrepreneurial skills (the inability of the entrepreneur to effectively manage a business; the economic situation of the country (macroeconomic imbalances); the change in the structure and size of the business. To overcome these difficulties, the services provided by professional accountants are essential. The most important element of research of these authors is represented by the findings regarding new businesses. The authors point out that professional accountants can reduce the number of difficulties to which a business is exposed if the services of professional accountants are provided before the opening of the company, respectively during the planning/planning stage of business.

2.6. Difficulties Generated by Dysfunctions at the Level of Formal Institutions

Concerned with the smooth functioning of small businesses, Fedulova et al. (2018) [18] sought to identify the most important obstacles for business management. Thus, they showed that the state and local self-government are among the most important factors for the development of small and medium-sized businesses in Southeast Europe. The authors point out that the state/local governments should not limit themselves to financial measures dedicated to small and medium-sized enterprises. Equally important are the measures dedicated to improving/supporting the business environment by deregulating and simplifying the tax administration and by simplifying and ensuring the stability and accessibility of the legal framework.

Aiming to analyse the impact of various market imperfections (including the goods market and the labour market), Calcagnini et al. (2015) [53] showed that product market and labour market regulations negatively influence business profitability. The authors pointed out that the efficiency of the financial markets represents a premise for the increase of corporate investments, having the potential to diminish the negative effects of the regulation of the other markets.

The success of small and medium-sized businesses depends on the support of central and local authorities. Public intervention is being considered for the creation of regional and local clusters that facilitate the integration of small and medium-sized enterprises in various associative structures (such as innovation hubs) so that they participate in the development of economic activities and priority sectors of the economy [2].

11 of 29

Sprenger et al. (2021) [54] interviewed 90 entrepreneurs to identify the most important difficulties affecting the operational continuity of micro and small enterprises. The authors classify these difficulties into two categories. The category of external difficulties includes: fiscal pressure, bureaucracy, the state of the economy, customer default, non-compliance with legal obligations by business partners, etc. Among the most important internal difficulties, the authors identify: difficulties in managing financial resources (including restricted access for contracting loans), difficulties in forming the client portfolio, difficulties in selecting suppliers, the presence of legal problems, difficulties associated with human resource management, uncertainties regarding business development opportunities. For newly created enterprises, the list of difficulties also includes: lack of strategic planning and lack of economic-financial knowledge and skills, essential to launch and manage a business.

Vojtech et al. (2019) [55] assessed the situation of small and medium enterprises. The authors conclude that entrepreneurs encounter difficulties in applying specific laws (such as those regulating labour relations, fiscal relations, and relations with pension fund budgets). To increase the chances of survival/development of their businesses, entrepreneurs consider, first of all, the reduction of taxes and fees, the simplification of business conditions, and the increase of support for obtaining subsidies, which strengthen the legal capital of businesses.

3. Materials and Methods

The objective of the empirical research was to assess the difficulties faced by entrepreneurs in developing their businesses. Specifically, based on the relevant theoretical explorations, it was considered to assess the perception of entrepreneurs who have recently launched a new business or managed a small business. The purpose of the study was to provide valuable references for the central government and local authorities when they base, adopt and implement public policies focused on local or regional economic development. At the same time, it was considered to facilitate knowledge of the business environment, for current and/or potential entrepreneurs, and also for existing enterprises.

The assumption of this objective was imposed in the context of the implementation of the STAR project within the Gheorghe Asachi Technical University in Iași, Romania. The STAR project (financed under the Human Capital Operational Program 2014–2020, Priority Axis 6-Education and Skills) had as its general objective the increase of the employment rate by running an integrated entrepreneurship program. 22 new businesses were established within the project. One of the project's administrative requirements was to develop a public policy proposal to support entrepreneurs in the project implementation region.

The research was based on deductive reasoning, based on the principles of mathematical induction. In economic research, predominates the use of deductive method, which harness historical data to formulate logical conclusions, without taking into account the uncertainties related to the phenomenon/process under analysis. As previous researchers have pointed out, the induction method provides more valuable results because it is not limited to a description of past data, but also has an important predictive role, facilitating the quantification of uncertainty in formulating conclusions [56].

The first uses of mathematical induction are recorded in Euclid's demonstrations of prime numbers. Subsequent mathematical developments, which marked the transition from infinite sets to finite sets of elements, showed that a proposition that proves to be true in one case can also be true in the case that follows it. However, when not all possible cases are taken into account, the same reasoning method can lead to both true and false propositions.

Mathematical induction is used in economic debates both in its classical form and in adapted variants. For example, Zhang and Ma [57] used this method to facilitate the optimization of the investment strategy when the investor has the possibility to make predictions about the market price. Lu et al. (2020) [58] used mathematical induction to facilitate the adoption of optimal decisions in the production planning stage. By scheduling

production, delivery and assembly, the authors aimed to increase the productivity of all participants in the global production system.

In the present study, the application of the principles of mathematical induction involved two stages:

- Verification of the veracity of the premises. Based on the literature review, it was shown that certain difficulties are present in all the business environments studied. To create the list of difficulties (which formed the basis for the development of the questionnaire), only the difficulties that proved to be significant both at the local and European levels were selected.
- Demonstration. Different from the classical approaches of mathematical induction, this study leverages statistical methods to test the final conclusion, starting from premises accepted as valid. The logical scheme of the research is presented in Figure 1.



Figure 1. Logical diagram of the research.

Based on the bibliographic and documentary research carried out in advance, a list of the main difficulties specific to the business environment in which micro-enterprises and small enterprises operate was created. The checklist was the technique that was the basis of the construction of the questionnaire. The questionnaire items were organized into two sections (Table 2). The first section concerned the evaluation of five groups of difficulties, selected for both practical and theoretical reasons. Since the targeted entities are characterized by an object of activity, form of organization, age (years of operation), fiscal regime, etc., as a preliminary step, the collection of data allowed the individualization of these particularities. Therefore, the second section of the questionnaire aimed to collect information about the businesses/companies represented by the respondents.

Groups of Items	Items	Symbol
	1. Limited access to financing for newly created/developing companies	FD1
Financial difficulties (FD)	2. Difficulties in identifying financing alternatives	FD2
	3. High credit costs	FD3
	4. Insufficient funding dedicated to technological development and digitization	FD4
	1. Increased production costs due to supply chain deficiencies	SSMD1
	2. Difficulties in identifying customers and markets	SSMD2
	3. Competition	SSMD3
Supply/sales market difficulties (SSMD)	4. Unfair competition	SSMD4
	5. Decrease in domestic demand	SSMD5
	6. Decrease in external demand	SSMD6
	7. Poor quality of infrastructure (difficult access to supply and sales markets)	SSMD7
Labour market difficulties (LMD)	1. Unavailability of human resources (e.g.,: qualified staff, experienced managers)	LMD1
	2. Increasing the cost of labour (e.g.,: increasing wage costs)	LMD2
	1. Inflation	DMI1
Difficulties induced by macroeconomic imbalances (DMI)	2. Taxation	DMI2
	3. Uncertainties about future developments	DMI3
	1. Unstable and ambiguous legislation, difficult to implement	DDFI1
Difficulties generated by dysfunctions at	2. Bureaucracy	DDFI2
the level of formal institutions (DDFI)	3. Corruption	DDFI3
	4. Delays in settlement with public institutions	DDFI4
	Age of the company	AGE
Control variables	Number of employees	NE
	Size (microenterprise/small enterprise)	SIZE

Table 2. Variables.

Source: Own processing.

A linear numerical scale was used to evaluate the perceptions regarding each of the twenty selected difficulties (organized into five groups), labelled at the endpoints (1—slightly important; 10—very important). In the survey, each participant provided a numerical answer to the twenty questions in the questionnaire.

Two free response items and one comparison scale item were inserted in the last section of the questionnaire. The first two items had the role of capturing information regarding the age of the company (AGE) and the number of employees (NE). For the analysis run, these two items were converted to dichotomous variables. Thus, for the AGE variable, the division was made into two categories: 0 for companies that have up to 5 years of activity (inclusive) and 1 for companies that have more than 5 years. The argument for this data organization was the business survival rate. According to the statistics [59], newly established businesses in Romania have a survival rate of around 50%. For the NE variable, distribution was made into two groups: enterprises with a maximum of 9 employees and enterprises with more than 10 employees inclusive. The third item (with paired comparison scale, labelled 0-microenterprise, 1-small enterprise), had the role of verifying the correct classification of the businesses represented by the respondents. According to the legislation in force at the moment of data collection, the micro-enterprise had to have a maximum of

9 employees and revenues of less than 0.5 million euros. Instead, small businesses had to have between 10 and 49 employees and revenues of less than 10 million euros.

The questionnaire was pretested. Based on the results of the pretest and the discussions with the beneficiaries of non-reimbursable funding (from the STAR Project, who established a new business in 2022) the questionnaire was adequate to be accessible to the respondents and to meet the methodological rigours.

For data collection, the questionnaire was distributed between October and November 2023. First, a pilot sample was considered, represented by the entrepreneurs who, in 2022, benefited from non-reimbursable financing under the STAR Project. To overcome the limitations of traditional sampling, the snowball method was considered. The starting point was the identification of entrepreneurs who can facilitate access to the harder-to-reach population. The identification of these entrepreneurs was carried out in the context of participation in local meetings of businessmen, such as those organized by professional associations of industrialists, associations of businessmen in different fields, associations of women entrepreneurs, etc. To ensure data quality, respondents were clearly informed about the objectives and requirements of the study. Through these entrepreneurs, to ensure a satisfactory level of homogeneity, the questionnaire was subsequently distributed, in electronic format, to 420 entrepreneurs who manage businesses classified as micro-enterprises or small enterprises (in the implementation area of the STAR project). As the data was collected, tests were carried out regarding the adequacy of the sample, in terms of its characteristics and volume.

Between 5 October and 10 November 2023, 112 electronic forms were registered, of which only 107 proved to be valid. Two questionnaires were eliminated because respondents selected the minimum value (1) for all items in the first section of the questionnaire. Three questionnaires were excluded because the control variables section indicated that, in 2023 (at the time of filling out the questionnaires), the respondents did not represent businesses classified as micro-enterprises or small enterprises (declaring more than 49 employees). Given the registration of the 107 valid questionnaires, the participant-item ratio (107/20) exceeded the 5:1 threshold. According to the rigours of statistics, the sample size is directly proportional to the number of items and inversely proportional to the level of communality of the items (for which details are presented in the next section). To test the consistency of the tool used to assess the perception of the business environment—specific tests were run. It was aimed to evaluate the extent to which the questionnaire items ensure the internal consistency and fidelity of the data).

Starting from the results of previous research focused on the identification and evaluation of difficulties in the business environment, the aim was to test these results on a specific sample of companies. Factor analysis was applied to identify the most important groups of factors (which bring together one or more difficulties specific to the analysed population) and to make judgments about their dimensions. Factorial analysis has also been used in economic and financial research. For example, Kuchiki (2024) used the method to assess the costs of the investment environment (in the case of manufacturing). The author extended the analysis to the country level to assess the determinants of foreign direct investment [60]. Bikas and Glinskytė (2021) [61] used the method to assess the determinants of firms' investment behaviour, and Bilge et al. (2021) [62] used the method to assess Generation Y's perceptions of leadership and job satisfaction.

In the present study, the identification of particularities at the level of the analysed sample was considered. To assess whether factor analysis can be applied, specific tests such as Meyer-Olkin Measure of Sampling Adequacy (MOM SA) and Bartlett were run.

After validating the factorial model for the organisation of the analysed variables (by repeating the analyses on a restricted sample drawn from the same population), to develop the analyses, the normality of the variables/dimensions was tested using the Kolmogorov-Smirnov test. This test indicated that the data did not have a normal distribution, forcing a shift to non-parametric analyses. Taking as a benchmark the three dichotomous variables (AGE, NE and SIZE), using the binomial logistic regression, it was aimed to predict whether

the perceptions of the respondents regarding the 20 identified difficulties are common or present significant differences.

The following hypotheses were formulated:

H0. *Respondents' perceptions of the difficulties in the business environment do not differ according to the particularities of the business they manage.*

H1. There are differences in respondents' perceptions of the difficulties in the business environment.

Since not all conditions for applying logistic regression were met, the Mann-Whitney U test (for data not symmetrically distributed) was considered. This test is often used when the conditions of normality of the collected sample are not met. The purpose of its use was to determine the differences between two data sets [63,64].

In the present study, based on the results obtained regarding the average ranks of the dependent variables, the differences at the level of the independent groups created based on the dichotomous variables were highlighted.

Finally, based on the primary data collected, using appropriate statistical tools and techniques, it was shown that the difficulties selected for evaluation are present in the business environment of the targeted sample. Still, there are some differences compared to the initial construct, which gives the present study originality. Based on the three dichotomous variables, it was shown that the difficulties analysed affect more newly established businesses, which have fewer employees and are classified as micro-enterprises.

As stated at the beginning of this section, unlike previous studies, this study was based on the use of statistical methods to demonstrate the presence of various difficulties in the analyzed economic environment. The main criteria for selecting the different statistical methods were: the nature of the data (predominantly numerical), the specific conditions of application and the intended purpose. SPSS 26 software was used to perform the analyses. Since the conditions for applying parametric tests (whose results are considered to be more robust) were not met, non-parametric tests were used, even though they pose the risk of affecting the accuracy of the results and the reliability of the conclusion. This aspect was noted as a limitation of the present study.

4. Results

4.1. Data Testing

Specific tests were carried out to identify the most suitable data analysis methods and obtain relevant results. According to the data in Table 3, the first test carried out (reliability statistics) revealed that, overall, the items that had the role of evaluating the perceptions of the difficulties faced by entrepreneurs are correlated with the global score of the test, the Cronbach alpha coefficient registering a value of 0.858. The result indicates a high level of internal consistency for the scale used within the specific sample.

Table 3. Reliability Statistics (20 items).

0	ummary	Ν	%		Reliability Statistics		
Cases	Valid	107	100.0	Cronbach's	Cronbach's Alpha Based	N of Items	
	Excluded ^a	0	0.0	Alpha	on Standardized Items		
	Total	107	100.0	0.858	0.862	20	

Source: Own processing. ^a Listwise deletion based on all variables in the procedure.

In Table 4, column (6), Cronbach's alpha values are shown if one of the 20 items were removed. Only removing one item (SSMD6) would result in a slightly higher Cronbach alpha coefficient than the original coefficient. However, the elimination of this item must be viewed with caution because, in column (4), a relatively low value is observed for the "corrected item-total correlation" relationship (0.217). According to the information in the second part of Table 4, this item has the lowest average value (3.97) being at a significant

distance compared to the average of the other items, which varies between 6.60 (SSMD4) and 8.64 (FD4). From an economic point of view, the small value of the average of item SSMD6 (Decrease in external demand) preliminarily indicates that the perception of entrepreneurs regarding the business environment is not significantly influenced by the decrease in external demand. This is because the businesses they manage (in the categories of micro-enterprises and small enterprises) do not run important external commercial activities that go beyond the country's borders.

		Item-To	tal Statistics					1	tem Statistic	s		
Items	Scale Mean If Item Deleted	Scale Variance If Item Deleted	Corrected Item-Total Correla- tion	Squared Multiple Correla- tion	Cronbach's Alpha If Item Deleted	Items	Mean	Std. De- viation	Variance	Skewness (Std. Error 0.234)	Kurtosis (Std. Error 0.463)	N
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
FD1	138.27	452.048	0.375	0.592	0.855	FD1	7.50	1.992	3.969	-0.952	1.064	107
FD2	137.86	452.348	0.378	0.590	0.854	FD2	7.92	1.962	3.851	-1.323	1.892	107
FD3	137.71	449.755	0.420	0.430	0.853	FD3	8.07	1.924	3.703	-1.033	0.588	107
FD4	137.13	465.964	0.258	0.664	0.858	FD4	8.64	1.700	2.892	-1.292	0.868	107
SSMD1	138.70	437.381	0.516	0.520	0.849	SSMD1	7.07	2.127	4.523	-0.837	0.302	107
SSMD2	138.71	437.774	0.529	0.414	0.849	SSMD2	7.07	2.066	4.269	-0.756	0.409	107
SSMD3	138.71	446.755	0.429	0.360	0.853	SSMD3	7.07	2.034	4.137	-0.125	-1.092	107
SSMD4	139.18	428.412	0.519	0.530	0.849	SSMD4	6.60	2.476	6.129	-0.386	-0.793	107
SSMD5	138.35	451.549	0.411	0.548	0.853	SSMD5	7.43	1.874	3.512	-0.629	0.155	107
SSMD6	141.80	454.574	0.217	0.284	0.864	SSMD6	3.97	2.759	7.612	0.631	-0.695	107
SSMD7	138.32	436.955	0.419	0.564	0.853	SSMD7	7.46	2.534	6.42	-0.934	0.075	107
LMD1	138.73	422.898	0.601	0.612	0.845	LMD1	7.05	2.393	5.724	-0.587	-0.363	107
LMD2	138.01	441.349	0.513	0.528	0.849	LMD2	7.77	1.974	3.898	-0.582	-0.711	107
DMI1	138.17	443.349	0.529	0.566	0.849	DMI1	7.61	1.842	3.392	-0.391	-0.429	107
DMI2	138.27	435.086	0.625	0.641	0.846	DMI2	7.50	1.885	3.554	-0.365	-0.262	107
DMI3	138.20	440.235	0.507	0.628	0.850	DMI3	7.58	2.038	4.152	-0.679	-0.02	107
DDFI1	137.77	458.313	0.359	0.522	0.855	DDFI1	8.01	1.724	2.972	-0.713	-0.11	107
DDFI2	138.04	442.074	0.501	0.745	0.850	DDFI2	7.74	1.983	3.931	-0.576	-0.573	107
DDFI3	138.72	432.336	0.497	0.681	0.850	DDFI3	7.06	2.402	5.77	-0.583	-0.368	107
DDFI4	139.10	440.603	0.416	0.485	0.853	DDFI4	6.67	2.378	5.656	-0.155	-0.742	107

Table 4. Cronbach's Alpha if Item Deleted and Descriptive Statistics.

Source: Own processing.

Instead, removing the other 19 items from the questionnaire would cause a decrease in the Cronbach alpha coefficient (below 0.858). The exception is one item (FD4—Insufficient funding dedicated to technological development and digitization) which, if it were to be removed, the fidelity coefficient does not change. This item presents the highest average value (8.64), the lowest standard deviation (1.70) and the lowest variance (2.89). This signals that the insufficiency of funding for technological development and digitization is perceived, by most entrepreneurs, as an important difficulty of the business environment. This perception does not vary significantly from one respondent to another, nor from the recorded average value.

The overall analysis for the twenty difficulties presented in the questionnaire indicates that the respondents' perceptions do not vary significantly (Standard Deviation registering values between 1.700 and 2.759). Only for six variables (DDFI4, LMD1, DDFI3, SSMD4, SSMD7, SSMD6), the coefficient of variation is greater than 0.5. The analysis regarding the symmetry of the value distribution reveals a range (-1.323; 0.631) with a preponderance of negative values. From the total of twenty variables, five show an approximately symmetrical distribution (SSMD3, SSMD4, DMI1, DMI2, DFI4), with Skewness having values between (-1/2 and +1/2). Most of the variables (twelve) show a moderately symmetric distribution, and three variables show a highly asymmetric distribution (FD2, FD3 and

FD4), with Skewness having values lower than -1 (the averages of the variables migrating towards the extremes of the scale). According to the customs of statistics, the presence of different distributions reduces the value of correlations between items. This fact is confirmed by the Pearson correlation analysis, which revealed that only three pairs of variables show a moderate level of association: SSMD5-FD4 (0.629), DMI2-DMI3 (0.640) and DFI2-DFI3 (0.704). For the other variables, the correlation analysis showed values lower than 0.486.

The analysis of the Cronbach alpha coefficient provides only a general picture of the reliability of the construct, represented by the twenty items of the questionnaire. Given that these items reflect multiple facets of the difficulties identified in the business environment (organized into five groups), there is a risk that the Cronbach alpha test does not clearly distinguish between the items in each of the five groups. For this reason, it is recommended to repeat the Cronbach alpha test at the level of item groups and perform additional analyses (such as principal components analysis or exploratory factor analysis).

The data in the first part of Table 5 reveal a high level of internal consistency when the analysis is related to the average values afferent to the five groups of difficulties, corresponding to the analysed sample, Cronbach alpha having values higher than the accepted significance threshold (0.7) (Pillai et al., 2020) [65]. Eliminating the first group of difficulties (FD) would allow the recording of a slightly higher Cronbach alpha coefficient than the overall coefficient. However, this operation is not justified because the average values in the second part of Table 5 (column 8), related to the difficulties in this group, reveal the importance of the variable for the analysed sample. Conversely, removing any of the other four groups of difficulties would result in a reduction in Cronbach's coefficient alpha (even below the threshold of significance—Table 5, column 6). Compared to the analysis at the level of the twenty items, where the standard deviation fell within the range (1.700–2.759), the analysis at the group level revealed a narrowing of the variation gap (1.349–1.923), highlighting more homogeneity at the level of the analysed values.

	Case Processi	ng Summary		Ν	%	Reliability Statistics						
Cases		Valid		107	100.0	Cronbach's	Cror	bach's Alpha	Based	N of		
		Excluded ^a		0	0.0	Alpha	on S	Standardized I	tems	Items		
		Total		107	100.0	0.759		0.761		5		
			Item-Total Statistic	cs			atistics					
Items	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Squared Corr	l Multiple elation	Cronbach's Alpha if Item Deleted	Items	Mean	Std. Deviation	Ν		
(1)	(2)	(3)	(4)		(5)	(6)	(7)	(8)	(9)	(10)		
FD	29.006	26.247	0.325	0.	281	0.777	FD 8.033 1		1.418	107		
SSMD	30.372	22.986	0.632	0.	450	0.687	SSMD	6.666	1.349	107		
LDM	29.632	18.832	0.626	0.473		0.678	LDM	7.407	1.923	107		
DMI	29.475	20.736	0.660	0.	506	0.666	DMI 7.564 1.607			107		
DDFI	29.669	23.101	0.433	0.	330	0.750	DDFI	7.369	1.688	107		

Table 5. Reliability Statistics (average values for each group)—at the level of groups of items.

Source: Own processing. ^a Listwise deletion based on all variables in the procedure.

4.2. Factor Analysis

As mentioned above, Cronbach's alpha analysis only provides a general picture of reliability. To overcome the risk of not identifying the particularities related to the items in each of the five groups, additional analyses were required. Given the potential to extend the use of the questionnaire to larger samples, factor analysis was considered. Before this analysis, the determination of the KMO-MSE index (Kaiser-Meyer-Olkin Measure of Sampling Adequacy, which compares the dimensions of the observed correlation coefficients with the dimensions of the partial correlation coefficients) and Bartlett's test of sphericity (Table 6) was required. These tests were carried out to assess whether factor analysis can be applied.

The KMO-MSA index recorded values greater than 0.6 (respectively, 0.744) and Bartlett's test value was found to be significant (p < 0.05), which rejects the null hypothesis (according to which the variables are uncorrelated) and admits the existence of correlations between variables. Therefore, the preliminary conditions for applying factor analysis were met.

	KMO and Bartlett's Test	
Kaiser-Meyer-Olkin Meası	re of Sampling Adequacy.	0.744
	Approx. Chi-Square	950.245
Bartlett's Test of Sphericity	df	190
	Sig.	0.000

Table 6. Kaiser-Meyer-Olkin Measure of Sampling Adequacy.

Source: Own processing.

The use of the factor analysis was justified because it was aimed at validating the construct and detecting its structure from the perspective of the relationships between the variables, respectively the identification of the relationships at the level of the variables from the five groups associated with the difficulties faced by the entrepreneurs in the targeted geographical area. At the same time, it was aimed to identify the variables that explain most of the variation observed in the previous analyses. Last but not least, factor analysis was performed as a step before logistic regression analysis and discriminant analyses.

The premise that was the basis of factor analysis was that certain variables cannot be observed directly, but only through other variables. The selected method (principal component analysis) allows the exploration of the matrix of linear correlations between the variables and evaluates the existing common variance, extracting and descending the factors according to their variability. At the base of the factorial model is a matrix that identifies several relationships based on the correlations between the observed variables and the factor saturations. Since the criterion for grouping the variables at the level of a factor was the degree of correlation, the method admits that the variables composing the same factor are more strongly correlated with each other and less with the variables composing other factors. As a confirmatory approach, factor analysis selects, structures, and facilitates understanding of how data covariates.

The preliminary evaluations of the factor analysis revealed the mean values and the standard deviation for each of the 20 analysed variables, as well as the existing correlations between these variables. Since these aspects have been previously discussed, their presentation and discussion will not be repeated. The next step was the analysis of communalities, namely the extent to which, at the level of a factor, the variables have common characteristics. This analysis highlights the extent to which the variance of a variable is shared with the variance of other variables within the factor. According to the data in Table 7, most of the variables are well represented at the level of the factorial model. Less represented are only three variables (SSMD1, FD3 and SSMD3) for which the recorded values are slightly lower than 0.5 (respectively: 0.37, 0.41 and 0.44). When values lower than 0.3 are recorded, it is accepted that communalities are very low.

Table 7. Communalities.

Items	FD 1	FD 2	FD 3	FD 4	SSMD 1	SSMD 2	SSMD 3	SSMD 4	SSMD 5	SSMD 6	SSMD 7	LMD 1	LMD 2	DMI 1	DMI 2	DMI 3	DDFI 1	DDFI 2	DDFI 3	DDFI 4
Initial	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Extraction	0.65	0.67	0.41	0.75	0.77	0.44	0.37	0.53	0.69	0.56	0.72	0.66	0.71	0.70	0.69	0.76	0.63	0.78	0.72	0.59
Source: Own processing.																				

The first results of the actual factor analysis are presented in Table 8. Using the principal components method as a criterion, 20 factors were identified—generically represented in column 1, of which only the first five meet the selection criteria. According to the Kaiser criterion, the number of common factors is given by the number of eigenvalues greater than 1. The software used allows the graphical representation of the eigenvalues to establish the number of common factors (with super unit values as the criterion). In Table 8, the graphic representation of the main components identified is also inserted. It can be seen that the first five factors are in the sequence of principal factors. The following fifteen factors are presented in a descending linear sequence.

		Initial Eigenvalu	es	Extractior	n Sums of Square	ed Loadings	Rotation Sums of Squared Loadings				
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)		
1	5.717	28.587	28.587	5.717	28.587	28.587	3.153	15.764	15.764		
2	2.910	14.548	43.135	2.910	14.548	43.135	3.069	15.344	31.108		
3	1.646	8.232	51.367	1.646	8.232	51.367	2.885	14.425	45.533		
4	1.299	6.493	57.861	1.299	6.493	57.861	1.931	9.657	55.190		
5	1.230	6.149	64.010	1.230	6.149	64.010	1.764	8.820	64.010		
6	0.962	4.810	68.819								
7	0.888	4.442	73.261								
8	0.797	3.985	77.247								
9	0.729	3.646	80.893								
10	0.660	3.301	84.194								
11	0.535	2.674	86.868								
12	0.429	2.147	89.015								
13	0.424	2.122	91.137								
14	0.357	1.783	92.920								
15	0.324	1.622	94.543								
16	0.298	1.491	96.034								
17	0.266	1.328	97.362								
18	0.216	1.082	98.444								
19	0.186	0.930	99.374								
20	0.125	0.626	100.000								

Table 8. Total Variance Explained.

Note: Extraction Method: Principal Component Analysis. Source: Own processing.

In Table 8, column (5) the eigenvalues of the five factors are presented. Columns (6) and (7) show the explained variance and the cumulative variance (according to the initial construct, before the rotation of the variables). The variance explained by each factor (before Varimax rotation) is distributed as follows: 28.587% (first factor), 14.548% (second factor), 8.232% (third factor), 6.493% (fourth factor), 6.149% (fifth factor). Overall, 64% of the variance is explained by five factors (pooled variance). Columns 8, 9 and 10 (from Table 8 and Figure 2) show the values for all five factors after applying the rotation procedure. Even if the total variance remains at the same level (64%), the internal structure reveals a redistribution of the variance explained by the five factors: 15.764% (first factor), 15.344% (second factor), 14.425% (third factor), 9.657% (fourth factor), 8.820% (fifth factor). As a result of the rotation, the first factor (column 6) loses its saturation level in favour of the next four factors (column 9).





The first columns 1–6 of Table 9 show the variables and their contribution to each of the five main factors, in terms of correlation, before applying the rotation procedure. Columns 7–12 provide the information obtained after applying the factor rotation procedure, according to the Varimax method (9 iterations). Columns 13–18 show the results of the factor analysis validation test.

Table 9. Component Matrix and Rotated Component Matrix.

		Compo	onent ^a				R	otated Comp	onent Matrix	a	Test validation (Extracted Sample)— Rotated Component Matrix ^a							
Items	1	2	3	4	5	Items	1	2	3	4	5	Items	1	2	3	4	5	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	
DMI2	0.723	-0.350	-0.199	-	-	FD4	0.825	-0.143	-	0.176	-0.117	FD4	0.833	-	-0.131	0.176	-	
LMD1	0.693	-	-0.244	-	-0.339	FD2	0.807	-	-	-	-	FD2	0.811	0.151	-		-	
DMI1	0.625	-	-0.285	-0.429	-0.208	FD1	0.736	-	0.296	-0.144	-	FD1	0.711	0.412	-	-0.114	-	
LMD2	0.619	-	-0.289	-0.411	-0.258	SSMD5	0.667	-		0.475	-	SSMD5	0.705	-0.138	-	0.422	0.128	
DMI3	0.612	-0.380	-0.320	-0.219	0.297	SSMD2	0.519	0.303	0.218	0.151	-	FD3	0.499	0.127	0.169		0.3	
DDFI2	0.596	-0.549	0.274	0.158	0.161	FD3	0.455	-	0.183	0.151	0.385	SSMD2	0.483	0.328	0.279	0.105	0.211	
SSMD1	0.589	-	-	0.361	-0.536	DDFI3	-	0.828	0.160	-	0.100	LMD2	0.111	0.796	0.176	0.142	-	
DDFI3	0.587	-0.448	0.326	-	0.270	DDFI2	-0.124	0.818	0.173	0.164	0.203	DMI1	0.175	0.795	-	0.158	-	
SSMD2	0.584	0.240	0.109	-	0.155	DDFI4	-	0.758	-	-	0.101	DMI3	-	0.634	0.444	-0.234	0.288	
SSMD4	0.576	-	-	0.431	-	DDFI1	-	0.614	0.157	0.255	-0.393	DMI2	-	0.600	0.415	0.222	0.362	
DDFI4	0.499	-0.376	0.315	-	0.320	LMD2	0.120	0.108	0.818	0.124	-	LMD1	-	0.581	0.126	0.417	0.336	
SSMD3	0.487	0.223	-0.169	0.231	-	DMI1	0.205	-	0.800	-	-	DDFI3	-	0.232	0.801	-	-	
FD3	0.478	0.311	-0.203	0.178	0.119	DMI2	-	0.429	0.637	0.162	0.280	DDFI2	-0.134	0.21	0.801	0.186	0.246	
FD4	0.273	0.793	0.165	-	0.104	LMD1	-	0.139	0.613	0.427	0.279	DDFI4	-	-	0.773	-	0.14	
SSMD5	0.434	0.629	0.217	0.236	-	DMI3	-	0.464	0.609	-0.262	0.315	DDFI1	-	-	0.625	0.391	-0.267	
FD2	0.414	0.620	-	-	0.321	SSMD1	-	-	0.303	0.770	0.275	SSMD1	-	0.25	0.102	0.742	0.377	
FD1	0.422	0.520	-0.107	-0.340	0.276	SSMD7	0.266	0.334	-	0.654	-0.316	SSMD7	0.239	0.181	0.237	0.736	-0.200	
DDFI1	0.437	-0.205	0.575	-0.246	-	SSMD6	-	0.110	-	-	0.733	SSMD6	-	-	-	-0.112	0.771	
SSMD7	0.497	0.158	0.560	-	-0.366	SSMD4	0.263	0.277	-	0.360	0.494	SSMD4	0.224	0.183	0.19	0.292	0.554	
SSMD6	0.285	-0.169	-0.431	0.462	0.226	SSMD3	0.347	-	0.190	0.247	0.385	SSMD3	0.393	0.102	0.17	0.112	0.438	
Notes: Extraction Method: Principal Component Analysis. a. 5 components extracted.						Notes: Extraction Method: Principal Component Analysis: Rotation Method: Varimax with Kaiser Normalization ^a . a. Rotation converged in 9 iterations.						Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 7 iterations.						

Source: Own processing. The areas marked in grey represent the main groups of factors identified.

After applying the Varimax method (based on orthogonal rotations, ensuring that the factors remain uncorrelated), the results allowed the formulation of some conclusions regarding the structure of the factors for the analysed variables, detailed in the following. The first factor (column 8) includes financial difficulties (according to the initial grouping) to which two more difficulties with financial implications are added (this factor will be called Expanded financial difficulties, E-DF). The second factor includes all four difficulties integrated into the initial group difficulties generated by dysfunctions at the level of formal institutions (DDFI). Therefore, this factor should not be redefined. The third factor aggregates two initial groups: DMI and LMD. Considering that the difficulties related to the labour market have a macroeconomic amplitude, this third factor will be called Expanded difficulties induced by macroeconomic imbalances (E-DMI). The last two factors were generated by dividing the supply/sales market difficulties (SSMD), after excluding

the two difficulties integrated in the first factor. The two new factors will be renamed as follows: supply and distribution channels difficulties (which also include infrastructure problems), and competition (a factor which also includes unfair competition, respectively, a decrease in external demand, as a potential result of external competition).

Since the factorial analysis can present statistical inference problems, validation was required. In this sense, it was considered to draw a sample from the same population, having as a criterion the size of the businesses represented by the respondents (entrepreneurs) whose perception of the difficulties in the business environment was explored. According to this criterion, 89 respondents represented micro-enterprises and 18 represented small enterprises. The factor analysis was repeated with the larger sample as a benchmark. Preliminary tests showed that factor analysis can be applied. The KMO-MSA index was 0.730, and Bartlett's test value (0.00) was found to be significant (p < 0.05). All utilities registered significant values (greater than 0.3). In this case, too, five factors had eigenvalues greater than 1. Following Varimax rotation, the first factor lost saturation in favour of the next four factors. The total variance explained by the five factors (64.97%) was slightly higher compared to that presented in Table 7 (64%).

Columns 13–18 from Table 9 show the results of the factorial analysis related to the extracted sample. From the perspective of the twenty variables analysed, the five factors identified show a 95% match with the factors identified in the analysis at the level of the entire sample. The exception is the variable LMD2, which migrates from one factor to another. In the internal structure of the five factors there are small differences in the positioning of the variables.

4.3. Supplementary Analysis—Assessment of Identified Difficulties

Once the factorial model for the organisation of the analysed variables was validated, the most suitable directions for data exploration were identified. To have an adequate knowledge of the distribution of the data related to the sample, testing the normality of the variables and their dimensions was considered. For this, the Kolmogorov-Smirnov, test was used, the variant corresponding to the sample size. For the normality test, distribution parameters were estimated from the sample data (the default setting). Thus, the existing asymptotic results and the Lilliefors significance correction based on Monte Carlo sampling were used. The results indicated that the data do not have a normal distribution (the significance level of the Kolmogorov-Smirnov test registering values lower than 0.05) (Table 10).

Table 10. Normality Tests.

	Kolmogorov-Smirnov ^a (df = 107)																			
Items	FD 1	FD 2	FD 3	FD 4	SSMD 1	SSMD 2	SSMD 3	SSMD 4	SSMD 5	SSMD 6	SSMD 7	LMD 1	LMD 2	DMI 1	DMI 2	DMI 3	DDFI 1	DDFI 2	DDFI 3	DDFI 4
Statistic	0.19	0.20	0.18	0.24	0.20	0.18	0.14	0.14	0.16	0.15	0.19	0.16	0.17	0.14	0.14	0.14	0.17	0.16	0.15	0.12
Sig.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: ^a. Lilliefors Significance Correction. Source: Own processing.

The results of the Kolmogorov-Smirnov test indicated that the use of parametric methods is not appropriate. Therefore, it was considered running a logistic regression to identify the probability that an observation (a particular identified difficulty) would fall into one of the two categories of the selected dichotomous variables. According to Table 2, the dichotomous variables were AGE, NE and SIZE. Specifically, it was considered to assess the extent to which the respondents' perceptions regarding the 20 identified difficulties are common or show significant differences according to the age of the business (companies that have been under/over five years of operation), the number of employees within the business respectively (under or over 9 employees) and business size (micro or small enterprises).

The application of logistic regression assumed the testing of specific hypotheses to have a confirmation of the correctness of using the method. The first two assumptions restrict the analysis to dichotomous variables, respectively ordinal or nominal variables. These conditions have been met. The third hypothesis was validated because the observations are independent and the dependent (dichotomous) variables are exhaustive and have mutually exclusive categories. Conversely, the condition regarding the linear relationship between any continuous independent variable and the logit transformation of the dependent variable was not met. Therefore, to prevent the risk of obtaining results that are not valid, the application of other non-parametric methods was pursued.

To understand if the respondents' perceptions (regarding the twenty selected difficulties) differ according to the parameters of the three dichotomous variables (AGE, NE and SIZE), the Mann-Whitney U test was applied, which allows comparing the differences between two independent groups. This test, considered a non-parametric alternative to the independent t-test, was applied in the context of knowing the properties of the available data. Since the assumption of normality of data distribution was not confirmed (Table 10), the Mann-Whitney U test was used to identify if there are differences between the business categories managed by the respondent entrepreneurs (Table 11).

			AGE					NE			SIZE					
	Mean	Rank	Ma	nn-Whitne	y U	Mean	Rank	Ma	nn-Whitne	y U	Mean	Rank	Ma	nn-Whitne	y U	
	0	1	MWU	Z	Sig.	0	1	MWU	Z	Sig.	0	1	MWU	Z	Sig.	
FD4	46.7	60.9	1050.5	-2.50	0.01	53.1	56.6	1009.5	-0.53	0.59	53.5	56.6	754.0	-0.41	0.68	
FD2	48.2	59.5	1126.0	-1.93	0.05	54.0	54.0	1079.0	-0.01	0.99	53.4	56.8	751.5	-0.42	0.67	
FD1	55.6	52.5	1349.0	-0.51	0.61	53.0	57.1	996.5	-0.61	0.54	53.2	57.8	732.0	-0.58	0.56	
SSMD5	51.0	56.8	1276.0	-0.97	0.33	53.1	56.8	1005.0	-0.55	0.59	52.9	59.3	705.0	-0.81	0.42	
SSMD2	63.0	45.5	961.0	-2.97	0.00	57.3	44.1	813.0	-1.95	0.05	55.7	45.7	651.5	-1.27	0.21	
FD3	47.2	60.5	1074.5	-2.27	0.02	48.9	69.0	674.0	-2.98	0.00	50.5	71.2	491.0	-2.64	0.01	
DDFI3	64.7	43.9	872.5	-3.52	0.00	59.2	38.5	662.5	-3.03	0.00	57.2	38.0	512.5	-2.43	0.01	
DDFI2	68.8	40.0	662.0	-4.87	0.00	58.6	40.3	709.0	-2.70	0.01	56.3	42.6	596.0	-1.74	0.08	
DDFI4	61.8	46.6	1024.0	-2.56	0.01	55.6	49.2	950.5	-0.94	0.35	55.0	48.9	710.0	-0.77	0.44	
DDFI1	65.1	43.5	851.5	-3.68	0.00	58.1	41.9	754.5	-2.38	0.02	56.6	41.4	573.5	-1.93	0.05	
LMD2	60.9	47.4	1069.0	-2.29	0.02	51.5	61.3	882.5	-1.44	0.15	53.2	57.9	731.5	-0.59	0.56	
DMI1	60.9	47.5	1071.0	-2.28	0.02	54.6	52.2	1031.5	-0.35	0.72	54.4	51.8	762.0	-0.33	0.74	
DMI2	66.8	41.9	766.5	-4.21	0.00	56.4	47.0	891.0	-1.38	0.17	55.2	48.2	696.0	-0.89	0.37	
LMD1	62.7	45.7	975.5	-2.87	0.00	52.4	58.8	950.0	-0.95	0.34	52.8	60.2	690.0	-0.94	0.35	
DMI3	65.0	43.6	860.0	-3.61	0.00	55.5	49.5	958.5	-0.89	0.38	54.9	49.6	722.0	-0.67	0.50	
SSMD1	57.5	50.7	1250.0	-1.15	0.25	53.3	56.2	1021.5	-0.43	0.67	53.1	58.3	724.0	-0.66	0.51	
SSMD7	58.9	49.4	1177.5	-1.60	0.11	57.0	45.0	838.0	-1.76	0.08	54.9	49.8	724.5	-0.65	0.52	
SSMD6	58.9	49.4	1177.0	-1.60	0.11	53.9	54.3	1071.0	-0.07	0.95	53.6	55.9	766.0	-0.30	0.77	
SSMD4	65.0	43.6	856.5	-3.60	0.00	56.4	46.8	885.5	-1.41	0.16	54.6	51.1	748.0	-0.44	0.66	
SSMD3	54.6	53.4	1399.0	-0.20	0.85	51.8	60.4	907.0	-1.26	0.21	52.1	63.2	636.0	-1.39	0.16	

Table 11. Mann-Whitney U test—all difficulties.

Legend: AGE: 0 if age of the company \leq 5 years (52 respondents); 1 if age of the company > 5 years (55 respondents); PBE: 0—The current environment is favourable for business development (62 respondents); 1—The current environment is unfavourable for business development (45 respondents); SIZE: 0 if business = microenterprise (89); 1 if business = small enterprises (18); NE: 0 if NE \leq 9 employees (80 respondents); 1 if NE > 9 employees (27 respondents); MWU = coefficient of Mann-Whitney U test; Sig. = Asymptotic Sig. (2-tailed). Significant values are marked in bold. Source: Own processing.

Before presenting the test results, some clarifications are required regarding the dichotomous variables. The respondents (whose perception of the environment is evaluated) are founders/managers of companies registered in the delimited perimeter of the analysis. For these companies, the respondents provided information on variables such as the age and size of the business and the number of employees. The descriptive statistics realised on nominal values indicated the following: the average age of businesses—9 years; the average number of employees—7; the sample is mainly represented by micro-enterprises (83%). These variables showed an asymmetric distribution, highlighting a heterogeneous sample. As presented in the previous section, to facilitate non-parametric analysis, the first two variables were transformed to allow for nominal, dichotomous data. After this transformation, the three variables are presented as follows: 52 respondents manage young businesses (with no more than five years of activity), and 55 manage businesses older than five years; 80 entrepreneurs (respondents) employed within the businesses they manage up to nine employees (inclusive), while 27 respondents manage businesses that employed more than nine employees; out of the total of 107 respondents, 89 respondents manage micro-enterprises and 18 manage small enterprises.

To obtain valid results, the fulfilment of the other specific assumptions was verified in the application of the test. Assumptions about the nature of the data were met, as the dependent variables (the twenty identified difficulties grouped into five factors) are measured at the ordinal level, and the independent variables are represented by data organised into distinct, dichotomous, independent groups. As specified above, the data used do not have a normal distribution, and the distributions are not symmetrical (an aspect that can be seen in Table 3, Items Statistics section). Since the data are not symmetrically distributed, the analysis was oriented to compare the mean ranks of the dependent variables (not fulfilling the conditions for the comparison of median ranks).

The data in Table 11 highlights that entrepreneurs' perceptions may vary depending on the particularities of the businesses they manage (age, number of employees and size). Variables for which Romanian entrepreneurs' perceptions are convergent in relation to all three selected dichotomous variables: FD3 (cost of financing), DDFI3 (corruption) and DDFI1 (unstable and ambiguous legislation). For these variables, the impact is negative for all business categories analyzed.

5. Discussions

The results of the factor analysis provided useful information regarding the difficulties identified in the targeted business environment, which have a major impact on the economic activities carried out by micro-enterprises and small businesses, allowing the authorities/entrepreneurs to make appropriate decisions, taking into account the dynamics of the variables in the business environment. Based on the results of the factor analysis, the twenty analysed variables were organized into five factors, the structure of which does not differ substantially from the initial groups.

Expanded financial difficulties (E-DF). The first factor (which includes the most important difficulties faced by entrepreneurs), adds to the four financial difficulties initially identified other two difficulties from the initial supply/sales market difficulties group (SSMD5 Decrease in domestic demand; SSMD2 Difficulties in identifying customers and markets). These two newly added variables have profound financial implications. The decrease in domestic demand and the difficulties encountered in identifying new customers and new markets affect the volume of sales and implicitly the cash flow of the business. Insufficient internal liquidity can slow down or limit business development possibilities. The most important financial difficulties identified at the level of the analysed sample are represented by: insufficient funding dedicated to technological development and digitization (DF4, 0.825), difficulties in identifying financing alternatives (FD2; 0.807) and limited access to financing for newly created/ developing companies (FD1; 0.736). These difficulties are succeeded by the difficulties related to the markets: SSMD5 (0.667) and SSMD2 (0.519). Placing the variable FD3 (0.455) on the last position in this factor is justified because, in their vast majority, small/newly created companies have not contracted loans to finance current or investment activities. The fragility of sales and the lack of a consistent history to prove creditworthiness are two factors that limit credit access. Therefore, difficulties related to the high cost of credit were perceived to be of moderate importance. These results are confirmed by the results of previous studies, which listed the following difficulties: access to financing [2,11,12], the cost of financing [1,22] and difficulties associated with sales markets [3,34,35].

- Difficulties generated by dysfunctions at the level of formal institutions (DDFI). In order of importance, the second factor integrates all the variables from the category difficulties generated by dysfunctions at the level of formal institutions: DDFI3 (0.828), DDFI2 (0.818), DDFI4 (0.758), DDFI1 (0.614). The novelty is that these variables are ordered according to their importance. Corruption (DDFI3) and bureaucracy (DDFI2) are perceived as the most important difficulties. These are followed by delays in settlement with public institutions (DDFI4) and by unstable and ambiguous legislation, difficult to implement (DDFI1). These results are also in agreement with previous studies, which confirm the presence of difficulties generated by the regulatory framework, bureaucracy and corruption [39,52–54].
- Expanded difficulties induced by macroeconomic imbalances (E-DMI). The third identified factor fully accumulates the variables from two initial groups: difficulties induced by macroeconomic imbalances (DMI) and labour market difficulties (LMD). The increase in the cost of labour (LDM2; 0.818) is the most burdensome for the good operation/development of businesses, all the more so as it is the result of a forced increase in the minimum wage on the economy (both due to external pressures to align wage policies and due to inflation), which amplifies the imperfections of the labour market. Inflation (DMI1; 0.800) and taxation (DMI2; 0.637) are perceived as major difficulties faced by entrepreneurs. The cumulative impact of these difficulties translates into higher prices and lower sales (as an effect of eroding purchasing power). The modest growth of real incomes (without fully covering the effect of inflation) combined with the high level of taxation encourages undeclared work (illegal work), but also labour migration (to other domestic and/or foreign markets). Overall, businesses in the analysed region are also faced with the unavailability of qualified human resources. Last but not least, the uncertainties in the economic environment (DMI3; 0.609) hamper the predictability of business development. An economic environment marked by uncertainty inhibits corporate investment policies aimed at ensuring business growth/development. The results are convergent with the results of previous studies focused on the analysis of difficulties induced by labour market imbalances [44,45,49] and macroeconomic imbalances [39,51,52,54].
- Supply and distribution channels difficulties (SDCD). The fourth factor incorporates two variables with a significant impact on business: the increase in production costs as a result of deficiencies in supply chains (SSMD1, 0.770) and the poor quality of infrastructure, which makes it difficult to access supply and sales markets (SSMD7; 0.654) [10,11,39].
- Competition (C). The last factor brings together three variables ordered as follows: decrease in external demand (SSMD6; 0.733), unfair competition (SSMD4; 0.494) and domestic market competition (SSMD3; 0.385). These difficulties have been reported in previous studies [3,6,18,35–37]. It is worth noting that, of the three factors associated with competition, the decrease in external demand (as a result of increased competitive pressures in foreign markets) seems to have a more significant influence.

All these results demonstrate the hypothesis of inductive research, based on confirmatory factor analysis. The difficulties identified both at the national and European levels are also present in the analysed business environment.

In order to assess whether there are differences in the perceptions of the responding entrepreneurs (regarding the identified difficulties) the Mann-Whitney U test was applied. The results obtained confirm the hypothesis H1. In the following, the differences in the five groups of difficulties confirmed at the factor analysis level will be discussed.

From the point of view of financial difficulties, according to the data in Table 11, the perceptions of entrepreneurs are not convergent. Entrepreneurs who manage businesses more than five years old, who have a larger number of employees and who manage businesses classified as small enterprises believe that insufficient funds (FD4) and difficulties in identifying alternative sources of financing (FD2) are more pressing for their businesses. From a statistical point of view, only the difficulties associated with insufficient funding for

technological development and digitalisation (DF4) proved to be significant for businesses that are more than five years old (0.01 Sig. AGE). This situation can be justified by the fact that these businesses have entered the growth stage, a stage that requires additional funding sources to support technological investments and adaptation to the requirements of the era of digitization and Industry 5.0.

Regarding the access to financing of new businesses (FD1) and cash flow problems (caused by the decrease in domestic demand) (SSMD5), the analysis did not provide clear nor statistically significant results.

Difficulties in identifying customers and markets (SSMD2) (with direct implications for the financial balance of the business) influence more new businesses, which are less than five years old and do not have human resources adequate to their needs. These results are statistically significant (0.00 Sig.AGE).

The high cost of debt financing (FD3) is perceived as more important by entrepreneurs who manage businesses that are more than five years old, that have a larger number of employees, and that are categorised as small businesses. All these results are statistically significant. The results are also relevant from a practical perspective. An enterprise that has more than five years of activity can prove its creditworthiness (to contract loans). However, due to the high interest and fees, this source of financing (lending) is perceived as a factor that slows down/encumbers/negatively influences the activity of companies.

In 2023, after a fragile improvement in 2022, the perception of the financial health of businesses deteriorated [66]. The deterioration was due to a high rate of inflation (which increased the cost of business financing) and an increase in indebtedness. In the conditions of restrictive bank financing, but also against the background of serious capitalisation problems (30% of Romanian enterprises registering negative equity) [66], the solution of identifying alternative sources of financing represents a real challenge for all entrepreneurs in Romania.

From the point of view of the difficulties generated by the dysfunctions at the level of formal institutions, the analysis revealed that these difficulties have a greater impact on young enterprises (which are less than five years old), which have less than nine employees and which fall under the category of micro-enterprises. In other words, entrepreneurs managing these newly established businesses consider corruption (DDFI3), bureaucracy (DDFI2) and legislative framework (DDF1) as important factors that negatively influence their businesses. These results are statistically significant. Given that these results are not statistically significant for businesses that are more than five years old, we can admit the idea that—after five years of activity—entrepreneurs align themselves with market practices and identify ways to overcome the barriers generated by corruption and bureaucracy. In the context of a very complex (and ambiguous) legislative framework, business orientation towards the formal economy vs. the informal (underground) economy is very vulnerable. During the analysis period, the informal economy in Romania came to represent about 30% of the gross domestic product [67]. Delays in settlements with public institutions (DDF4) significantly influence all the activity of newly established enterprises, which have less than nine employees. The directly targeted operations are those that concern the collection of invoices issued based on commercial relations with public institutions or those that concern the recovery of sums from various public budgets.

Difficulties induced by macroeconomic imbalances (E-DMI) have an impact on business. According to the data in Table 11, the impact is greater (and statistically significant) on businesses that have less than five years of activity. The unavailability of skilled labour (LDM1), rising labour costs (LMD2), inflation (DMI1) and tax burden (DMI2) put pressure on selling prices. The increase in the prices of own products/services affects the competitiveness of the business and accentuates the uncertainties regarding the survival or development of the business (DMI3).

Regarding difficulties associated with supply and distribution channels (SSMD1), including those related to transport infrastructure (SSMD7), the analysis revealed that entrepreneurs' perceptions are not convergent. Even if the results did not prove to be

statistically significant, these difficulties are present in the analysed business environment, directly impacting the costs and times of production and distribution. Given that delivery time is an important element of the value package offered to customers, these difficulties directly affect the competitiveness of businesses, impacting both the decrease of domestic demand (SSMD5) and external demand (SSMD6).

The competitiveness of a business depends on the extent to which it manages to capitalize on opportunities and control/overcome difficulties/threats. Today's markets are free, globalized markets, and the free movement of goods, people and capital are prerequisites for increased competition (C). For the analysed sample, entrepreneurs have different perceptions regarding the difficulties induced by fierce competition (SSMD3). It should be noted that more important (and statistically significant) are the difficulties generated by unfair competition (SSMD4, Sig. 0.00). The most affected are the businesses that are less than five years old. These results are confirmed by the specialized literature. For example, Wang and Guedes (2024) [1] reported that SMEs are under increasing pressure due to global competition and complexity.

All these results are confirmed in the literature review, where it was shown that smaller businesses face more challenges [8], and the size and age of the business limit access to financing and qualified human resources [1,17,34,35,54], having a negative impact on performance [8].

6. Conclusions

The present study is focused on identifying and assessing the difficulties in the business environment. Explicitly, the difficulties encountered by micro-enterprises and small enterprises in a limited geographical area were considered. The research focus on this business segment is justified by the fact that businesses differ in their nature and size, and the environment in which these businesses operate influences their activities differently. An additional argument for this direction of research is represented by the fact that previous studies were based on assessments made on large (more or less homogeneous) samples, without considering the spatial or structural differences of the analysed phenomena.

This study fills the existing literature gap and is distinguished by the research topic and methodology addressed. The main objective was to assess the entrepreneur's perception regarding the most important difficulties in the business environment. The aim was to identify and validate a set of difficulties faced by entrepreneurs in the targeted geographic area. Different from the results of previous studies, the present study shows that the most significant from a statistical point of view were financial difficulties, difficulties generated by dysfunctions at the level of formal institutions and difficulties induced by macroeconomic imbalances. Using three dichotomous variables, it was shown that the difficulties analysed affect more newly established businesses, which have fewer employees and are classified as micro-enterprises.

The results of the study are useful from at least two perspectives. First of all, knowing the specific difficulties provides support for the adequacy of public policies (regional or local) aimed at economic revitalization through specific measures to support local economic development. Second, it provides support to current/potential entrepreneurs in setting up business strategies to overcome the inherent difficulties in the business environment. Even though the empirical research was conducted on a pilot sample, these practical implications can also be considered for the other eighteen less developed regions in the European Union.

The results of the present study should be interpreted with caution given that the research was exposed to some limitations. The main limitation is given by the fact that the analyses are limited to a specific sample (delimited spatially and temporally). This limitation was assumed in the context of the concern to ensure the homogeneity of the sample. However, taking into account the fact that the difficulties selected to be tested were present in the European business environment (not only at the level of the analysed region), the results of this study can be extrapolated to the other less developed regions of the European Union. Moreover, this limitation is compensated by the fact that the research

methodology (which sought to comply with all the rigours of statistical data processing) can be replicated on larger samples, to allow comparative analyses at the level of regions or even countries. Compared to the parametric methods, the use of non-parametric methods presents some risks related to the accuracy of the results and the reliability of the conclusion. In the development of this research, the application of the most appropriate methods in relation to the particularities of the constructed database was taken into account, aiming to comply with all statistical rigors. In future research, the application of other statistical methods appropriate to the available databases will also be considered. Last but not least, it should be pointed out that the present study carries out a global assessment and testing of the difficulties identified in the business environment, without making any particularizations at the level of different industries. Since each industry faces specific challenges, this debate will represent a priority in future research.

Author Contributions: Conceptualization, M.B.T.; methodology, M.B.T., S.D.I., I.D., L.B. and V.D.R.; validation, M.B.T., S.D.I., I.D., L.B. and V.D.R.; investigation, M.B.T., S.D.I., I.D. and L.B.; writing—original draft preparation, M.B.T., S.D.I., I.D., L.B. and V.D.R.; writing—review and editing, M.B.T. and V.D.R. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: Data are contained within the article.

Conflicts of Interest: The authors declare no conflicts of interest.

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How well do the companies responsible for facilitating the digital transition perform? An analysis on Romanian ICT sector

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Abstract

Purpose – This study proposes an analysis of the performance of companies that have assumed the responsibility of facilitating the digitalization of economic activities. Because of their potential to accelerate digitization, these companies have been financially supported. The monitoring of the performances recorded by these companies, including the evaluation of the impact of different determining factors, meets both the needs of the financiers (concerned with the evaluation of the efficiency of the use of nonreimbursable financing) and the needs of continuous improvement of the activities of the companies in the field.

Design/methodology/approach – The study assesses performance dynamics and the impact of its determinants. The model allows achieving a simplified vision of performance and its determinants, supporting decision-makers in the management process. The construction of an estimation model based on the multiple regression method was considered. Robustness tests were performed on the results, using parametric and nonparametric tests. **Findings** – The results of the analysis at the level of the extended sample indicated that, during the analyzed period, the economic and commercial performances decreased, and significant influences in this respect include the financing structure, sales dynamics and volume of receivables. The analysis at the level of the restricted sample confirmed these interdependencies and provided additional evidence of the impact of other determinants. **Research limitations/implications** – The study contributes both to performance research and to the assessment of the prospects for accelerating digitalization in support of economic activities. Since the empirical research was carried out on a sample of Romanian companies that provide services in information technology, which accessed nonreimbursable financing, the representativeness of the results is limited to this sector. For the analyzed sample, the study provides support for improving performance.

Practical implications – The results of the study prove to be useful from a microeconomic and macroeconomic perspective as well, as they provide evidence on the performance of companies that have implemented information and communication technology (ICT) projects and on the efficiency of the use of non-reimbursable funding dedicated to business support.

Originality/value – The study fills the literature gap regarding the performance of companies that have developed ICT projects and received grant funding for the implementation of these projects. The literature review indicated that there are few studies conducted on these companies, which did not include Romanian companies.

Keywords Digitalization, ICT, Projects, Non-reimbursable financing, Company performance,

Determinants of performance

Paper type Research paper

1. Introduction

The development of society as a whole catalyzed by technical-scientific progress generates a process of translation in the sphere of production factors used, from the classic ones to some

Performance of ICT companies

Received 28 November 2023 Revised 16 January 2024 6 March 2024 2 April 2024 Accepted 2 April 2024



Kybernetes © Emerald Publishing Limited 0368-492X DOI 10.1108/K-11-2023-2500 much more complex ones, as a source of acquiring competitive advantages and implicitly increasing the performance of companies. The assimilation and use of new technologies by companies often require ample financial resources that cannot be provided by their own effort, thus imposing a financial effort of the state in the direction of co-financing or the involvement of supranational organizational structures. In this sense, the digitalization of industry, agriculture, trade, etc. is among the main current concerns of the European Union (EU), given its potential to contribute to the optimization of the firm's performance (Abou-Foul *et al.*, 2021), the promotion of adequate management in the sphere of decision-making and the flexibility of processes and strategies (Matalamäki and Joensuu-Salo, 2022). At the same time, digitalization leads to the stimulation of innovation and creativity in the business environment, to the dissemination of knowledge, contributing to the increase of competitiveness at the micro and macroeconomic level.

The financing mechanisms aimed at supporting digitalization require institutional involvement at an aggregate level, both in the field of specific decisions adopted by the executive (European Commission) and in the active participation of the member states, in the direction of designing strategies at the national level, the adoption of concrete plans and measures and the co-financing of the commitments assumed. The digitalization of industry was initiated in 2016 by the European Commission in the context of the digital single market strategy (European Commission, 2016), which proposed the creation of an appropriate, stimulating framework for the dissemination of technical and technological progress for the benefit of private economic operators in the European space, through digital innovation centers. The purpose of these centers/hubs was to provide expertise services in the field of technologies, testing and networking, all contributing to a potential increase in revenues (to over 110 billion euros annually – European Commission, 2017) but also to the removal of existing disparities (Schrauf and Berttram, 2015; Rüßmann *et al.*, 2015).

Despite these efforts at the institutional level and consistent investments focused on offering digital services, creating real value for customers and increasing the financial performance of the investment is still considered an elusive goal (Kamalaldin *et al.*, 2020). At the same time, the empirical results regarding the impact of digitalization on the performance of companies have not reached convergent conclusions.

Some authors are reserved regarding the impact of digitalization on performance (Qiu *et al.*, 2018), drawing attention to the costs related to the integration of technologies, the removal of managerial inertia, the redesign of relations with business partners. Conversely, other study shows that there is a positive correlation between the level of digitalization of firms and their financial performance (Ji *et al.*, 2022). Heredia *et al.* (2022) show a positive influence of digital skills on the performance of firms with technological capabilities. Usai *et al.* (2021) argue that innovation performance can be achieved through creativity and constant efforts in research and development activities. At the same time, companies in the ICT sector are the most innovative, registering the highest share of research and development expenses (Hunady *et al.*, 2020). But although studies (i.e. Janger *et al.*, 2017) have provided evidence on the higher level of productivity and profitability of knowledge-generating companies by adopting new digital technologies, such as Big Data, AI (artificial intelligence) and machine learning, the literature is poor in terms of determinants of their performance.

On the other hand, the indices of the digital economy and society, at the level of 2022, place Romania in last place among the EU member states, identifying large gaps in terms of digital technologies and digital public services (for citizens and businesses) (European Commission, 2022). The share of SMEs that have at least a basic level of digital skills is low, as is the percentage of businesses that exchange digital information, all this against the background of the lack of an articulated government strategy in the field of digital skills. The share of SMEs that have at least a basic level of digital intensity was well below the EU average (22% compared to 55%), and there is a significant difference also in terms of the adoption by SMEs of cloud technologies or artificial intelligence. The need to support Romanian companies to Performance of ensure the digital transition thus appears more than obvious. At the same time, measuring the performance of these companies and evaluating the determining factors of financial performance can represent a way of improving the performance of ICT companies.

Previous empirical research focused on the analysis of the determinants of financial performance provides mixed results, limiting both the possibility of systematic replication of the analyses and the representativeness and generalization of the results. The lack of convergence in the results is due to the diversity of the samples selected for analysis, the periods analyzed, the data processed, the indicators used to evaluate the variables and the analysis models used. The particularities specific to the different business environments, the analyzed periods and the very rich instrumentation do not justify an exhaustive analysis. Therefore, as recent scientific research proves (Tudose and Avasilcăi, 2021), analyses at the level of samples and clearly defined periods are able to provide new results that contribute to the advancement of knowledge on performance and determinants.

From the perspective of these considerations, the present study investigates the performance and its determinants for a sample that was not the subject of previous studies, represented by Romanian ICT companies that benefited from non-reimbursable financing. The analyzed period is characterized by the fact that it is delimited correlated with the life cycle of projects with non-reimbursable financing (projects dedicated to facilitating the digital transition). The method, data and indicators used in the empirical research are selected according to the particularities of the analyzed companies.

Therefore, our work adds to the literature by proposing an evaluation of the performance of Romanian companies that have assumed the responsibility of facilitating the digitalization of economic activities by accessing the non-reimbursable funds offered by the EU, along with the identification of the determining factors of the performance of this sector. The hypothesis from which our research starts is that firms responsible for digitalization, which have benefited from non-reimbursable financial assistance, possess technological capabilities and digital skills and are also oriented towards creativity and innovation, which allows them to increase their performance.

2. Theoretical background

Seen as a break with the past, as a "disturbance" of an old status-quo, the digital transformation process becomes a projection of new strategic frameworks, intended to reconfigure the company's competitive capabilities (Warner and Wäger, 2019) in the direction of creating new business models. These models are characterized by the reduction of information disparity, the proximity to buyers and the flexibility of production processes as a result of adaptation to the market. But this mutation manifests sui-generis, with a high dynamism due to technical and technological progress, inducing volatility, uncertainty and complexity of the business environment (Matt et al., 2015). In the end, the consequence is the materialization an organizational transformation, which integrates digital technologies and business processes in a digital economy.

Other authors see the digitalization process as articulated on a number of three consecutive phases (Matzler et al., 2018): digitization of products and services (Internet of Things, smart devices), digitization of processes and decisions (Industry 4.0., Big Data), and the digitization of business models. The latter generate new digital processes and products and new forms of making profits, leading to a paradigm shift of specific business models, where classic products and services are replaced by digital ones. All these results in a new segmentation of the markets. New markets and market niches are identified, in which networks of strategic partnerships between firms play an important role by developing dynamic competitive capabilities (Chesbrough and Schwartz, 2007).

ICT companies

A study by the European Investment Bank (Cathles et al., 2020) demonstrated a positive and significant correlation between the digitalization of companies and their productivity. But although there is a positive correlation between productivity and performance (Chen and Srinivasan, 2023; Ricci et al., 2020), Chen and Srinivasan (2023) point out that high productivity does not automatically lead to increased performance. The explanation is that the adoption of digital technologies is costly, the companies registering a decrease in shortterm financial performance. Other works also emphasize the existence of a time gap between the moment of investment flows of this nature and the maturation of the new business model. at least in the initial phases, when marginally, the level of profits is exceeded by that of costs in the implementation phases (Deng et al., 2021). Even in these conditions, digital technologies ensure the development of the business, subsequently stimulating innovation, the collection and processing of data regarding the present and future requirements of consumers, foreshadowing trends in the development of related products and services, maintenance (Nambisan et al., 2017), etc. In this sense, the financial performance will be closely related to the emergence of synergies between the results of digitalized and classic activities, respectively with the possibility of sharing information obtained with the help of new technologies between different functional structures of the entity (Guo and Xu, 2021).

An OECD study (2021) highlighted that the benefits generated by digitalization are internalized by companies differently, depending on their technical and managerial skills, reflecting distinctively in their financial performance. The greatest gains from the adoption of digital technologies are achieved by firms with superior technical and managerial skills. For example, studies carried out on KIBS (knowledge-intensive business services) have highlighted the role of companies in this sector in generating new knowledge (Chung and Tseng, 2019), by contributing to the transformation of e competencies and skills bases and to the development of employees' work capabilities. According to Ribeiro-Navarrete *et al.* (2021), the superior financial performance of companies in the KIBS sector is due to the use of social networks for corporate purposes, their continuous adaptation, the development of employees' skills to use digital technologies and the experience of managers.

Salvi *et al.* (2021) consider that the market performance of companies, which is reflected in the share price, is positively correlated with the degree of adoption of digital technologies in their activities. These companies enjoy increased revenue, connectivity and digitalization making it easier for them to expand their market through online commerce, customer knowledge and a faster response to their needs. At the same time, they can reduce their costs by developing innovative business models and optimizing the use of resources. Iona-cu *et al.* (2022) conclude that digitalization efforts are rewarded in financial markets, through a greater attractiveness of investors towards digitalized companies, but the effects of digitalization on financial performance occur with a certain lag, related to investors' expectations regarding future economic results.

Regarding the determinants of financial performance, the literature review indicated that they are very various (Kristóf and Virág, 2022; Tousek *et al.*, 2021). Taking into account the particularities of the companies selected for analysis, the analyzed period and the specifics of the field of activity, the current literature review sought to identify the influences of the most representative factors determining performance: the financing structure (leverage and degree of indebtedness), tangibility of assets, liquidity and business size, growth rate, investment capacity, etc.

The tangibility of assets is shown to have an important role in creating the premises of accessing external credit, given its ability to reduce transaction costs and information asymmetry (Liberti and Sturgess, 2016), and having a direct positive influence in terms of financial performance (İltaş and Demirgüneş, 2020). However, other studies do not identify a direct link between the profitability of companies and the tangibility of assets (Odusanya *et al.*, 2018). For large firms, the tangibility of assets contributes to increasing the possibility of

business financing through loans, argue Oke and Obalade (2015), but will lead to an increase Performance of in the degree of indebtedness which, at least in the case of long-term loans, will generate mutations in the capital structure, affecting the financial performance of companies (Abosede, 2020). As a consequence, it is the responsibility of financial management to ensure the optimization of the degree of indebtedness, relative to the activity sector, the market share (Valaskova and Gajdosikova, 2021), but also taking into account the size of the company, because the larger it is, the better it can catalyze the reduction of the risk of over-indebtedness. The relationship between size and financial performance is negatively mediated by indebtedness in the study of Lopez-Valeiras et al. (2016).

Although Kristóf and Virág (2022) showed that different components of leverage can be considered viable predictors for the performance of companies in different sectors, opinions do not converge on leverage either. Some researchers determine a negative relationship between leverage and profitability (Ghardallou, 2023), while for others the relationship is positive (Lenka, 2017). Other authors provided evidence on the negative impact on return on assets and the positive impact on return on equity (Tousek et al., 2021). A study conducted in the financial technology industry (Papadimitri et al., 2021) found that financial leverage has a negative impact on profitability and risk-adjusted performance, new firms being more vulnerable.

Some studies do not find a direct determining relationship between quick ratio and financial performance, even suggesting that liquidity is in an inversely proportional relationship with profitability (at least in the case of companies operating in the food sector) (Paringga and Kurniawati, 2022) while others suggest a relatively positive influence on return on assets (Sari *et al.*, 2022). By referring to the gross profit margin of some companies in the same sector, no significant effect of the current ratio is identified (Durrah et al., 2016).

Uwonda and Okello (2015) argue that maximizing sales and increasing the market share of firms cannot be achieved without a judicious lending policy, and consequently, Mbula et al. (2016) demonstrate the existence of a positive significant linear relationship between account receivable and financial performance of firms funded by government venture capital. Other research points out that the financing of research and development expenses in general puts financial management in a dilemma. If up to a certain point, considered critical, financial performance will be stimulated by increasing the ability to innovate, beyond it, costs will register an upward trend, impeding/burdening the expected profit (Qi and Deng, 2019).

As previous studies have pointed out, performance measurement unconditionally involves an evaluation process and forces the use of a set of strategic, tactical and operational key indicators (Re Cecconi et al., 2019). The indicators used in the performance management area are delimited into two groups: financial and non-financial. This paper focuses on the determinants of financial performance, considered a multidimensional concept, which is why performance measures are very diverse/varied and numerous. Due to the diversity of indicators (associated with the impossibility of their simultaneous and integral use), decision makers have options/preferences on the use of certain indicators. In this context, the careful selection of indicators should be carried out with special care and responsibility. This is because, depending on the quality and relevance of the information they provide, the selected indicators can be decisive both in the strategic planning phase and in the control activity.

For example, Castelnuovo and Pellegrino (2018) and Ardian et al. (2021) consider that the most important measures for financial performance are those that highlight liquidity, solvency, business efficiency, profitability and asset growth. In order to determine the impact of applying IFRS 16 on the financial statements and key financial reports of a company, Susanti *et al.* (2021) considered the following performance measures: profitability (reflected by ROA and ROE); solvency (reflected by the ratio between total debt and equity, respectively, total asset); efficient use of assets (reflected by the ratio between total sales and total asset), liquidity (or net cash flow from operating activities, respectively, the interest coverage ratio).

ICT companies

Both researchers and practitioners have made pertinent suggestions on the use of certain performance measurement methods (Kopia *et al.*, 2017). However, it is the duty of each decision-maker to select the most appropriate measurement methods/techniques/tools. Although the literature has been substantially enriched with increasingly complex studies on performance, the research findings are not convergent for at least two considerations: (1) different measurement tools are used; (2) there is no common priority order as regards performance drivers (Ayako *et al.*, 2015).

Holistically analyzing the literature focused on performance evaluation, taking into account the incidence of its determinants, it is observed that two determinants have received the most attention: the financing structure (reflected by the combination of own funds and borrowed funds) and the size of the firm. Although the researchers' concerns were convergent (pursuing the identification of ways to increase the company's performance/value), the results of their studies were divergent, shaping two striking theories: trade-off theory, which supports the positive impact on performance, and pecking order theory, which substantiates the negative impact on performance. Due to the fact that the pecking order theory does not aim to reach an optimal level of indebtedness, some authors (Kannadhasan *et al.*, 2018; Simatupang *et al.*, 2019) consider that the trade-off theory is better than the pecking order theory.

Extending the perspective to the other determinants of performance, few studies provide convergent results. Thus, it has been admitted that performance measurement is dependent on the data used in the measurement system and the tools used. In addition to the established indicators used in financial analysis to measure performance (efficiency of resource use, debt level, capital efficiency, liquidity, etc.), recent researches have emphasized that the evaluation of the company's performance based on financial indicators must be complemented with the evaluation based on non-financial ones. The latter reflect the quality of management (Arda *et al.*, 2019), corporate culture (Chatman *et al.*, 2014), business sustainability (Hussain *et al.*, 2018; Xu and Wang, 2018), the effectiveness of management remuneration policies, the quality of the communication system with the shareholders and the reputation of the members (Orozco *et al.*, 2018), the ability to innovate (Sjödin *et al.*, 2019), the market orientation (Ho *et al.*, 2018), etc.

3. Research objective, methodology and data

The analyses carried out at the level of the European Union (EU), which focused on the assessment of regional development disparities, showed that, in South-Eastern Europe, some countries (including Romania) registered significant gaps in terms of competitiveness and sustainable economic growth. In this context, the institutions of the European Union have given priority to supporting the economies of these countries, providing financing based on the European Regional Development Fund and the Cohesion Fund. The conditions for granting financial support have been established to respond to the particularities of the Member States concerned. In addition to European regulations, member states have established their own investment priorities (and specific criteria for granting non-reimbursable financing) to help bridge the gaps. Therefore, each member state had its own intervention mechanism, adapted to its needs, but oriented towards achieving the objectives assumed at the European Union level.

Having as a benchmark the European intervention mechanism, the national criteria that were the basis for the granting of financial support (in the form of non-reimbursable financing) and the macroeconomic context specific to each member state, the possibilities of constructing the sample for the empirical research were limited. Only the analyses at the member state level proved relevant. For this reason, the analysis in the present study focused on the example of Romania.

In the period 2014-2021, in order to facilitate the transition to a digital economy and to Performance of meet EU requirements, Romania has assumed the objective of increasing the ICT sector's contribution to business development, especially electronic commerce, Financial support was granted to companies in the ICT sector that have demonstrated the ability to contribute to the development of the infrastructure necessary for the process of monitoring online transactions. Therefore, the present study aims to assess the financial performance of companies that have taken on the responsibility of providing ICT solutions for business development. Subsidiarily, the identification of the determining factors of financial performance was also pursued. The assumed research questions were: (RQ1) How did the performance of these companies evolve during the implementation of the projects, compared to previous periods? And (RQ2) what are the determinants of the performances recorded by these companies?

In order to analyze the performance and its determinants, the companies that benefited from non-reimbursable financing with the aim of facilitating the digitalization of economic activities were considered. The construction of the sample was based on the reports on access to and use of non-reimbursable financing. Specifically, the data related to the Competitiveness Operational Program (COP) were used, as presented in the list of contracted projects, according to the report from June 30, 2022.

Implemented in the 2014–2020 period, the mentioned program provided non-refundable funding to support investments aimed at increasing the competitiveness of firms. Special attention was paid to the action to support the use of ICT for business development, especially the framework for running electronic commerce (Action 2.2.2). Funding for these objectives was opened in 2017. According to the reporting of June 30, 2022, financing was secured for 252 projects. At the time of reporting, 126 projects were completed, 97 projects were under implementation and 29 projects were terminated. Out of the total of 126 completed projects, 27 aimed to facilitate access to the Internet (broadband) and 99 projects aimed to offer ICT solutions for economic activity. For the realization of the empirical research, the 99 companies that have completed the implementation of the projects (as of the reporting date – June 30, 2022) were taken into account. Some difficulties were encountered in the data collection process due to the unavailability of reports. As data for eight companies were not available, the sample was reduced to 91 companies.

Out of the total of 91 companies, only two are organized as large companies (joint-stock companies), the rest being small and medium enterprises, without access to the capital market. Therefore, the possibilities of processing market data have been shattered. Instead, according to national regulations, for these companies are published annual synthesized financial statements (on the website of the Ministry of Finance). For this reason, the empirical research was based on secondary data collected from annual financial statements available online.

For the present study, the construction of the dataset was done manually, collecting data for each of the 99 companies (for the period 2015-2022), corresponding to the information presented in the synthesized annual financial statements. The information in these documents is limited to: turnover; gross and net profit; recorded revenues and expenses; fixed assets and current assets (detailed by stocks, receivables and availability); share capital and equity, liabilities and average number of employees. For the empirical research related to the present study, the full potential of the available dataset was taken into account. Thus, based on the available data, three indicators were determined with the role of measuring performance and eleven indicators that have the potential to exert a direct or indirect influence on business performance. The total number of observations was 10,192, which corresponds to 14 indicators, for 91 companies and 8 years of analysis.

For the selected companies, data were collected to allow the determination of the variables related to the analysis (Table 1). According to literature, the indicators selected to measure

ICT companies
Λ		Symbol	Methodology of computation	Potential impact on performance
	Dependent variables			
	Return on assets	ROA	Gross profit/Total assets [%]	-
	Return of equity	ROE	Net profit/Equity [%]	-
	Return on sales	ROS	Gross profit/Turnover [%]	—
	Independent variables			
	Turnover growth rate	Tgr	Turnover $n/(n-1)$; 2017 = 1[index]	(+)
	Levier	LEV	Debts/Equity [%]	(+)
	Level of	LI	Debts/(Debts + Equity) [%]	(-)
	indebtedness	_		
	Tangibility	Tang	Fixed assets/Total assets [%]	(+)
	Ability to invest in term	Ait	Fixed assets/Turnover [%]	(—)
	Share of receivables	R/T	Receivables/Turnover [%]	(—)
	Income per expenditure	I/E	Income/Expenditure [index]	(+)
	Quick ratio	QR	Cash/Debts [%]	(+)
	Current ratio	CR	Current assets/Debts [%]	(+)
Table 1.	Labor productivity	LP	Natural logarithm of turnover per number of employees	(+)
estimating	Firm size	S	Natural logarithm of total assets [%]	(+)
performance impact	Source(s): Authors' of	own resear	ch	

performance highlight the financial competitiveness of companies (Sachin and Rajesh, 2022; Kristóf and Virág, 2022). Regarding the indicators selected to measure the determinants of performance, recent studies confirm their usefulness at the analysis level (Tousek *et al.*, 2021; Kristóf and Virág, 2022).

Return on assets (ROA), return of equity (ROE) and return on sales (ROS) are the most widely used performance measures, reflecting the efficiency of assets, equity and sales. Since the selected companies are subject to different profit taxation regimes, in order to have a common reflection of the efficiency of the use of assets, the size of the gross profit was used as a benchmark in determining the ROA indicator. This decision is also justified by the fact that some of the selected companies recorded losses, which were carried over to the results of the following years. This made the annual net profit no longer reflect the economic-financial reality. Moreover, Strouhal *et al.* (2018) pointed out that the possibilities for determining ROA differ depending on the source of information (synthesized/extended documents) and the legal provisions regarding the reporting of financial results (International Financial Reporting Standards -IFRS, International Accounting Standard -IAS 1). The authors also highlighted that, when analyzing the interdependence between LI and ROA in the case of companies with higher debt, it is recommended to use the methodology for determining ROA by referring to earnings before interest and taxes.

The estimation of the potential impact of the different determining factors on the three selected performance measures (detailed in the last column of Table 1) was carried out in a generic manner (without an explicit breakdown on each performance indicator), considering the following arguments: (1) no studies carried out on similar samples (represented by companies from the ICT industry in Romania) were identified: (2) there is no convergence at the level of the results of the analyses carried out on Romanian companies from other fields (Tudose and Avasilcăi, 2020; 2021); (3) the impact of different factors on different

performance measures may vary depending on the life cycle of the projects (Gavrila-Paven Performance of and Wainberg, 2022).

ICT companies

In the selection of the dependent variables, both the data available for the selected sample and the recommendations of previous studies, which sought to capitalize on the information from the annual financial statements (Ardian et al., 2021; Susanti et al., 2021), were taken into account. Specifically, we considered the indicators that highlight the volume and dynamics of sales, the efficiency of the use of material and human resources, liquidity, solvency and the efficiency of the activity. Thus, turnover growth rate (Tgr) was determined as an index to reflect turnover dynamics from one year to another. The year 2015 was considered the reference year; values in subsequent years reflected the increase in turnover compared to the previous year. In the financial literature, this index is used to reflect the dynamics of a business. Leverage (LEV), according to the determination methodology (presented in Table 1), compares the absolute size of debt and equity. Values lower/higher than 100% indicate a predominant use of own funds/those that generate debt. Different from leverage, level of indebtedness (LI) reflects the share of debt in the total financing available in a business. Tangibility (Tang) highlights the composition of the company's assets, showing the share of assets available to the company for a period longer than one year. When fixed assets are related to turnover, the ability to invest in term (Ait) can be evaluated. Share of receivables (S/T) was chosen in our research to reflect the commercial policy of the companies (recording receivables reduces the possibilities of current financing of the business in favor of customers). Income per expenditure shows the amount of income generated by each monetary unit spent. Quick ratio (QR) and current ratio (CR) are two indicators that reflect the extent to which companies correlate their volume of current assets with the volume of shortterm debt. Firm size is an indicator often used in financial management analyses that link the company's performance and debt level. The theories formulated in this sense (pecking order theory and trade-off theory), respectively their divergent positions regarding the impact of company size on performance, represent a challenge for financial analysts. In addition to material and financial resources, this research also evaluates the contribution of human resources on the performance of Romanian companies responsible for digitalization. Labor productivity (LP), like profitability indicators (ROA, ROE, ROS), is an indicator that reflects the efficiency of resource use.

The analyzed period was selected in such a way that the dynamics of performance could be defined both in the period preceding the implementation of the projects (2015–2017) and in the period of implementation and post-implementation (2018–2022). The analyzed period corresponds to the pre- and post-pandemic period, being marked by alternations between increases and decreases in the performance of Romanian companies, both for those providing services and for those that carried out industrial activities (Nicolescu, 2022).

For the assessment of the causal relationship between performance and its determinants, the method of multiple regression was used. Since the data from the selected sample take into account a set of 14 indicators, for 91 companies, over a period of 8 years, the regression analysis assumed the use of the appropriate mode for panel data (pooled OLS regression). The choice for this method of statistical analysis was justified by the nature of the data but also by the fact that the method is often used in analyses focused on evaluating the interdependencies between performance and its determinants.

The general model of the regression equation was: $Xit = Yit \cdot \beta_1 + Zit \cdot \beta_2 + Uit$, where i represents the companies selected for the analysis, t is the time (2015–2022); Xit is the dependent variable (in our case ROA, ROE or ROS); Yit represents the independent variables (Tgr, LEV, LI, Tang, Ait, R/T, I/E, Qr, CR and LP); Zit represents the control variable (S); β_1 and β_2 represent the coefficients; Uit is the error term. After a careful analysis of the dependent and explanatory variables, tests on the multicollinearity of the data were performed. These tests required the organization of analyses on two samples (one extended and one restricted). Using SPSS software, descriptive, correlation and regression analysis were run. After obtaining the estimated values of the parameters of the regression models (using the method of the smallest squares), robustness tests were carried out (using parametric and non-parametric tests).

4. Results and discussion

Descriptive statistics indicated the existence of outlier values for the selected variables. The heterogeneity of the data collected for the selected companies is due to the fact that the selection for the sample was not made on the basis of predetermined criteria. All 91 companies that received grant funding and completed project implementation were included in the sample. The presence, in the data series, of some outlier values generates risks related to the statistical significance of the results and their representativeness. In order to minimize these risks, 33 companies that recorded losses for more than one year (over the 8 years analyzed) were eliminated from the total of 91 companies (Table 2). Doing so, the minimization of special cases registered by companies was also pursued.

According to the data in Table 2, some of the analyzed independent variables have negative minimum values. The analyses carried out on the dataset (built on account of the information from the synthesized annual financial statements) indicated the following:

- The minimum negative values of the indicators that reflect the financing structure (1)(LEV, LI) are given by the registration of negative values at the level of equity (due to the significant increase in the volume of debts). Out of the 728 annual equity data recorded by the analyzed companies, 89 were negative. This situation was recorded by 23 of the 91 companies. Three of these companies recorded negative equity for only one year, and 23 recorded negative equity for 2 or 3 consecutive years. The negative values were recorded during the project implementation period (2017–2022). In 2022, only 4 companies registered negative capitals (of relatively small values). The main justification for these situations is given by the financing mechanism. According to the pre-established procedures, the beneficiaries of this type of financing (respectively the companies that have been selected) must ensure the implementation of the projects from their own or borrowed funds. On predetermined dates, the beneficiaries submit a request for reimbursement on the basis of which the management authority approves the transfer of the amounts, corresponding to the evidence related to the expenses incurred. To ensure the implementation of the projects, the companies resorted to bridging loans (contracted based on the financing request approved by the management authority. After eliminating the 33 companies, only one remained in the restricted sample, which recorded negative equity only in 2021 (-33,445 m.u.). In 2022, the equity of this company became positive (53,626 m.u.).
- (2) The minimum negative values of the indicators determined by fixed assets (Tang, Ait) can be explained as follows. In 2019 and 2020, only one company recorded negative fixed assets. The situation is justified by the very large difference between the negative equity (-662,103 m.u.) and the debts registered in 2020 (944,726 m.u.). In 2021, this company recorded a halving of debts, and in 2022 it no longer records negative fixed assets. In the restricted sample (58 companies) this company was no longer included.
- (3) The minimum negative value of the QR indicator (from Table 2) is given by the fact that six companies temporarily recorded, during the implementation of the projects, cash availability with negative values. Thus, two companies recorded negative values for four consecutive years (2018–2021). One company recorded negative cash

) urtosis	$\begin{array}{c} 7.2\\ 208.3\\ 88.8\\ 88.8\\ 13.7\\ 13.7\\ 13.7\\ -0.2\\ -0.2\\ 133.3\\ 77.8\\ 0.8\\ 0.2\\ 0.2\end{array}$	Performance o ICT companie
s; 8 years) ss Kı		
companie Skewne	-7.6 -7.6	
dicators (91 Std.Dev	$\begin{array}{c} 23.3\\71.7\\71.7\\1.4\\1.4\\582.8\\34.2\\32.9\\332.1\\60.4\\4.7\\9.4\\1.0\\1.5\end{array}$	
of the 14 in Mean	$\begin{array}{c} 18.4 \\ 46.5 \\ 18.2 \\ 1.4 \\ 54.4 \\ 54.4 \\ 554.4 \\ 56.6 \\ 68.6 \\ 68.6 \\ 105.9 \\ 1.3 \\ 3.8 \\ 1.3 \\ 3.8 \\ 1.3 \\$	
ata for each Max	$\begin{array}{c} 108.9\\ 1308.2\\ 252.1\\ 19.0\\ 3685.1\\ 472.9\\ 98.8\\ 98.8\\ 3836.4\\ 4916.9\\ 113.8\\ 1$	
464 di Min	$\begin{array}{c} -144.0 \\ -247.3 \\ -619.9 \\ 0.1 \\ -338.8 \\ 0.0 \\ 0.0 \\ 0.0 \\ -5.4 \\ 0.4 \\ -0.4 \\ 0.0 \\ 9.7 \\ 10.7 \end{array}$	
ars) Kurtosis	$\begin{array}{c} 185.5\\ 237.8\\ 86.0\\ 86.0\\ 47.5\\ 179.0\\ -0.3\\ 101.2\\ 55.5\\ 55.5\\ 55.5\\ 712.2\\ 10.3\\ 10.3\\ 10.3\end{array}$	
ompanies; 8 ye Skewness	-2.8 0.5 -8.4 19.4 3.0 -7.5 0.8 9.1 6.6 6.6 6.6 10.2 21.5 -1.9 -1.9 -1.9	
dicators (91 co Std.Dev	$\begin{array}{c} 67.8\\ 343.4\\ 186.8\\ 5.3\\ 5.3\\ 179.6\\ 179.6\\ 24.9\\ 24.9\\ 24.9\\ 24.9\\ 24.2\\ 48.2\\ 4.2\\ 4.2\\ 2.7\\ 1.9\end{array}$	
of the 14 in Mean	$\begin{array}{c} 11.5\\ 45.7\\ -12.2\\ 1.7\\ 257.0\\ 68.6\\ 68.6\\ 27.3\\ 93.4\\ 1.70.0\\ 1.2\\ 1.2\\ 1.2\\ 1.2\\ 1.2\\ 1.2\\ 1.2\\ 1.2$	
lata for each o Max	1029.7 5823.0 666.0 126.0 1194.3 98.8 3836.4 4916.9 1295.1 73.7 577.4 17.1 17.1 17.1 17.1 19.0 wn research	
728 (Min		
	ROA ROE Tgr LLEV LLI Tang Ait Ait CR CR CR CR CR CR S Source(s	Table Descriptive statisti

for three consecutive years. Three companies recorded negative cash for just one year. Only the company that recorded three consecutive years of negative cash remained in the restricted sample, but in 2022 the cash becomes positive. A company can record negative cash when its payments are greater than its receipts, the difference being covered by the cash infusion made by the founders/managers.

- (4) The minimum negative value of the R/T indicator (from Table 2) is explained by the fact that only one company registered negative receivables in 2018. The situation cannot be attributed to a registration error because the company in question registered receivables in the previous year (2017) and in the following year (2019) of approximately 36% of the sales value. By their nature, trade receivables are relatively certain assets. When a customer enters insolvency proceedings, the receivable related to the business relationship with this customer may become negative. Since the case is only an isolated one, without raising problems in project implementation, the company in question was kept in the restricted sample.
- (5) The minimum negative value for the LP variable is the result of the logarithmic operation of some subunit values. For the first years of project implementation (2018–2020), three of the analyzed companies reported very low sales values (of a few monetary units). Subunit values were obtained by relating these sales to the average number of employees. Since the total annual revenues reported were higher than those obtained from sales, it was inferred that these companies recorded revenues from other sources (other than sales). Since the data related to the analyzed companies were collected from the synthesized annual financial statements, no additional information could be identified regarding the statements recorded by the three companies. In the restricted sample these companies were no longer included.

In order to decide whether the three companies that registered negative values for the aforementioned indicators are justified to be kept in the restricted sample, preliminary tests were carried out to evaluate the significance of the models and the interdependencies between the variables (both for the sample of 58 companies and for the sample of 55 companies). These tests indicated that keeping the three companies in the restricted sample does not change the significance of the results.

Both for the extended sample (91 companies) and for the restricted sample (58 companies), the analysis at the level of mean values indicated that ROE (45.7%, respectively, 46.5%) is higher than ROA (11.5%, respectively, 18.4%). This information confirms that most of the companies in the sample used borrowed funds. The increase in the degree of indebtedness is justified by the mechanism for granting non-reimbursable financing.

For the extended sample (91 companies), the average value for ROS is negative, which indicates the presence in the sample of companies with losses and poor sales. In contrast, at the level of the restricted sample (58 companies), the average ROS became positive. Every 100 m.u. sales, the companies achieved an average of 18.2 m.u. profit (Figure 1).

In the period preceding the implementation of the projects (2015–2016) the debt level (LI) was lower. In 2017, the year in which the project financing contracts were signed, the debt level increased; as previously stated, this is the consequence of the applicable financing mechanism. During the implementation and post-implementation period (especially in 2021), due to exhaustion of non-reimbursable financing, the indebtedness of the 91 companies increased. Moving the analysis to the level of the restricted sample, it is observed that, during the project implementation period (2017–2021), the degree of indebtedness remains moderate. The companies in the restricted sample register a consistent increase in the degree of indebtedness only in the last year of analysis (2022) (Figure 1). The increase in the internal demand for financing (covered by credits) is justified by the fact that the companies that



Source(s): Authors' own research

obtained the non-refundable financing must prove the sustainability of the implementation projects. These projects must also produce effects after the exhaustion of the nonrefundable funds.

The analysis at the level of the two samples indicates that, during the implementation and post-implementation period, the performance – assessed by ROA and ROE – presented an oscillating evolution (Figure 1). This evolution can be explained by the fact that most of the companies in the sample (heterogeneous in terms of size and sales volume) were more concerned with the successful implementation of projects than with their internal efficiency. In contrast, ROS (also treated as a performance measure) indicated an improvement over the analyzed period, only for the restricted sample. At the level of the extended sample, ROS remains negative in the period 2016–2022, indicating the size of losses per monetary unit of sales. On the other hand, at the level of the restricted sample, this performance measure is positive but showed an oscillating trend during the years of implementation. Directly related to ROS is the R/T variable, which indicates the share of receivables in total turnover. The data revealed that in order to boost sales, companies adopted a customer support program (by granting delays in paying bills).

At the level of the analyzed companies, the average annual turnover growth rate (Tgr) was 70% for the extended sample, and 40% for the restricted sample. Leverage (LEV) shows that debts are much higher than equity. The average degree of debt was 68.6% for the extended sample, and 54.4% for the restricted sample (according to Table 2).

In both the extended sample and the restricted sample, 27% respectively 29% of total assets (Tang) are fixed assets (materialized in information and communication technology equipment), and the growth rate of fixed assets is close to the growth rate of the turnover for

the extended sample (93.4%). At the level of the restricted sample, the share of fixed assets in total sales (Ait) decreased to 68.6%. This information reflects the concern of companies to make investments in fixed assets, which will increase their production/service delivery capacity.

For the most part, sales were completed with the recording of receivables. In order to support customers, the collection of sales revenue was delayed from the time of issuing the invoices. At the end of the reporting periods, the cumulative receivables exceeded the sales volume (average R/T being 170% for the extended sample and 105.9% for the restricted sample). This facility to customers fueled the current cash shortage. The contracting of short-term loans represented the solution for ensuring a positive cash-flow, but which led to an increase in indebtedness. Overall, the result was a positive one, as the average ratio between income and expenses (I/E) indicates that for every 1 monetary unit spent, 3.2 monetary units of income were achieved (respectively, 4.4 - for the restricted sample). In terms of liquidity ratios, relative to liabilities, the companies in the sample recorded higher inventories, receivables and cash than current liabilities. Mean QR (1.2 and 1.3 respectively) and mean CR (4.6 and 3.8 respectively) exceed the recommended reference ranges (0.35; 0.65) for QR and (1; 2.5) for CR. Exceeding the reference ranges for liquidity indicators should be interpreted with caution considering the size and dynamics of trade receivables.

Regarding labor productivity (LP), the mean (11.8) and median values (12.1) recorded both at the level of the extended sample and at the level of the restricted sample (12.6 and 12.4) are very close. However, for the extended sample, the mean square deviation and dispersion (skewness (3) and kurtosis (10.3)) indicate a major asymmetry in the indicator values. The situation becomes more favorable in the case of the restricted sample, because the data series shows a symmetrical distribution.

In terms of their size (S, control variable), the companies in the sample are not homogeneous. The volume of total assets (according to which the size of the companies was assessed) varies significantly. However, the dynamic analysis of the annual average values indicated a clear increase in the size of the companies (the increase was 140% in 2022 compared to 2015). During the project implementation period (2017–2021), the size of the companies in the sample doubled. This increase is justified by the fact that the non-reimbursable financing was used to make investments specific to their activity. In order to improve the lack of homogeneity in the size of the companies, it was decided to use the logarithm function (natural logarithm). By applying the logarithmic function, the data series acquired a better distribution (even symmetrical, in the case of the restricted sample of 58 companies).

Regarding data symmetry/asymmetry analysis, the situation is as follows: (1) except for one of the variables for which the kurtosis is negative (Tang), all other variables show a sharp leptokurtic distribution, indicating that the data are relatively clustered and close to the mean; (2) except for two of the variables (S and LP), all the other variables show average values higher than the median values, the distributions being asymmetric (left or right).

The decision to reduce the sample (to ensure a minimum threshold of homogeneity) proved to be relatively effective. In both situations, the skewness and the kurtosis mainly indicate values higher than the recommended thresholds. The conclusion that emerges is that only three of the selected numerical variables (Tang, S and LP) have a normal distribution. Since the application of parametric tests carries the risk of obtaining erroneous results, the application of non-parametric tests (which are not conditioned by aspects of data distribution) was also considered.

The correlation analysis (Table 3) indicated that no strong correlations were identified between the analyzed variables (which provide an image of the companies' performance and the determining factors for the recorded performances), which is why it was decided to run the analyses regression with the following performance measures as dependent variables: ROA, ROE and ROS.

s	$\begin{array}{c} 0.06\\ 0.01\\ 0.07\\ 0\\ 0\\ 0.12^{***}\\ -0.06\\ -0.04\\ -0.06\\ -0.06\\ -0.06\\ 0.12^{***}\\ 0.12^{***}\\ 0.12^{***}\\ 0.08^{*}\\ 0.04^{***}\\ 0.08^{*}\\ $	$\begin{array}{c} -0.11^{*}\\ -0.06\\ 0.00\\ 0.05\\ 0.011^{*}\\ 0.06\\ 0.11^{*}\\ 0.06\\ 0.11^{*}\\ 0.02\\ 0.08\\ 0.01\\ 0.32_{^{\rm ms}}\\ 1\end{array}$	Pe IC
LP	$\begin{array}{c} 0.13^{**}\\ -0.04\\ 0.17^{**}\\ 0.17^{**}\\ -0.00\\ 0.08^{*}\\ -0.03\\ -0.05\\ -0.05\\ -0.01\\ 0.06\\ 0.01\\ 0.06\\ 0.01\\ 1\end{array}$	$\begin{array}{c} 0.10^{*}\\ 0.01\\ 0.04\\ 0.16^{**}\\ 0.16^{**}\\ 0.12^{*}\\ 0.12^{*}\\ 0.12^{*}\\ 0.12^{**}\\ 0.03\\ 0.03\\ 0.03\\ 0.32^{**}\\ 0.32^{**}\\ 0.32^{**} \end{array}$	
CR	$\begin{array}{c} 0.01\\ 0.02\\ 0.02\\ -0.03\\ 0.04\\ -0.03\\ 0.03\\ 0.03\\ 0.05\\ 0.03\\ 0.05\\ 0.03\\ 0.05\\ -0.11_{4**}\end{array}$	$\begin{array}{c} 0.09^{*}\\ -0.02\\ 0.10^{*}\\ -0.01\\ -0.01\\ -0.01\\ 0.06\\ 0.16^{**}\\ 0.16^{**}\\ 0.16^{**}\\ 0.16^{**}\\ 0.16^{**}\\ 0.06\\ 0.13^{**}\\ -0.07\end{array}$	_
QR	$\begin{array}{c} 0.06\\ -0.01\\ 0.02\\ -0.03\\ -0.05\\ -0.05\\ 0.06\\ 0.06\\ 0.06\\ 0.06\\ 0.06\\ 0.06\end{array}$	$\begin{array}{c} 0.15^{**}\\ -0.03\\ 0.12^{*}\\ -0.03\\ -0.05\\ 0.07\\ 1\\ 0.57^{**}\\ -0.08\\ 0.03\\ -0.08\end{array}$	
I/E	$\begin{array}{c} 0.06\\ 0.01\\ 0.01\\ -0.01\\ -0.01\\ -0.02\\ -0.01\\ -0.01\\ -0.01\\ 0.05\\ -0.06\\ -0.01\\ 0.05\\ -0.06\end{array}$	$\begin{array}{c} 0.18^{***}\\ 0.04\\ 0.011_{*}\\ 0.011_{*}\\ -0.01\\ -0.02\\ -0.02\\ -0.01\\ 0.16^{***}\\ 0.16^{***}\\ -0.01\\ -0.01\\ -0.01\\ -0.01\\ \end{array}$	
R/T	$\begin{array}{c} -0.08^*\\ 0.01\\ -0.31^{**}\\ 0.01\\ -0.06\\ 0.07\\ -0.11^{**}\\ 0.18^{**}\\ 0.18^{**}\\ 0.18^{**}\\ 0.03\\ -0.04\\ -0.04\\ -0.04\end{array}$	$\begin{array}{c} -0.17^{**} \\ 0.03 \\ -0.44^{**} \\ 0.06^{*} \\ -0.04 \\ 0.18^{*} \\ 0.24^{*} \\ 1 \\ -0.01 \\ -0.01 \\ -0.01 \\ -0.01 \\ -0.01 \\ 0.06 \end{array}$	
Ait	$\begin{array}{c} -0.04\\ -0.01\\ -0.07\\ 0.09*\\ -0.06\\ -0.06\\ -0.03\\ 1\\ 1\\ 0.18**\\ -0.01\\ -0.03\\ -0.05\\ -0.07\end{array}$	$\begin{array}{c} -0.14 \\ -0.07 \\ -0.07 \\ -0.02 \\ 0.01 \\ 0.06 \\ 0.25 \\ -0.04 \\ -0.04 \\ -0.06 \\ 0.06 \end{array}$ ant at the 0	
Tang	$\begin{array}{c} -0.03\\ -0.05\\ 0.08*\\ -0.03\\ -0.03\\ -0.03\\ -0.03\\ -0.05\\ -0.11**\\ 0.12**\\ 0.05\end{array}$	$\begin{array}{c} -0.13^{**}\\ -0.12^{*}\\ 0.06\\ -0.07\\ -0.09^{*}\\ -0.09^{*}\\ -0.11^{*}\\ -0.11^{*}\\ -0.11^{*}\\ -0.21^{**}\\ -0.19^{**}\\ 0.11^{*}\\ 0.11^{*}\end{array}$ n is signific	
LI	$\begin{array}{c} -0.26^{**}\\ -0.00\\ -0.08\\ 0.01\\ 0.01\\ 1\\ 0.01\\ 0.07\\ 0.07\\ -0.02\\ -0.08\\ 0.04\\ -0.14^{**}\\ -0.03\end{array}$	$\begin{array}{c} -0.46 \\ 0.07 \\ 0.07 \\ 0.05 \\ 0.05 \\ 0.42 \\ 0.06 \\ 0.18 \\ 0.06 \\ 0.12 \\ 0.06 \\ 0.12 \\ 0.06 \\ 0.12 \\ 0.12 \\ \end{array}$	
LEV	-0.00 0.08 0.03 0.03 0.03 0.03 -0.03	$\begin{array}{c} -0.23^{***}_{-0.17^{***}}\\ 0.17^{***}_{-0.05}\\ 0.04\\ 1\\ 1\\ -0.01\\ -0.01\\ -0.03\\ -0.12^{***}_{-0.13^{***}}\\ -0.01\\ -0.11^{*}_{-0.13^{***}}\\ -0.01\\ -1.13^{***}_{-0.01}\end{array}$	
Tgr	$\begin{array}{c} 0.01\\ 0.01\\ 1\\ 0.02\\ 0.02\\ 0.02\\ 0.03\\ 0.03\\ 0.00\\ 0.01\\ -0.03\\ 0.00\\ -0.01\\ 0.00\\ -0.00\\ 0.00\\ -0.00\end{array}$	$\begin{array}{c} 0.00\\ 0.06\\ 0.05\\ 1\\ 0.05\\ 0.04\\ 0.01\\ 0.00\\ -0.07\\ 0.00\\ 0.06\\ 0.06\\ \mathrm{he} \ 0.01 \ \mathrm{leve} \end{array}$	
ROS	$\begin{array}{c} 0.16^{**}\\ 0.03\\ 1\\ 1\\ -0.27^{**}\\ 0.03\\ -0.08^{*}\\ -0.08^{*}\\ 0.03\\ 0.02\\ 0.01\\ 0.01\\ 0.07\\ 0.01\end{array}$	$\begin{array}{c} 0.50^{**} \\ 0.16^{**} \\ 0.16^{**} \\ 0.16^{*} \\ 0.05 \\ -0.05^{*} \\ 0.06 \\ -0.02^{*} \\ 0.11^{*} \\ 0.11^{*} \\ 0.11^{*} \\ 0.10^{*} \\ 0.00 \\ 0.00 \end{array}$	
ROE	$\begin{array}{c} 0.21 **\\ 1\\ 1\\ 0.03\\ 0.01\\ 0.08 *\\ -0.05\\ -0.01\\ 0.00\\ 0.01\\ 0.00\\ 0.01\\ 0.02\\ 0.01\\ 0.02\\ 0.01\\ 0.02\\ 0.01\\ 0.01\\ 0.01\\ 0.02\\ 0.01\\ 0.01\\ 0.01\\ 0.01\\ 0.01\\ 0.02\\ 0.01$	$\begin{array}{c} 0.32^{**}\\ 1\\ 0.16^{**}\\ 0.16^{**}\\ 0.07\\ 0.07\\ -0.07\\ 0.03\\ -0.03\\ 0.04\\ -0.03\\ 0.04\\ -0.02\\ 0.01\\ -0.06\\ 14tion \text{ is sign}\\ \text{rs' own pro} \end{array}$	
ROA	$\begin{array}{c} panies \\ 1 \\ 0.21 ** \\ 0.16 ** \\ 0.01 \\ -0.03 \\ -0.03 \\ -0.03 \\ -0.03 \\ 0.06 \\ 0.06 \\ 0.06 \\ 0.06 \\ 0.01 \\ 0.01 \\ 0.01 \\ 0.01 \end{array}$	<i>panies</i> 1 0.32*** 0.50*** 0.50*** 0.00** 0.13*** 0.14*** 0.18*** 0.18*** 0.18*** 0.10*** 0.10*** 0.10**** 0.10**** 0.10***** 0.15************************************	
	91 com ROS ROS ROS ROS LEV LI Tang Ait RrT RRT CR CR CR CR CR CR CR CR CR CR CR CR CR	58 com ROA ROE ROE Tgr LEV LLEV LLEV LLEV LLEV LLP QR CR CR CR CR CR Source Source	_

Table 3.Correlation analysis

Performance of ICT companies To run the regression analysis, two preliminary tests were performed that provided information on the statistical significance of the models (Table 4). The analysis indicated the following: the model that had ROA (respectively ROS) as a dependent variable proved to be statistically significant (R square was 9% and 19%, respectively, 30% and 29%); the model that had ROE as a dependent variable proved to be statistically insignificant.

At the extended sample level, the determinants of financial performance are Tgr, LI, R/T (negative impact) and LP (positive impact) (Tables 5-8). As it was also shown in the explanations related to the descriptive statistics, the companies in the sample register very high receivables throughout the analyzed period. These receivables (materialized in payment facilities granted to customers) limit current cash flow and force companies to identify alternative sources of financing (most often leading to an increase in short-term debt).

Indebtedness has a negative impact on financial performance as measured by ROA. This result is consistent with the pecking order theory, which postulated that changing the financing structure (in the sense of increasing indebtedness) has the effect of reducing business profitability. The only variable with a positive influence on financial performance (measured by ROA and ROS) is labor productivity (LP).

The subsample analysis expanded the list of determinants with statistically significant influences on performance. In addition to Tgr, LEV, LI, R/T and LP (whose influence was proven by the analysis at the level of the extended sample), the list of determining factors also included Tang, Ait, I/E, CR and S. It is worth noting that, for the 58 selected companies, the rate of turnover growth has a positive impact on ROS. Indebtedness keeps its negative impact on performance (as measured by ROA and ROS).

As a novelty element, the tangibility of assets (Tang) has a negative impact on ROA. The situation can be explained by the fact that holding fixed assets requires additional expenses, which reduces the gross result of a financial year.

The ability to invest in the term (Ait), positively influences ROS. The increase in fixed assets translates into an increase in production/service provision capacity. Substituting the labor factor (which incurs higher costs) with the capital factor (which incurs lower costs) ensures that more customers are satisfied at lower costs, leading to increased ROS. In contrast, receivables retain the negative influence on ROS.

Current liquidity (CR) and company size (S) are factors with negative influence on ROA. The negative impact of current liquidity (CR) on performance is justified by the large volume of receivables recorded by the companies in the sample. Although the increase in receivables will lead to increased liquidity, this result is canceled out by the effect of indebtedness (which provides cash flow to finance current activities). As previously shown, indebtedness has a negative impact on performance. As with the extended sample analysis, LP maintains the positive impact on performance, measured by ROA.

In all regression equations run, the tolerance level slightly exceeds the default reference threshold (0.7). However, the results obtained prove to be robust from a statistical point of

	Samples Model	ROA	91 companies ROE	ROS	ROA	58 companies ROE	ROS
Table 4.	<i>R</i> <i>R</i> Square Adjusted <i>R</i> Square Std. Error of the Estimate	$0.30 \\ 0.09 \\ 0.08 \\ 65.19$	$0.11 \\ 0.01 \\ -0.00 \\ 343.77$	$0.44 \\ 0.19 \\ 0.18 \\ 169.21$	0.55 0.30 0.29 19.73	$0.22 \\ 0.05 \\ 0.03 \\ 70.70$	0.54 ^a 0.29 0.28 35.40
Statistical significance of models	Sig. <i>F</i> Change – ANOVA Source(s): Authors' own rese	0.00 earch	0.58	0.00	0.00	0.02	0.00

statistics VIF	$^{-1.01}_{-1.01}$	Performance of ICT companies
Collinearity s Tolerance	$^{-}$ 0.99 0.98 0.98 0.85 0.86 0.92 0.92 0.92 0.73 0.73	
nfidence 1 for B Upper Bound	$\begin{array}{c} 40.26\\ 1.08\\ 0.00\\ 0.11\\ 0.17\\ 0.02\\ 0.02\\ 0.17\\ 0.17\\ 5.41\\ 1.39\\ 1.39\\ 1.39\\ 1.69\end{array}$	
95.0% το Interva Lower Bound	$\begin{array}{c} -38.02 \\ -0.73 \\ 0.00 \\ 0.00 \\ -0.12 \\ -0.12 \\ -0.02 \\ -0.03 \\ -0.03 \\ -0.13 \\ -0.13 \\ -1.29 \\ -1.29 \\ -2.26 \end{array}$	
Sig	$\begin{array}{c} 0.96\\ 0.71\\ 0.63\\ 0.00\\ 0.02\\ 0.15\\ 0.16\\ 0.18\\ 0.18\\ 0.16\\ 0.18\\ 0.16\\ 0.18\\ 0.16\\ 0.18\\ 0.16\\ 0.18\\ 0.16\\ 0.18\\ 0.16\\ 0.10\\ 0.40\\$	
t	$\begin{array}{c} 0.06\\ 0.38\\ -0.48\\ -7.00\\ -0.36\\ -0.36\\ -1.44\\ 1.34\\ 0.35\\ 0.35\\ 0.35\\ 0.35\\ 0.35\\ 0.35\end{array}$	
Standardized Coefficients Beta	0.01 -0.02 -0.02 -0.04 -0.05 -0.05 0.01 0.03 0.03 0.03 0.03 0.03 0.03 0.03	
Std Error	19.94 0.46 0.00 0.01 0.01 0.01 0.01 0.01 0.05 0.05	
Unstandardized Coefficients B	1.12 0.17 0.00 -0.10 -0.10 0.00 0.00 0.01 0.01 0.	Table 5.
	(Constant) Tgr LEV LL LI Tang Ait R/T I/E QR CR CR CR CR CR CR Source(s): T –	Regression analysis – ROA dependent variable (extended sample, 91 companies)

Table 6. Regression analysis – ROS dependent variable (extended sample, 91 companies)

	Unstandardized Coefficients		Standardized Coefficients			95.0% cc Interva	onfidence al for B	Collinearity st	atistics
	В	Std Error	Beta	t	Sig	Lower Bound	Upper Bound	Tolerance	VIF
(Constant)	-67.15	51.75		-1.30	0.19	-168.75	34.45	I	I
Tgr	-9.50	1.20	-0.27	-7.91	0.00	-11.85	-7.14	0.99	1.01
LEV	0.00	0.01	0.01	0.31	0.76	-0.01	0.01	0.98	1.02
LI	-0.06	0.04	-0.05	-1.57	0.12	-0.13	0.01	0.96	1.04
Tang	0.29	0.27	0.04	1.06	0.29	-0.25	0.83	0.85	1.18
Ait	0.00	0.02	0.01	0.14	0.89	-0.04	0.05	0.84	1.19
R/T	-0.12	0.01	-0.29	-8.19	0.00	-0.15	-0.09	0.92	1.09
I/E	0.09	0.13	0.02	0.66	0.51	-0.17	0.34	0.99	1.01
QR	-0.91	1.56	-0.02	-0.59	0.56	-3.98	2.15	0.92	1.09
CR	0.34	0.29	0.04	1.21	0.23	-0.22	0.91	06.0	1.11
LP	10.11	2.73	0.15	3.71	0.00	4.75	15.47	0.72	1.40
s	-2.26	3.93	-0.02	-0.57	0.57	-9.97	5.46	0.73	1.37
Note(s): T – <u>`</u>	Folerance; VIF - Varia	unce inflation fact	or						
Source(s): Al	uthors' own research								

tatistics VIF	$^{-1.05}_{-1.05}$	Performa ICT com
Collinearity s' Tolerance	$\begin{smallmatrix} & 0.25 \\ 0.80 \\ 0.80 \\ 0.81 \\ 0.81 \\ 0.81 \\ 0.81 \\ 0.81 \\ 0.81 \\ 0.81 \\ 0.81 \\ 0.84 \\ 0.70 \\ 0.7$	
idence or B Upper Bound	$\begin{array}{c} 56.42\\ 56.42\\ 0.00\\ 0.02\\ -0.08\\ 0.01\\ 0.00\\ 0.08\\ 0.00\\ 0.08\\ 0.00\\ 0.03\\ -0.04\\ -0.04\\ -0.04\\ -0.14\end{array}$	
95.0% conf Interval f Lower Bound	$\begin{array}{c} 1.78\\ -1.11\\ -0.01\\ -0.37\\ -0.37\\ -0.01\\ 0.02\\ -0.33\\ -0.33\\ -0.33\\ -0.33\\ -0.54\\ -0.33\\ -0.54\\ -0.54\\ -0.54\\ -0.54\\ -0.54\\ -0.79\\ -0.7$	
Sig	$\begin{array}{c} 0.04\\ 0.77\\ 0.06\\ 0.00\\ 0.00\\ 0.54\\ 0.12\\ 0.00\\ 0.54\\ 0.00\\ 0.01\\ 0.03\\$	
t	$\begin{array}{c} 2.09\\ 0.29\\ -1.88\\ -9.42\\ -3.66\\ -1.56\\ 3.51\\ -1.56\\ 3.51\\ -2.26\\ -2.26\\ -2.26\\ -2.26\\ -2.17\end{array}$	
Standardized Coefficients Beta	$\begin{array}{c} 0 \\ -0.08 \\ -0.06 \\ -0.06 \\ -0.07 \\ -0.07 \\ -0.07 \\ 0.03 \\ -0.07 \\ 0.012 \\ 0.03 \\ -0.09 \\ 0.012 \\ 0.012 \\ 0.012 \\ \end{array}$	
Std Error	13.90 0.66 0.00 0.03 0.03 0.03 0.04 0.03 0.04 0.02 0.00 0.02 0.13 0.13 0.13 0.13 0.13 0.13 0.67 nuce inflation factor	
Unstandardized Coefficients B	29.10 0.19 0.00 -0.31 -0.16 0.00 0.00 0.00 0.05 0.15 -0.29 -0.29 -0.29 -1.46 erance, VIF - Varia ors' own research	
	Constant) Tgr LEV LEV LEV Tang Ait R/T S CR CR CF S Source(s): T – Tol	Regression a ROA o variable sample, 58 co

Table 8. Regression analysis – ROS dependent variable (restricted sample, 58 companies)

	Unstandardized Coefficients		Standardized Coefficients			95.0% cc Intervs	onfidence al for B	Collinearity st	atistics
	В	Std Error	Beta	t	Sig	Lower Bound	Upper Bound	Tolerance	VIF
(Constant)	39.26	24.94		1.57	0.12	-9.76	88.27	I	I
Tgr	2.89	1.19	0.10	2.43	0.02	0.56	5.22	0.95	1.05
LEV	0.00	0.00	0.05	1.12	0.26	0.00	0.01	0.80	1.25
LI	-0.32	0.06	-0.26	-5.52	0.00	-0.44	-0.21	0.68	1.46
Tang	-0.04	0.08	-0.02	-0.55	0.58	-0.20	0.11	0.80	1.25
Ait	0.02	0.01	0.11	2.45	0.01	0.00	0.04	0.84	1.19
R/T	-0.06	0.01	-0.44	-10.00	0.00	-0.07	-0.04	0.81	1.23
I/E	0.06	0.03	0.08	2.01	0.05	0.00	0.11	0.96	1.04
QR	0.06	0.44	0.01	0.14	0.89	-0.80	0.93	0.63	1.59
CR	0.17	0.23	0.04	0.73	0.47	-0.28	0.62	0.59	1.71
LP	-1.26	1.94	-0.03	-0.65	0.52	-5.07	2.55	0.70	1.43
s	0.78	1.21	0.03	0.64	0.52	-1.60	3.16	0.84	1.20
Note(s): T –	Tolerance; VIF - Varia	ance inflation fac	tor						
Source(s): A	vuthors' own research								

view because the collinearity test (VIF-Variation Inflation Factor) shows values lower than Performance of 10 (as shown in Tables 5-8). As mentioned at the beginning of this section, due to the asymmetric distribution of the cross-sectional data series, the application of parametric tests was carried out under the assumption of assuming the risk of obtaining erroneous results. To test the validity of the parametric tests, the following considers the application of nonparametric tests on the links between performance and its determinants.

In order to make inferences about the performance and dynamics of the determining factors of the companies in the selected sample, the Wilcoxon matched-pairs signed rank test was used, because it allows paired observations regarding numerical variables without normal distribution. These observations were made on the following pairs:

- performance before and after the implementation of the projects, respectively, before (1)and after the use of non-reimbursable financing; this non-parametric test will shed more light on performance dynamics (and answer RQ1);
- the dynamics of performance determinants, to see if the analyzed indicators differ (2)between the two periods (before and after the implementation of the projects); these tests will shed more light on the impact of different determinants (and answer RQ2).

This test also allows evaluating the extent to which the decrease/increase of a certain indicator (in the two moments, before and after the implementation of the projects) is statistically significant or not. The Wilcoxon matched-pairs signed rank test, considered a non-parametric alternative to the two-sample *t*-test, has been successfully used in other studies as well. For example, Al-Malkawi and Pillai (2013) used the Wilcoxon matched-pairs signed rank test to assess whether certain financial indicators, which provide support for the performance analysis of companies in the real estate sector, varied significantly before and after the financial crisis. Beverly et al. (2019), used this statistical technique to measure corporate performance before and after a merger. Walsh and Ajibade (2018) applied this test to evaluate whether the government policy of merger and acquisition activity had concrete positive effects in creating value and increasing operational performance.

In this study, two sets of hypotheses were formulated for running this test: H0 (null hypotheses) and H1 (alternative hypotheses), corresponding to the 14 dependent and independent variables analyzed:

- H0. The median values of the two data groups remain at comparable levels before and after the implementation of the projects (2015 and 2022, respectively).
- H1. The median values of the two data groups are different before and after the implementation of the projects (2015 and 2022, respectively).

Positive differences will be recorded when the performance increases, respectively, negative values when performance will decrease. The sum of these differences may indicate the following situations: zero value-performance remained at comparable levels; positive valueperformance increased; negative value-performance has decreased.

Because the software used allowed, differently from the methodology related to previous studies, in parallel with the Wilcoxon matched-pairs signed rank test (Asymp. Sig. 2-tailed) a Monte Carlo Sig test was also carried out (2-tailed), for a significance level of 95%. The test results are presented in Table 9.

The data in Table 9 provide the answer for question RQ1. During the implementation of the projects, the profitability of the selected companies evolves differently, depending on the measures used for measurement. Thus, ROA and ROS decrease (Z-score being -2.003, respectively -0.662, based on positive ranks) and ROE increases (Z-score taking the value -1.132, based on negative ranks). In other words, for 54 companies (out of a total of 91), the

ICT companies

N	Indicators	Ranks	Ν	Mean rank	Sum of ranks	Test statistics ^{a.c}	Value
	ROA2022 – ROA2015	Negative Ranks	54	48.13	2599.00	Ζ	-2.003^{b}
		Positive Ranks	37	42.89	1587.00	Asymp. Sig. (2-tailed)	0.045
		Ties	0			Monte Carlo Sig. (2-tailed)	0.047
	ROE2022 – ROE2015	Negative Ranks	43	42.02	1807.00	Z	-1.132 ^d
		Positive Ranks	48	49.56	2379.00	Asymp. Sig. (2-tailed)	0.258
		Ties	0			Monte Carlo Sig. (2-tailed)	0.255
	ROS2022 – ROS2015	Negative Ranks	49	45.14	2212.00	Z	-0.662 ^b
		Positive Ranks	41	45.93	1883.00	Asymp. Sig. (2-tailed)	0.508
	m 0000 m 0010	Ties	1	10.00	1.050.00	Monte Carlo Sig. (2-tailed)	0.511
	1gr2022 – 1gr2016	Negative Ranks	36	46.06	1658.00	Z	-1.567*
		Ranks	04 1	40.13	2437.00	Asymp. Sig. (2-tailed)	0.117
	I FV2022 -	Negative	42	51.90	2180.00	(2-tailed)	-0.344 ^b
	LEV2015	Ranks Positive	49	40.94	2006.00	Asymp Sig (2-tailed)	0.731
		Ranks Ties	0	10101	2000.000	Monte Carlo Sig.	0.728
	LI2022 – LI2015	Negative	34	42.94	1460.00	(2-tailed) Z	-2.505^{d}
		Ranks Positive	57	47.82	2726.00	Asymp. Sig. (2-tailed)	0.012
		Ranks Ties	0			Monte Carlo Sig.	0.014
	Tang2022 –	Negative	32	35.25	1128.00	(2-tailed) Z	-3.578^{d}
	1811g2015	Positive	57	50.47	2877.00	Asymp. Sig. (2-tailed)	0.000
		Ties	2			Monte Carlo Sig. (2.tailed)	0.000
	Ait2022 – Ait2015	Negative Ranks	32	27.33	874.50	Z	-4.615^{d}
		Positive Ranks	57	54.92	3130.50	Asymp. Sig. (2-tailed)	0.000
		Ties	2			Monte Carlo Sig. (2-tailed)	0.000
Table 9.Nonparametric tests							(continued)

Indicators	Ranks	Ν	Mean rank	Sum of ranks	Test statistics ^{a.c}	Value	ICT companies
R/T2022 - R/T2015	Negative Ranks	30	33.67	1010.00	Z	-4.175^{d}	
	Positive Ranks	60	51.42	3085.00	Asymp. Sig. (2-tailed)	0.000	
	Ties	1			Monte Carlo Sig. (2-tailed)	0.000	
I/E2022 – I/E2015	Negative Ranks	51	46.08	2350.00	Z	-1.017^{b}	
	Positive Ranks	40	45.90	1836.00	Asymp. Sig. (2-tailed)	0.309	
	Ties	0			Monte Carlo Sig. (2-tailed)	0.308	
QR2022 - QR2015	Negative Ranks	65	48.55	3156.00	Z	-4.207^{b}	
	Positive Ranks	26	39.62	1030.00	Asymp. Sig. (2-tailed)	0.000	
	Ties	0			Monte Carlo Sig. (2-tailed)	0.000	
CR2022 - CR2015	Negative Ranks	59	48.88	2884.00	Z	-3.131 ^b	
	Positive Ranks	32	40.69	1302.00	Asymp. Sig. (2-tailed)	0.002	
	Ties	0			Monte Carlo Sig. (2-tailed)	0.002	
LP2022 - LP2015	Negative Ranks	27	45.04	1216.00	Z	-3.346^{d}	
	Positive Ranks	63	45.70	2879.00	Asymp. Sig. (2-tailed)	0.001	
	Ties	1			Monte Carlo Sig. (2-tailed)	0.001	
S 2022 – S 2015	Negative Ranks	17	23.06	392.00	Z	-6.732^{d}	
	Positive Ranks	74	51.27	3794.00	Asymp. Sig. (2-tailed)	0.000	
	Ties	0			Monte Carlo Sig. (2-tailed)	0.000	

a. Wilcoxon Signed Ranks Test; b. Based on positive ranks; c. Based on 10,000 sampled tables with starting seed 1,314,643,744; d. Based on negative ranks

Source(s): Authors' own research

Table 9.

ROA recorded in 2022 was lower than the ROA related to 2015. Conversely, for 48 of the 91 companies, the ROE was higher in 2022 compared to 2015 Similar to the situation recorded for the ROA variable, 49 companies recorded decreases for the ROS variable.

Moving the attention to the level of significance of the obtained results, it is observed that only for a single performance measure (ROA) the results are statistically significant. For the variable ROA, both Asymp.Sig. (2-tailed), as well as Monte Carlo Sig. (2-tailed) provided data that the p value is less than 0.05.

As noted in the literature, in the short term, the adoption of digital technologies is costly, with companies registering a decrease in financial performance (Chen and Srinivasan, 2023;

Deng *et al.*, 2021). The results obtained in this study represent additional evidence for those already reported in the literature: the benefits generated by digitalization are internalized by companies in different ways (OECD, 2021), and financial performances evolve with a certain gap (Ionaşcu *et al.*, 2022). On during the analyzed period, the companies gave priority to the implementation of projects, which resulted in investments for the purchase of equipment and software to increase the production/service provision capacity. The solution of the call for borrowed financial resources was timely, because it allowed to increase the efficiency of the use of own funds.

The same non-parametric test was used to test the dynamics of performance determinants. Relationships between predefined pairs were taken into account, taking as benchmarks the values recorded before and after the implementation of the projects (2015 and 2022, respectively).

For four variables (LEV, I/E, QR and CR) negative ranks were greater than positive ranks. These variables registered decreases, but the decrease is statistically significant only for QR and CR. For QR and CR, the *p* value is less than 0.05, which rejects the null hypothesis that the median values of the two groups are the same.

For seven variables (Tgr, LI, Tang, Ait, R/T, S and LP) positive ranks were greater than negative ranks. The increases in these variables proved to be statistically significant only for LI, Tang, Ait, R/T, S and LP. Table 10 presents the results of the two tests (parametric and non-parametric) applied to the data related to the companies in the selected sample.

The data presented in Table 10 provide the answer to the second research question assumed. According to the results of the non-parametric tests, the ROA variation could be negatively influenced by the increase in LI, Tang, Ait, R/T, S and LP. The analysis from the perspective of the methodologies for determining the analyzed variables indicates two types of interdependencies: direct and indirect. The direct interdependence between ROA, on the one hand, and Tang and S, on the other hand, can be justified by the variation in the volume of assets. According to the determination formula used for ROA, the increase in the volume of fixed assets could have the effect of reducing the size of the profit related to a monetary unit of assets. This situation will occur when profit remains constant, decreases or increases at a rate lower than the growth rate of assets. This situation corresponds to the analyzed companies, which register a decrease in performance under the conditions of an increase in assets (as a result of the investments made on account of non-reimbursable financing). As shown in the descriptive statistics debate, over the period under review, the volume of assets held by the companies in the sample increased by 140%.

As a direct consequence of the increase in the volume of assets, Ait (determined as the ratio between fixed assets and turnover) registered an upward trend. Therefore, an indirect determination relationship (through the size of assets) is identified between Ait and ROA. As for the indirect determination relationships between R/T and ROA, the mediation is done through turnover dynamics. When deliveries of goods/services are not immediately followed by a financial flow in the opposite direction, companies record receivables. Although it is an important tool in strengthening customer relations, receivables limit the possibilities of companies to capitalize on their full financial potential. The negative influence of receivables on business profitability was also proven by the results of parametric analyses.

Against the background of the decrease in the volume of current liquidity (as a result of the increase in the volume of receivables) and as a result of the increase in the volume of current assets (as an effect of the investments assumed through the financing contract), the companies register a decrease in the level of CQ and CR. As the non-parametric test results indicate, these deteriorations in business liquidity can have the effect of decreasing business profitability.

Considering the financing mechanism specific to the contracted projects, most companies made investments in assets on account of borrowed funds. This represented a temporary

	Tgr		LEV		LI		Tan	50	Ait		R/T		M	(F)	QF		Ċ	~	Π	0.	0,	
<i>Parametric tests</i> Samples ROA ROE ROS	91 (-)	(+) - 28	91 (80	91	<u>(</u>) - () <u>28</u>	91		91	(+) (+)	91		91	(+) (+) (+) (+) (+) (+) (+) (+) (+) (+) (+)	91	58	91		$\overset{}{(+)} \overset{}{(+)} \phantom$	28	91	
Nonparametric tests - ' ROA ROE ROS (4) Note(s): The signs in l Source(s): Authors' or	<i>J1 compa.</i> Tgr (†) 5rackets 1 vn resear	<i>nies</i> repres	LEV - ent the	positi	LI (†) ve (+)	or neg	Tan (†) ative (.	g –) imp	Ait (†) act on	perfor	R/T (†) mance.	The a	I/I - urrows	€ († or ↓	QF (Ļ) repre	sent i	CF (L) noreas	د ا ا ا ا ا	LI († or decr) eases (ст С	

 Table 10.

 Results of parametric and nonparametric tests – only statistically significant results

Performance of ICT companies

solution, because–at certain deadlines, established by the financing contract–the companies submitted the specific documentation for the settlement of the expenses incurred (respectively, for the collection of the non-refundable financing). In this context, an indirect interdependence between LI and ROA is delineated. For the analyzed companies, it can be admitted that the increase in the debt ratio (LI) had an indirect influence on the ROA (through the size of assets purchased based on borrowed resources). The negative influence of LI on performance is proven by both parametric and non-parametric tests.

As shown in Tables 5, 7 and 9, our analysis identified a negative impact of indebtedness on performance (assessed by ROA and ROS). In addition to the arguments presented in the previous paragraph, it is necessary to specify that, along with the financial rigidity generated by the debt service, the increase in the degree of indebtedness can expose the companies to the risk of insolvency, but also to the possible opprobrium of the stakeholders, be they shareholders/associates, creditor clients, who sanction poor financial performance. Capital structure is very critical in the financial performance of firms in the ICT sector, and therefore they need to make informed decisions about how to balance debt and equity capital sources. Previous research has analyzed the interdependence between ROA and LI across several sectors and reported that, in general, profitability increases with increasing leverage. However, when indebtedness exceeds certain thresholds, profitability decreases (lencova et al., 2021). Keeping the analysis at the level of European companies, Heckenbergerová and Honková (2023) showed that the analysis of interdependencies between LI and performance are more appropriate if ROA is used as a performance measure. At the same time, the authors also pointed out that debt financing is preferred by companies with lower ROA. Similar results were reached by Jaisinghani and Kakali (2017), who showed that small and mediumsized firms are negatively influenced by higher levels of debt (as postulated by pecking order theory). Different from previous studies, Al-Sa'eed (2018) confirmed the negative or positive relationship of indebtedness on performance, taking into account the performance measures used – ROA or ROE, Regarding the studies on Romanian companies, Tudose and Avasilcăi (2023) showed that, when the analysis considers samples that include small and mediumsized companies, the structure of financing has a negative impact when financial performance is assessed by ROA.

Regarding the impact of asset tangibility, our analysis found a negative influence on performance as measured by return on assets (ROA), consistent with the findings of Abosede (2020). The potential influence of asset tangibility on ROA can be interpreted through the lens of the increase in operating expenses associated with the expansion of production capacity/ service provision, the diversification of the range of products and services catalyzed by the possession of specialized assets (IT equipment and specific software). Beyond the short-term negative influence, on long term it should be noted the aggregate effect of expanding a company's patrimony (by increasing the volume of investments in fixed assets) on increasing the degree of confidence of business partners, including credit institutions, should not be neglected. In the long term, these beneficial effects will be counterbalanced by less favorable aspects such as facing different degrees of (accelerated) wear and tear of existing production capacities especially in the ICT sphere, high maintenance costs and low liquidity.

Another result obtained in the present study is the negative impact of receivables on financial performance, thus refuting the findings of Mbula *et al.* (2016). Our result can be explained by the fact that, although selling on credit is an effective means of commercial expansion, it can generate reduced liquidity, risk of non-payment, commercial dependence on certain partners, the need to attract additional funds through loans. These effects make it necessary to adopt a judicious lending policy, to monitor and revise it according to cyclical changes. The positive influence of income per expenditure on financial performance measured by return on assets and sales (ROA and ROS) indicates a high potential for

profitability for the companies in the analyzed sample, efficiency and operational flexibility, Performance of thus contributing to the increase in market value and the polarization of potential investors.

The negative impact of the current ratio (CR) on the financial performance measured by the return on assets (ROA), proven only in non-parametric tests, translates into an increased solvency risk and facing difficulties in meeting current financial obligations, the low possibility of financing (innovative) activities aimed at generating added value, the atrophy established commercial relations, decreasing attractiveness for investors. Our result refutes the conclusions of other studies (Sari et al., 2022; Kim et al., 2023). The QR and CR decline indicated as statistically significant in the non-parametric analysis can represent an argument for accepting a potential impact on performance (ROA), at least at the level of companies for which the differences between the values recorded before and after the implementation of the projects are negative.

The positive impact of productivity (LP) on performance, proven only in parametric tests, has been the subject of previous studies that have shown that there is a positive correlation between the digitalization of companies and their productivity (Cathles et al., 2020). Although previous studies (Chen and Srinivasan, 2023; Ricci et al., 2020) have indicated that high productivity does not automatically lead to increased performance, the present study provides evidence in favor of a direct and positive correlation. The results of the Wilcoxon matched-pairs signed rank test reveal that the increase in LP after the implementation of the projects is statistically significant. It is possible that this increase is positively reflected in the dynamics of performance, but this impact may be overtaken by the impact of other factors with a negative influence on performance.

In the light of the obtained results, this study has the potential to improve the performance of ICT companies, directly responsible for facilitating the digitalization of economic activities. Using the estimation model based on the multiple regression method, the research provides managers with the tools and means to improve performance.

From a practical point of view, the usefulness of the results of this study can be translated as follows. During the implementation of projects with non-reimbursable founds, managers of ICT companies must carefully manage performance (measured by ROA, ROE and ROE). This is because, in the first years of implementation of the projects, managers tend to be more concerned with the successful implementation of projects than with maintaining/increasing the performance of the companies they lead. Regarding the determinants of performance, managers should consider that performance may be negatively affected by the increase in indebtedness (LI) and the increase in receivables (R/T). At the same time, in the context of increasing indebtedness, a temporary deficit of liquidity is created that can negatively influences performance. Increasing the ability to invest in term (Ait) proved to have a positive impact on performance. Last but not least, managers need to make better use of human resources, as increasing labor productivity (LP) can improve economic and commercial performance (ROA and ROS).

5. Conclusions

The importance and need for measuring and evaluating organizational performance were recognized early on. Currently, measuring performance and evaluating its determinants are necessary and permanent activities, becoming more and more complex precisely because of the multidimensional nature of performance. As shown in the literature review, due to the lack of homogeneity of the analyzed samples, periods, data and indicators, previous empirical research focused on the analysis of performance determinants has provided mixed results, limiting the possibilities of generalizing the results.

Seeking to fill a relative lack of concern in the literature, our study aimed to investigate how well companies are performing in facilitating the digital transition. In order to strengthen

ICT companies

the practical utility and to ensure the representativeness of the results, the present study focused on a sample of companies that was not the subject of previous studies. Our approach was based on the analysis of the main data from the financial statements of a sample of 91 (subsequently restricted to 58) private entities that benefited from non-reimbursable financing for the implementation of projects for the development of ICT products and services, in the periods preceding the implementation of the projects (2015–2016), as well as during the implementation (2017–2021) and post-implementation (2022) period.

The first step of our research was to assess the dynamics of the performance of the selected companies. The financial data of the companies analyzed at the level of the restricted sample support the fact that in the analyzed period there was a decrease in the return on assets and sales (ROA and ROS). Most of the sales of these companies took place in the accumulation of trade receivables, as a consequence, the value of the receivables being significant.

At the same time, the study aimed to identify the determinants of financial performance for the selected companies and the implications for this sector. The results showed that, for the different performance measures (ROA, ROE and ROS), in the structure of the determining factors can be found: turnover growth rate (Tgr), level of indebtedness (LI), share of receivables (R/T), assets tangibility (Tang), income per expenditure ratio (I/E), current ratio CR), size of the companies (S) and labor productivity (LP).

The results of the analyses carried out on the two levels (extended sample and restricted sample), as well as the results of parametric and non-parametric tests, indicated that the use of more performance measures (such as ROA, ROE, ROS) is crucial because between the determinants of performance and the measures of selected performance there are interdependencies that cannot be generalized. As the results highlight, the ROA can be negatively influenced by level of indebtedness (LI), asset tangibility (Tang) and size of the company (S). This performance measure (ROA) can be improved by carefully managing revenue and expenditure dynamics (I/E). Instead, by focusing the analysis on another facet of performance (ROS), the list of determinants expands. The positive influence of the sales variation (Tgr) and the negative influence induced by the share of receivables in the total sales (R/T) are noted.

The present study has profound practical implications, the results obtained being useful both to company managers (concerned with the analysis of the dynamics of financial performance during the implementation of projects aimed at facilitating the digital transition), and to political decision-makers (concerned with evaluating the impact of the use of non-reimbursable financing dedicated to supporting businesses).

The study may also be useful to researchers concerned with performance evaluation and its determinants. From a scientific point of view, the usefulness of the results of this study is given by the fact that the empirical research is carried out on a sample that has not been the subject of previous studies, and the analyzed period is correlated with the life cycle of projects with non-reimbursable funding (projects dedicated to facilitating the transition digital). The results of these analyses could also be useful to entities that manage European and national non-reimbursable funding. These results can be considered as evidence regarding the impact of public policies dedicated to digitalization.

This research faced some limitations related to the amount of data available (found only in the synthesized financial statements) and the small size and lack of homogeneity of the extended sample. To overcome this second problem, in the present study, it was decided to replicate the analyses at the level of a restricted sample. Since the empirical research was carried out on a sample of Romanian companies that accessed non-reimbursable financing, the representativeness of the results is limited only to the field of activity of the analyzed companies. Another limitation is given by the fact that our research was limited to microeconomic variables. The research of the performance of the companies responsible for

the digitalization of economic activities can only be properly evaluated in a well-defined Performance of macroeconomic framework.

All of these limitations will be benchmark concerns for future research. Thus, we envisage

a more complex assessment of the determinants of the performance of companies responsible for the digital transition to pave the way for increasing their performance through effective incentives. We consider the expansion of both internal and external determinants, especially since the analyzed period is marked by imbalances such as crises, inflation, supply chain disruptions. etc.

Given the particularities of the companies selected for analysis, to ensure the representativeness of the results, future research will consider expanding the sample, including all companies receiving grants to support digitalization, regardless of the source of the grants. In the present study, only the companies that accessed non-reimbursable financing within the Competitiveness Operational Program (Action 2.2.2) were considered. By enlarging the sample, it is also envisaged to carry out analyses at the level of clusters/sub-samples delimited according to the sources of non-reimbursable financing, the initial performances of the companies, their sizes or the periods of analysis. Moreover, given that the results of the present study reveal a decrease in performance during the implementation of infrastructure development projects for digitalization services, for future research we consider tracking performance dynamics during the monitoring and post-implementation periods.

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Management, Innovation and Entrepreneurship in Challenging Global Times

Proceedings of the 16th International Symposium in Management (SIM 2021)



https://link.springer.com/chapter/10.1007/978-3-031-47164-3_35

Financial performance, indebtedness and economic cycles

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Abstract

This research aims to emphasize the impact of indebtedness on the financial performance of tourism companies. To capture this impact in the different phases of economic cycles, the study focused on the period 2004-2019. The econometric analysis, is using panel data models, and it has been done for distinct periods of time. The sample was represented by 42 tourism companies. Based on the results of the full-period analysis, performed on the model of return on assets (ROA) and also on the model of return on equity (ROE), it was shown that indebtedness has a negative effect on financial performance. Statistical analysis also provides information on the impact of other micro- and macroeconomic variables. Thus, it was shown that the size of the company and the inflation rate have a negative impact, while the GDP growth rate and the degree of liquidity have a positive influence, when the performance is assessed by ROA. Breaking down the period analysed into sub-periods depending on the manifestation of the crisis we have shown that the variation of ROA - under the impact of the variables included in the analysis - is more significant than the variation of ROE. During the pre-crisis (2004-2008) and crisis (2009-2015) periods none of the variables analysed influenced ROE. The results of the study are valuable both scientifically and practically because they provide clues to managers on how to adapt performance and indebtedness strategies to the national macroeconomic context.

Keywords: tourism companies, financial performance, financial structure, indebtedness, economic cycles.

Introduction

The dynamism of today's economies, induced by the variations in various factors at the micro and macroeconomic level, determines companies to focus more on how to use the available resources. This is because resources are limited and needs are

2

unlimited. The use of these resources and the way in which the interests of stakeholders are satisfied are the benchmarks according to which the performance of a business is assessed.

Depending on their size, the object of activity, the nature of the production factors used, the degree of indebtedness, the branch or industry they belong to, the markets in which they operate, companies have different degrees of adaptability to the conditions of the economic environment. Profile studies indicate that - from the perspective of accessibility to different resources - small and medium-sized companies have fewer options to improve performance compared to large companies (Sujeewa 2020). However, a resource encountered at the level of all companies is the financial resource. From the perspective of this resource, what differentiates companies is the fact that the financial resource used can be deficient or surplus, own or borrowed, attracted in the short, medium or long term, etc. Due to its presence during the company's existence, the financial resource was considered an important factor that contributes to the success (or failure) of the business. Therefore, theorists and practitioners alike pointed out that the adoption of a set of specific financial resource management practices might result in an improvement not only of the financial performance but, also of the overall value of a business (Such-Devesa and Esteban 2011; Kizildag 2015; Le and Phan 2017; Nunes and Serrasqueiro 2017; Falk and Steiger 2018; Xu et al. 2020).

Debates on performance are between the previous but also recent concerns of researchers. The researchers' interest was based on the fact that, at the corporate level, continuous performance improvement is a vital goal (Chandler 1962). This is because the performance can be highlighted by long-term growth and also by high survival rates (Bercovitz and Mitchell 2007). Depending on the stage of the economy (we consider here the alternation between the phases of economic growth and decline, between the pre- and post-crisis periods), but also on the internal situation, companies are considering formulating strategies to help them adapt to the ever-changing socio-economic environment. These strategies have particularities specific to the industries to which the companies belong. This is the reason why in this study we aimed to conduct an investigation of the financial performance for companies that are operating in the tourism sector.

The tourism industry has an old tradition in Romania. Strongly marked by seasonality (Zhang and Xie 2021) but also by economic crises, this sector registered an unfavourable evolution. The main cause was the inability of Romanian tourism companies to face the competition of major international tour operators. Based on this problem, the present research evaluates the effects of indebtedness and business cycles on the financial performance of companies in the tourism industry. Because insufficient data were found to analyse and impact the recent pandemic crisis, the research was summarized in the time horizon 2004-2019.

In order to approach the topic of this paper, an extensive analysis was needed both from a theoretical, methodological point of view, but also from an empirical one. This analysis was focused mainly on the cause-effect relationship between financial performance and one of the most important determinants (debt financing), taking into account the particularities induced by economic cycles. The analysis of the literature on this topic revealed that research is predominant in other sectors and less in the tourism sector. Regarding the tourism sector, no previous research has been identified to analyse the dynamics of financial performance of Romanian companies, from the perspective of economic cycles.

In order to achieve the proposed objectives, the paper was structured as follows. The first section includes an analysis of the literature that addresses the issue of financial performance with emphasis on its determinants. The second part describes the research methodology used. Section three presents the results obtained and discusses them, highlighting their particularities for tourism companies. The paper ends with conclusions but also with a set of ideas regarding future research on this topic.

State of the art on performance and its determinants

Measurement of the performance can provide help for the managers in establishing their long-term strategies, support the adequacy of organizational behavior, and facilitate change management by identifying areas that require special attention, allocating resources more efficiently, and adopting a more efficient operating, planning, and control system. The bibliographic research carried out indicated that performance management has multiple purposes: strategic, administrative, informational, development, organizational maintenance and documentation (Aguinis, 2013). Thus, performance management contributes to the formulation and evaluation of corporate strategies, motivates human resources and provides useful information to all stakeholders (Kennerley and Neely 2002; Frolick and Ariyachandra 2006), ensuring continuous evaluation of resource efficiency and effectiveness (Chvatalova and Koch 2015).

Assessing the role of performance management in different macroeconomic contexts, well-known researchers have shown that during crises, companies reduce or even abandon performance management (Aguinis and Burgi-Tian, 2021). Even if the difficulties faced by companies are doubled by the difficulties of measuring performance, the recommendation is to strengthen performance management precisely to support companies in the superior valorization of resources and overcoming unfavorable periods.

Performance is a multidimensional concept. In the context of this research, we focus on the financial dimension. Financial performance is assessed based on the following benchmarks: the financial results (profits) made by a company in a given period (Chen et al. 2016); efficiency of resource allocation to achieve goals (Kurniaty et al. 2018); the ability to create value for stakeholders (Orozco et al. 2018); the current and future growth potential of a company (Le Thi Kim et al, 2021); the ability to attract and generate returns for investors (Al-Sa'eed 2018; Kurniaty et al. 2018). The diversity of benchmarks that underlie the assessment of performance indicates that financial performance measures are also diverse. Most often a distinction is made between accounting measures and market measures. Accounting measures include: rates of return (assets - ROA, equity - ROE, sales - ROS, investments - ROI); profit margins; sales volume or cash flow (Alshehhi et al. 2018). Market value and TobinsQ are measures of financial performance that capitalize on the information provided by the market.

In the process of reviewing the literature we noticed that there is a wide debate on the determinants of financial performance (especially those related to financing). However, these debates did not focus mainly on the tourism sector, an idea reinforced by Karadeniz and Koşan (2021).

Studies focused on the analysis of the determinants of financial performance propose and test hypotheses and develop causal models. These studies distinguish between internal factors (such as the structure of capital, shareholding structure, the specificity of products / services, the quality and cost of their production, organizational culture, etc.) and external factors (specific to industry and / or national economy, such as the rate of economic growth, of inflation, and of unemployment, the degree of indebtedness of companies, consumer price index etc.). Conducting extensive research on the determinants of financial performance, Capon et al. (1990) stated that the most representative are: industry concentration, asset growth or sales growth, market share, firm size (appreciated by sales volume) and capital intensity.

Concerned with the analysis of performance determinants, Pantea et al. (2014) reported that little attention is paid to internal factors. Based on this finding, they analysed a sample of 55 companies (for a period of 15 years) and showed that company size, capital intensity and human resources are the determinants with a positive impact on performance. At the same time, the authors also pointed out that, in the literature, there is no convergence regarding the most important determining factors (internal or external).

Without making a separate grouping of the analysed factors, Le Thi Kim et al. (2021) tested seven hypotheses on the impact of the following variables on financial performance: total assets turnover ratio, sales growth, leverage, consumer price index, firm size, quick ratio and ownership structure (private or public). Referring to a sample of Vietnamese food companies, the authors pointed out that only the first fourth factors have a statistically significant influence on financial performance (assessed by ROE and ROS).

Focusing on a sample of companies in the automotive industry (from Europe and the USA), for which they processed accounting and market data, Dinu and Vintila (2017) tested the impact of the following variables on financial performance (appreciated by ROA and ROE): debt, CEO duality, tax rate, crisis, size of the company, cost of capital, Tobin's Q, GDP per capita, inflation rate, short term interest and current ratio. The results of the study showed that the first four variables have a positive influence, while the next ones have a negative influence on the financial performance assessed by ROE.

Assuming that localization in a cluster has positive effects on performance, Martinez-Perez et al. (2021) conducted an analysis on the relationship between capital structure (bridging capital respectively) and performance of cultural tourism companies and identified a U-shaped reverse link. Other authors (Karadeniz and Koşan 2021) analysed the performance of tourism companies listed on the Istanbul Stock Exchange (for a period of seven years). Using price to earnings ratios as benchmark indicator, the authors showed that tourism companies registered significant differences in terms of liquidity, solvency, profitability, growth, size and stock return ratio. Debt requires a compromise between returns and risks (Sodaa et al. 2021). Debt - defined as access to capital that comes from outside the company, which involves temporary use because it must be repaid at maturity (Anwar 2019) - can negatively affect the value of a business (due to the risks involved) but at the same time can contribute to increase the expected yields (due to the leverage effect). In order to aim for an optimal funding structure, researchers and practitioners constantly analyse the profitability and risks associated with the business.

Focusing on the Chinese tourism industry, Xu et al. (2020) showed that the environmental management and debt financing significantly influenced sustainable financial growth. Regarding the impact of environmental management on sustainable financial growth, the authors have shown that debt financing can amplify this impact.

As the financing structure is an important determinant of the financial performance of tourism companies, the researchers' attention was also focused on identifying the determinants of the capital structure (Serrasqueiro and Nunes 2014; Kizildag 2015; Nunes and Serrasqueiro 2017; Pacheco and Tavares 2017). Thas, in the area of tourism, Falk and Steiger (2018) showed that the level of indebtedness depends on many factors, such as: growth opportunities, size and age companies, ownership structure, industry, size of the tangible assets and profitability.

Pacheco and Tavares (2017) conducted an analysis of 43 Portuguese tourism units (for the period 2004-2013) in the SME category and showed that indebtedness has a negative impact on performance (appreciated by ROE). Similar findings which confirm the preference of SMEs for financing their assets from internal sources and not external - have reached Vieira and Novo (2010), Degryse et al. (2012), Serrasqueiro and Nunes (2014). Le and Phan (2017) investigated the relationship between the structure of capital and the performance of companies in small countries in transition (such as Vietnam), and showed indebtedness rates have a significantly negative relationship with performance (appreciated by ROA and ROE). The authors also point out that this result is not in line with the majority of the studies realized in developed countries, which have obtained a positive relationship between capital structure and performance. Hasan et al. (2014) analysed the same determination relationship but on an example of 36 large listed companies in Dhaka (Bangladesh) and showed that the capital structure has a negative impact on performance (measured by ROA, ROE, earnings per share and Tobin's Q). Similar results were reached by Botta (2019), who stated that hotel SMEs face an optimal capital structure, which allows them to maximize profitability (too small or too large debts reducing financial performance). In the same paper, the authors also note that hotel SMEs are not particularly concerned with optimizing the structure of capital they use, and their financing behaviour is deeply linked to the availability of internal funds.

Regarding the tourism sector, the existing literature indicates that it is particularly affected by two categories of factors: the most dominant are the ones related to public health problems (Chien and Law 2003; Novelli et al. 2018); the latter are attributed to economic variations (Dahles and Susilowati 2015). The influences between the tourist activity and the economic activity of a country are manifested in both directions. A successful economy amplifies the development opportunities of companies. Conversely, high-performing companies contribute substantially to a country's economic development (Naser and Mokhtar 2004), generating positive externalities at the level of society and the natural environment (Belás et al. 2015).

As the literature notes, economic fluctuations (materialized in periods of growth, decline or recession), natural disasters, and political turmoil are major challenges for tourism in developing countries (Dahles and Susilowati 2015). Moreover, from the point of view of some foreign authors (Paraskevas et al. 2013), the investigation of the viability of the tourism sector in times of crisis is treated as a new subdomain of tourism studies.

Appreciating that the relationship of capital structure with corporate performance gained importance after the global crisis (due to liquidity problems), Azeez et al. (2015) analysed the performance of a sample of 200 companies belonging to different sectors of activity in the US - in the pre, during and after the crisis - and stated that for the correct assessment of the relationship between the capital structure and the performance of the companies, attention must be paid both to the indicators used and to the particularities of the analysed periods. Their results revealed that debt is more closely and negatively correlated with performance (ROA and ROE) when analysing the entire period (2003-2012). In the pre-crisis (2003-2006) and post-crisis (2009-2013) periods, the ROA keeps the same connection with debt. Instead, in the post-crisis period the debt is closely and positively correlated with ROE.

Unlike the previously mentioned research, which analysed only the impact of indebtedness on financial performance (using different measures) in the pre- and post-crisis periods, in this study we aim to analyse the variation of financial performance both under the impact of indebtedness and of some macroeconomic variables that characterize the different phases of economic cycles. We consider the following variables: GDP growth rate, unemployment rate and inflation rate.

Methodology

The research of the corporate performance obliges to pay special attention to the following aspects: the instruments for measuring the variables (performance, indebtedness, economic growth / decrease, etc.) and their correct determination; data sources (the use of both secondary sources which can provide historical information, and also of primary data, which are based on observation but at the same time are not relevant for longer periods of time); the representativeness of the samples (because the lack of homogeneity limits the representativeness we decide to focus on a specific industry).

Starting from these, in order to ensure the homogeneity of the companies in the sample, we selected the companies choosing a set of specific criteria: were included in the sample the companies which had the object of activity belonging to CAEN code 5510 - Hotels and other similar accommodation facilities); and which had annual sales of at least 3 million Euros for the last year of the analysed period. The

total number of companies identified according to the indicated CAEN code (almost 3000), only 60 companies met the sales volume criterion. From these, only 42 had financial data for the entire period considered. From the 42 companies, 14 recorded losses for more than three consecutive years. The turnover generated by the 42 companies (at the level of 2019) represents a third of the turnover generated by all the companies registered with the CAEN code 5510.

The period considered for the analysis is of 16 years, between 2004 and 2019. In order to increase the quality of the empirical analysis and to identify the role of the different phases of the economic cycles on the relationship between financial performance and its determinants, we divided this period into three sub-periods: the pre-crisis period (between 2004 and 2008), the period of manifestation of the crisis (2009-2015), and the period after the crisis (2016-2019). The division into pre- and post-crisis periods was made taking into account the dynamics of the macroeconomic variables included in the analysis (GDP growth rate, unemployment rate, inflation rate). The selected sample includes both medium and large companies. The statistical analysis performed using the Data Analysis package from Excel focused on the analysis of the panel data and used the data collected from secondary sources (obtained from www.mfinante.ro). The use of companies' accounting information for the empirical analysis has also been confirmed by other studies in the literature (Hada et al., 2019), which considered the performance analysis of Romanian companies. The dependent and independent variables and the methodology for determining them are presented in Table 1.

Variables	Symbol	Calculation
Dependent variables		
1. Return on assets	ROA	(Gross profit / Total assets) *100
2. Return on equity	ROE	(Net profit / Equity) *100
Independent variables		
1. Level of indebtedness	LI	Liabilities / (Liabilities + Equity) *100
2. GDP growth rate	GDP	-
3. Unemployment rate	UR	-
4. Inflation rate	IR	-
5. Global competitiveness index	GCI	-
Control variables		
1. Company size	CS_1	Total assets (natural logarithm)
	CS_2	Number of employees (natural log.)
2. Level of liquidity	LL	(Cash availability/Liabilities) *100
3. Sales growth rate	SGR	(Sales n /Sales n-1); Sales $2004 = 1$

Table 1. Variables of regression model

Note: According to literature review. Source: Processed by authors.

In view of those identified in the literature and taking into account the particularities of the sample on which the analysis will be performed, we propose to test the following hypotheses: H1. In the case of tourism companies in Romania, indebtedness has a negative effect on financial performance (assessed by ROA and ROE).

H2. The size of the companies (assessed by total assets or number of employees) has a negative effect on financial performance (assessed by ROA and ROE).

H3. Level of liquidity and sales growth rate have a positive effect on financial performance (appreciated by ROA and ROE).

H4. Economic growth (assessed by GDP growth rate) and global competitiveness (assessed by the global competitiveness index) have a positive effect on financial performance (assessed by ROA and ROE).

H5. Unemployment rate has a negative effect on financial performance (appreciated by ROA and ROE).

H6. Inflation rate has a negative effect on financial performance (appreciated by ROA and ROE).

The dynamics of the macroeconomic indicators is shown in Figure 1. To highlight economic cycles, we used GDP growth rate (which reflects the dynamism of the national economy) and two indicators that assess two major categories of imbalances, namely, money market imbalance (inflation rate) and labour market imbalance (unemployment rate). In addition, we also included in the analysis the global competitiveness index, which reflects the aggregation of institutions and macroeconomic policy measures aimed at increasing productivity and economic performance. According to the literature, the pillars of competitiveness are: institutions, infrastructure, ICT adoption, macroeconomic stability, health, skills, product market, labour market, financial system, market size, business dynamism, and innovation capability (Schwab, 2019).



Fig. 1. Dynamic of macroeconomic variables Sources: https://data.worldbank.org/country/romania; Schwab 2019; https://insse.ro/cms/ro/content/ipc%E2%80%93serie-de-date-anuala

In order to identify the determinants of the financial performance of the companies, correlation but also regression analyses were performed. The statistical analyses were made using Data Analysis software. Our sample being formed of a set of 11 indicators, for 42 companies that were analysed over a period of 16 years, the
regression analysis implied using panel data models. The equation of the regression model is presented below:

$$Yit = Xit \beta 1 + Zit \beta 2 + uit$$
(1)

where: *i* represents each company in the sample, *t* represents the time (between 2004 and 2019); *Yit* represents the dependent variables (in our case ROA or ROE); *Xit* represents the independent variables (LI, GDP, UR, IR, GCI); Zit represents the control variables (CS₁, CS₂, LL and SGR); β 1 and β 2 represent the coefficients; *uit* describes the error term.

The regression analysis was run over four time periods: 2004-2009 the entire 16-year period; 2004-2008 the pre-crisis period; 2009-2015 the period of manifestation of the crisis and 2016-2019 the post-crisis period. The results obtained after running the empirical analyses are detailed and discussed in the following section.

Results and discussions

As we already mentioned above, the econometric models used to identify the relationship between financial performance and its determinants involved the use of correlation and regression analysis. Prior to these analyses, we first presented the results obtained for the descriptive statistics (table 2).

The results show the significant variation of the indicators considered during the analysed period, with differences depending on the company and period. The average return on assets (ROA) is 5.6% and varies between a negative minimum (-31.7%) and a maximum of 44.1%. The return on equity (ROE) registers an average of 7.4%, and the minimum-maximum variation intervals are much higher (-747.7% and 851.3%). The superiority of ROE over ROA indicates that the analysed companies also used borrowed capital, the cost of which was lower than the internal rate of return. The proof is the fact that the average degree of indebtedness at the sample level is 43.8% (the minimum being 0.5% and the maximum 242.7%).

	ROA	ROE	LI	DGP	UR	IR	GCI	CS_1	CS_2	LL	SGR
Mean	5.6	7.4	43.8	4.1	6.3	4.6	4.3	207.5	4.9	0.5	1.2
Standard Error	0.4	2.4	1.3	0.2	0.0	0.1	0.0	8.1	0.0	0.1	0.0
Median	3.4	5.3	35.8	4.3	6.8	4.7	4.1	131.0	4.9	0.1	1.1
Standard Deviation	10.2	63.0	33.3	4.1	1.1	3.4	0.7	209.0	1.0	1.4	1.2
Minimum	-31.7	-747.7	0.5	-5.5	3.9	-1.5	3.7	1.0	0.0	-5.1	0.1
Maximum	44.1	851.3	242.7	10.4	7.3	11.9	6.5	1199.0	7.1	13.5	23.8
Count	672	672	672	672	672	672	672	672	672	672	672

Table 2. Descriptive statistics

Source: Processed by authors

The analysed macroeconomic indicators show evolutions that characterize the analysed period (2004-2019). The average GDP growth rate is 4.1%, but it varies between negative values (minimum -5.5%) and maximum values of 10.4%. The average inflation rate is 4.6% and records similar variations as GDP growth rate

(minimum -1.5% and maximum 11.9%). Unemployment rate varies between 3.9% and 7.3%, with an average value of 6.3%. The average global competitiveness index is 4.3 (which places Romania in the top 50-60 states in the ranking made annually by the World Economic Forum).

The highest standard deviation is recorded in the case of the company size variable (CS1), which justifies the fact that the sample consisted of a limited number of companies (respectively, 42). The average level of liquidity is 0.5%, which shows that - at the sample level - companies have liquidity that can cover up to half of total debt (short-term and long-term). The average sales growth rate is 1.2, which means that the average annual sales growth rate was 20%. Compared to this high growth rate, we must specify that the minimum-maximum variation range was major: 0.1 and 23.8.

The correlation analysis did not indicate strong associations between the variables (details in Table 3). The results obtained after running the regression analysis are summarized in Table 4 presented below. R Squared indicates that 31% of the ROA variation and only 1% of the ROE variation is influenced by the variation of the independent variables considered in our models. The statistical confidence considered was 95%, thus the threshold of significance was 0.05.

Table 3. The analysis of correlation

	ROA	ROE	LI	DGP	UR	IR	GCI	CS_1	CS_2	LL	SGR
ROA	1										
ROE	0.24	1									
LI	-0.34	-0.03	1								
DGP	0.20	0.02	-0.01	1							
UR	-0.19	-0.03	0.12	-0.17	1						
IR	-0.03	0.03	0.07	0.21	0.30	1					
GCI	0.17	0.03	-0.12	-0.03	-0.65	-0.26	1				
CS_1	-0.31	-0.09	-0.03	-0.14	-0.23	-0.30	0.22	1			
CS_2	-0.12	-0.05	-0.18	0.05	-0.06	-0.01	0.04	0.63	1		
LL	0.28	0.03	-0.34	-0.01	-0.11	-0.03	0.12	-0.03	0.03	1	
SGR	0.02	0.00	0.02	0.06	-0.02	-0.03	0.03	0.00	-0.08	-0.02	1

Source: Processed by authors

Table 4. The analy	sis of r	egres	sion				
Regression Statis	tics I	ROA	ROE				
Multiple R		0,56	0,11				
R Squared		0,31	0,01				
Adjusted R Squar	red	0,30	0,00				
Standard Error		8,49	63,08				
Observations		672	672				
			ANC	OVA			
ROA	df		SS	5	MS	F	Significance F
Regression	9		21823.2	2	2424.8	33.7	7.2E-49
Residual	662		47702.4	4	72.1		

Total	671	69525.6			
ROE	df	SS	MS	F	Significance F
Regression	9	30600.5	3400.1	0.9	0.6
Residual	662	2633843.9	3978.6		
Total	671	2664444.4			

Source: Processed by authors

In the ANOVA test, for the ROA-based model, *Significance F* takes values lower than the significance threshold (0.05) and non-zero, which validates the proposed regression model. The model that assesses the impact of determinants on the financial performance measured by ROE is not statistically significant (because the *Significance F* is greater than 0.05).

The results of the first regression analysis, which process the data for the whole period, are summarized in Table 5. The first regression model can be rewritten as follows:

 $ROAit = -0.08LI + 0.36GDP - 0.73UR - 0.34IR + 1,74GCI - 3.14CS_1 + 0,78CS_2 + 1.10LL - 0.14 SGR + 56.72$ (2)

Table 5. Coefficients of regression models

ROA	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	56.72	9.66	5.87	0.00	37.75	75.70
LI	-0.08	0.01	-7.14	0.00	-0.10	-0.06
DGP	0.36	0.09	3.96	0.00	0.18	0.54
UR	-0.73	0.65	-1.14	0.26	-2.01	0.54
IR	-0.34	0.11	-3.04	0.00	-0.56	-0.12
GCI	1.74	0.96	1.81	0.07	-0.15	3.63
CS_1	-3.14	0.36	-8.85	0.00	-3.84	-2.45
CS_2	0.78	0.45	1.72	0.09	-0.11	1.66
LL	1.10	0.25	4.41	0.00	0.61	1.59
SGR	0.14	0.27	0.52	0.60	-0.39	0.67
ROE	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
	000000000	Stantaara Entor				00001 2270
Intercept	90.23	71.81	1.26	0.21	-50.77	231.23
Intercept LI	90.23 -0.03	71.81 0.08	1.26 -0.39	0.21 0.70	-50.77 -0.19	231.23 0.13
Intercept LI DGP	90.23 -0.03 -0.02	71.81 0.08 0.68	1.26 -0.39 -0.03	0.21 0.70 0.98	-50.77 -0.19 -1.35	231.23 0.13 1.31
Intercept LI DGP UR	90.23 -0.03 -0.02 -2.46	71.81 0.08 0.68 4.81	1.26 -0.39 -0.03 -0.51	0.21 0.70 0.98 0.61	-50.77 -0.19 -1.35 -11.90	231.23 0.13 1.31 6.98
Intercept LI DGP UR IR	90.23 -0.03 -0.02 -2.46 0.37	71.81 0.08 0.68 4.81 0.83	1.26 -0.39 -0.03 -0.51 0.45	0.21 0.70 0.98 0.61 0.65	-50.77 -0.19 -1.35 -11.90 -1.25	231.23 0.13 1.31 6.98 1.99
Intercept LI DGP UR IR GCI	90.23 -0.03 -0.02 -2.46 0.37 1.67	71.81 0.08 0.68 4.81 0.83 7.16	1.26 -0.39 -0.03 -0.51 0.45 0.23	0.21 0.70 0.98 0.61 0.65 0.82	-50.77 -0.19 -1.35 -11.90 -1.25 -12.38	231.23 0.13 1.31 6.98 1.99 15.73
Intercept LI DGP UR IR GCI CS ₁	90.23 -0.03 -0.02 -2.46 0.37 1.67 -4.19	71.81 0.08 0.68 4.81 0.83 7.16 2.64	1.26 -0.39 -0.03 -0.51 0.45 0.23 -1.59	0.21 0.70 0.98 0.61 0.65 0.82 0.11	-50.77 -0.19 -1.35 -11.90 -1.25 -12.38 -9.37	231.23 0.13 1.31 6.98 1.99 15.73 0.99
Intercept LI DGP UR IR GCI CS ₁ CS ₂	90.23 -0.03 -0.02 -2.46 0.37 1.67 -4.19 -0.30	71.81 0.08 0.68 4.81 0.83 7.16 2.64 3.35	1.26 -0.39 -0.03 -0.51 0.45 0.23 -1.59 -0.09	0.21 0.70 0.98 0.61 0.65 0.82 0.11 0.93	-50.77 -0.19 -1.35 -11.90 -1.25 -12.38 -9.37 -6.87	231.23 0.13 1.31 6.98 1.99 15.73 0.99 6.27
Intercept LI DGP UR IR GCI CS_1 CS_2 LL	90.23 -0.03 -0.02 -2.46 0.37 1.67 -4.19 -0.30 0.85	71.81 0.08 0.68 4.81 0.83 7.16 2.64 3.35 1.85	1.26 -0.39 -0.03 -0.51 0.45 0.23 -1.59 -0.09 0.46	0.21 0.70 0.98 0.61 0.65 0.82 0.11 0.93 0.65	-50.77 -0.19 -1.35 -11.90 -1.25 -12.38 -9.37 -6.87 -2.78	231.23 0.13 1.31 6.98 1.99 15.73 0.99 6.27 4.48

Source: Processed by authors

From the 9 independent variables (included in the model that assesses performance by ROA), 5 have a significant impact on financial performance (P-value <0.05). Level of indebtedness, inflation rate, and company size (measured by total assets) sales growth rate are the variables that negatively influence financial performance (specifying that the last variable has a statistically insignificant influence). GDP growth rate and level of liquidity are the only variables with a positive (and statistically significant) impact on financial performance. The negative impact of the inflation rate on performance can be interpreted by the fact that high inflation rates do not stimulate indebtedness, because it increases the cost of borrowed capital).

The breakdown by time periods favoured the identification of the impact of independent variables on performance of companies considering different time periods for the economic cycles. Thus, the regression models used previously were applied to these data for each sub-period. The results thus obtained were described in Table 6. Regarding the first model (based on ROA), the results of the analysis reveal that 20% (in the pre-crisis period), respectively 36% (in the crisis and the period after the crisis) of the variation in financial performance is explained by the change of the independent variables. The second model is less significant because the variation of ROE is determined by the variation of independent variables only in proportion of 5% in the pre-crisis period, 1% in the crisis period and 10% in the postcrisis period. Moreover, in the ANOVA test, Significance F takes values greater than or equal to the significance threshold (0.05), which invalidates the regression model that uses ROE as a measure of financial performance.

Regression	2004-2008		2009-2	015	2016-2019		
MODELS	ROA	ROE	ROA	ROE	ROA	ROE	
Multiple R	0.45	0.21	0.60	0.11	0.60	0.31	
R Squared	0.20	0.05	0.36	0.01	0.36	0.10	
Adjusted R Squared	0.17	0.00	0.35	-0.02	0.32	0.05	
Standard Error	8.94	50.90	7.88	84.08	8.33	21.30	
Observations	210	210	294	294	168	168	
Significance F	6.8E-07	0.39	8.8E-24	0.94	6.1E-12	0.05	

Table 6. Regression analysis

Source: Processed by authors

In the context of the above explanations, our attention will be directed to the regression model that measures financial performance through ROA (Table 7). However, in order to follow the variation of the financial performance measured by ROE - during the three phases of the economic cycle - we determined the impact of the independent variables (table 8).

The data in Table 7 allow the following interpretations: the degree of indebtedness has a negative impact on the financial performance in the crisis and post-crisis periods; although it has a weak impact, this result is statistically significant; the size of the company (assessed by total assets - CS_1) negatively influences the financial performance regardless of the state of the economy (pre-crisis, crisis or post-crisis), the influence being statistically significant; the degree of liquidity positively influenced the performance, in the crisis period; it is a weak but statistically significant impact.

In the pre- and post-crisis periods, there were no other variables with a statistically significant impact on the financial performance assessed by the ROA (*P value* for intercept was higher than the assumed significance threshold).

	bernelents of f	egression	ROT model				
Results	2004-20	008	2009-20	015	2016-2019		
ROA	Coefficients	P-value	Coefficients	P-value	Coefficients	P-value	
Intercept	11.99	0.84	-33.29	0.50	54.07	0.61	
LI	-0.03	0.10	-0.12	0.00	-0.11	0.00	
GDP	-0.92	0.33	-0.29	0.32	1.10	0.67	
UR	0.21	0.89	9.11	0.16	2.20	0.85	
IR	0.54	0.42	-1.42	0.07	0.39	0.85	
GCI	12.30	0.39	4.66	0.68	2.92	0.67	
CS_1	-3.36	0.00	-2.30	0.00	-4.06	0.00	
CS_2	1.17	0.29	0.55	0.34	-0.15	0.87	
LL	0.98	0.08	1.07	0.00	0.81	0.07	
SGR	-0.03	0.95	1.78	0.13	0.23	0.59	

Table 7. Coefficients of regression - ROA model

Source: Processed by authors

The regression analysis based on ROE, as expected (because the model did not prove to be statistically significant), indicated that the variables do not significantly influence financial performance. The only variable with significant influence is the degree of indebtedness (LI). As in the first regression model (which uses ROA as a measure of performance), indebtedness has a negative impact on ROE (only in the post-crisis period) (Table 8).

14010 01 0		Bressien	110 2 1110 401				
Results	2004-2008		2009-20)15	2016-2019		
ROE	Coefficients	P-value	Coefficients	P-value	Coefficients	P-value	
Intercept	-346.89	0.31	-642.79	0.23	78.68	0.77	
LI	-0.05	0.65	0.01	0.95	-0.05	0.42	
GDP	-5.84	0.28	-2.03	0.51	1.20	0.85	
UR	4.32	0.61	23.64	0.73	2.67	0.93	
IR	6.41	0.10	1.53	0.86	-0.09	0.99	
GCI	100.61	0.22	124.32	0.30	4.97	0.78	
CS1	-3.33	0.45	-2.17	0.68	-6.21	0.00	
CS2	-3.07	0.62	-0.42	0.95	0.81	0.73	
LL	0.71	0.82	1.53	0.69	0.35	0.76	
SGR	0.27	0.90	0.96	0.94	-1.45	0.18	

Table 8. Coefficients of regression - ROE model

Source: Processed by authors

Given that the analysis of the determinants of financial performance according to the phases of economic cycles has not been the subject of previous analyses (especially in the tourism sector), we consider that the results of our empirical analysis are very useful from a theoretical point of view (because they fill the research gap in this segment) and practical (because they provide managers with guidelines for substantiating effective organizational strategies, taking into account the phases of business cycles).

Conclusions

Scientific discussions on the relationship between the impact of indebtedness on corporate performance are extensive and controversial. Experiences have shown that crises can change performance and financing strategies and, implicitly, companies' behaviours and results. This is why our research focused on a detailed analysis of the mentioned relationship, before, during and after the crisis.

Our research was focused on analysing the financial performance of a set of companies from the tourism sector in Romania. The unfavourable evolution of the tourism sector in the last decades outlined our research problem and focused our attention on identifying the factors that could underlie this evolution.

The incursion made in the literature in the field pointed out that the assessment of the impact of the determinants of financial performance is a permanent concern and has received constant attention from researchers. This is due to the fact that performance management supports companies in formulating and implementing their strategies, considering the influences that come from the microeconomic and macroeconomic context.

Our empirical investigation had the purpose to identify the significance and also the intensity of the influences of the determinants of financial performance (appreciated by ROA and ROE), depending on the phases of economic cycles. The statistical analysis performed on a sample of companies in the tourism sector provided representative information both for the period of sixteen year between 2004 and 2019 and also on sub-periods. The regression model included five internal determining factors (indebtedness, liquidity, sales growth rate and company size – measured by total assets and by number of employees) and four external indicators (GDP growth rate, inflation rate, unemployment rate and global competitiveness). The results of the empirical analyses are summarized in Table 9.

Our results confirm hypotheses H1 and H2 – borrowing and companies' size have a negative impact on financial performance. At the same time, our results confirm the pecking order theory (which considers that the order of use of financial resources is more important compared to their share in total funding). Similar results were also obtained by Pacheco and Tavares (2017), Vieira and Novo (2010), Degryse et al. (2012), Serrasqueiro and Nunes (2014), Le and Phan (2017), Hasan et al. (2014), Azeez et al. (2015). Regarding the size of the company (assessed by total assets -CS₁) our results are also confirmed by Azeez et al. (2015). Regarding the other two control variables (level of liquidity and sales growth rate), hypothesis H3 is partially validated. The analysis for the entire period indicated that the level of liquidity (LL) has a positive impact on financial performance (measured by ROA). In contrast, the analysis at subperiod level indicated that this impact is statistically significant only during the crisis (2009-2015). For the sales growth rate (SGR) variable, econometric analyses did not indicate any influence on financial performance.

The analysis at the level of macroeconomic variables - at the level of the whole period (2004-2019) – partially confirms the hypotheses H4, which allows the appreciation that the periods of economic growth (marked by the reduction of macroeconomic imbalances) contribute favourably to the improvement the performance of tourism companies. The inflation rate has a negative influence, when the performance is assessed by ROA (this influence is no longer significant at the level of subperiod analyses). Evidence of the impact of economic variation on performance is also provided by Dahles and Susilowati (2015), Naser and Mokhtar (2004), Belás et al. (2015).

	2000-	-2019	2000-	-2008	2009-	-2015	2016-	2019
	ROA	ROE	ROA	ROE	ROA	ROE	ROA	ROE
Intercept	(+)	Х	х	Х	х	Х	Х	х
LI	(-)	х	х	х	(-)	Х	(-)	х
GDP	(+)	х	х	х	х	Х	х	х
UR	Х	х	х	х	х	Х	х	х
IR	(-)	х	х	х	х	Х	х	х
GCI	Х	х	х	х	х	х	х	х
CS_1	(-)	Х	(-)	х	(-)	х	(-)	(-)
CS_2	Х	Х	х	х	х	х	х	х
LL	(+)	х	х	х	(+)	х	х	х
SGR	х	х	х	х	х	х	х	х

Table 9. Impact of the analysed variables on financial performance

(+) positive influences, (-) negative influences, x – statistically insignificant influences Source: Processed by authors

In the analysis of the literature, we did not identify a similar study, which would present the interdependencies between financial performance and micro and macroeconomic variables associated with the pre-crisis, crisis and post-crisis periods. Therefore, we consider that our study is filling the gap existent in the research regarding the management of financial performance, with accents on the companies from the tourism sector from Romania. The originally of our research comes first from the sample chosen for the analysis because it is representative at the industry level. Second, the originality comes from the extend period of sixteen years and its breakdown by sub-periods depending on the manifestation of the financial crisis. Thirdly, but of great importance, the originality comes from the results obtained because they can help in defining organizational strategies.

However, the study also has limitations. Because the data for the internal indicators were obtained from simplified annual financial statements, this led to the analysis of a small number of variables with a potential impact on performance. Moreover, the results obtained from the regression analyses show that the chosen indicators explain only a third of the financial performance variation, which shows us that there are other variables that could be included, and that could have a potential effect on performance. Future research directions aim at identifying these factors and including them in econometric models in order to expand knowledge about the determinants of financial performance of companies in the tourism sector in Romania.

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Article Global Analysis Regarding the Impact of Digital Transformation on Macroeconomic Outcomes

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Abstract: In the context of the development of information technologies, the concerns about assessing the effects of digital transformation have increased. Although it is intuitively accepted that digital transformation has a favourable impact on macroeconomic variables (based on the interdependencies between micro- and macroeconomic performance), there is little scientific research providing evidence of this. Building on this identified research problem, this study aims to bridge the gap between theory and practice. After assessing the extent to which the world's economies have responded to the need for digital transformation, an econometric analysis was conducted to quantify the impact of digital transformation on economic and social outcomes. To ensure the representativeness of the results, the econometric analysis was conducted on a sample of 46 countries selected according to the size of their gross national income per capita. The NRI (Network Readiness Index) and the sub-indices associated with the economic environment (future technologies, business, and economy) were used as independent variables. Gross domestic product (GDP) was used as a dependent variable. The results indicate that NRI has a positive and significant impact on GDP per capita. Analysis at the sub-indices level partially confirms this result and highlights that their contributions to the growth of macroeconomic performance may be different. The study results have practical utility as they provide clues on the structural efficiency of the benchmarks underpinning the digital transformation. To increase the positive impact on macroeconomic outcomes, policy-makers can propose and implement policies to facilitate access to those technologies that prove to be more effective.

Keywords: digital transformation; Network Readiness Index; GDP per capita; annual growth rate of GDP; America; Arab states; Asia; Pacific; Europe

1. Introduction

Researchers' concerns about digitisation and digital transformation have been growing recently. The proof of this is the number of research articles identified on the Web of Science platform (as of 20 December 2022) on topics such as digitalisation (2792 articles), digital transformation (24,385 articles), digital transition (13,899 articles), digital innovation (18,847 articles), etc. Figure 1 shows the dynamics of this research, with a recent exponential increase.

Based on the review of a set of 39 relevant publications, Kraus et al. (2021) [1] highlighted two essential issues: technology is the driver of change induced by digital transformations; and digital transformations are occurring at all levels (companies, environment, society, and institutions). Reiterating that the use of new technologies is a requirement for ensuring the competitiveness of companies operating in a digital environment, Vial (2019) [2], in an extensive literature review, pointed out that digital transformation is both an endogenous phenomenon (in that it takes the form of a response by decision-makers to the opportunities offered by digital technologies) and an exogenous threat (requiring a response by companies to factors originating in the business environment).



Citation: Tudose, M.B.; Georgescu, A.; Avasilcăi, S. Global Analysis Regarding the Impact of Digital Transformation on Macroeconomic Outcomes. *Sustainability* **2023**, *15*, 4583. https://doi.org/10.3390/ su15054583

Academic Editors: Maria Palazzo, Alessandra Micozzi and Dominique Lepore

Received: 7 February 2023 Revised: 28 February 2023 Accepted: 1 March 2023 Published: 3 March 2023



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Studies have shown that the most important determinants of digital transformation are associated with the external environment and organisational culture [3]. By the nature and magnitude of its impact, digital transformation based on the incorporation of digital technologies generates both opportunities (facilitating change) and threats for companies [4,5], ecosystems, industries, or economies [6].

Most research on the impact of transformations assesses the impact at the microeconomic level. Interactions between digital transformation and the value creation process, competitiveness, performance, sustainability, innovation, and business risks are considered. Zhang et al. (2023) [3] pointed out that digital transformation generates competitive advantages because it comes bundled with an innovation portfolio, which changes the value creation process. Thus, digital transformation generates new business models [5,7–10], stimulates innovation [11] and contributes to the creation of new products/services [3], achieves reconfigurations in customer preferences and behaviours [3,12,13], and contributes to increasing the performance of the economic environment [14].

Regarding the ubiquity of digital transformations, specialists affirm that not all companies need to be part of digital transformation processes, only those that can make creative and empirical simulations of business models that demonstrate the ability to implement digital transformations [15]. The same authors showed that, for these companies, digital transformation must respond to a 'planned digital shock'. In other words, the causes and effects of digital-transformation-induced change can be managed in a way that is good for business and good for the environment.

Through interactions at the microeconomic level, digitisation and digital transformation also create the conditions for increased macroeconomic performance. Of the more than 24,000 articles (in the above-mentioned database) that directly or indirectly address the causes and effects of digital transformation, only 0.2% integrate macroeconomic issues in the debate. As can be seen in Figure 1, after the 1990s, concerns about analysing the impact of digital transformations intensified. The researchers focused on ICT, a context in which evaluations were made regarding the effects of increasing access to information and increasing the speed of knowledge diffusion in different fields.

Taking the period 1970–1990 as a benchmark, Röller and Waverman (2001) showed that a third of the economic growth recorded in 21 countries was due to the development of telecommunications [16]. Vu (2011) carried out analysis for the period 1996–2005 and showed that ICT contributes to economic growth because it stimulates innovation and technology diffusion (at the level of industries and at the level of countries and regions) and improves the efficiency of resource allocations at the level of national economies [17]. The positive effect at the macroeconomic level derives from the positive effects recorded at the microeconomic level, which materialized in the reduction of production costs (because of easier and faster communication at the level of economic agents).

Comparing the two works written ten years apart, it is noticeable that there has been progress in the field of literature research. The impact of ICT is analysed by the country category (more developed and less developed) and the determinants are decomposed to highlight the structural changes in terms of economic growth. Simultaneously, a distinction is made between ICT penetration and the increase in its use. To provide more clarity on the contribution of ICT to economic growth, subsequent research has indicated that this contribution may differ depending on the type of technology examined.

For example, Toader et al. (2018) analysed the effects of accelerated ICT development and assessed the impact on GDP per capita for EU states for 18 years (2000–2017). They built impact measurement models based on four factors associated with ICT (fixed-broadband subscriptions, broadband Internet connection, level of internet usage, and mobile cellular subscriptions) and seven factors associated with macroeconomic variables. The authors showed that a 1% increase in the use of ICT infrastructure contributes to an increase in GDP per capita of between 0.0767% (fixed-broadband subscriptions) and 0.396% (mobile cellular subscriptions) [18]. Fernández-Portillo et al. (2019) analysed the impact of ICT globally but also from the perspective of five constructs (connectivity, human capital, Internet use, technological integration, and public services). Global analysis indicated that ICT was the most important contributor to GDP per capita. Conversely, the analysis at the level of the five constructs showed that the contribution to the growth of macroeconomic results is different [19].

Mayer et al. (2019) analysed the impact of broadband infrastructure investment on economic growth (as measured by GDP per capita). They showed that these networks speed up the transmission of information and knowledge; specifically, each 10% increase in speed produces about a 0.5% increase in GDP per capita [20]. Soava et al. (2022) retrospectively (2003–2020) and prospectively (2025) analysed the contribution of e-commerce to the formation and growth of the gross domestic product and indicated that the digital economy contributes to economic and social development, having the ability to multiply the growth effect of GDP [21].

Since the studies were conducted on different samples (more or less homogeneous), for different periods (of the order of a few years or decades), using different methodologies and different ICT components, the results regarding the positive impact of ICT on macroeconomic variables were heterogeneous. For this reason, some authors point out that the results cannot be generalized, especially since some studies either did not identify any relationship between the two variables (Fernández-Portillo et al., 2019) [19] or reported statistically insignificant results (Mayer et al., 2019) [20].

To ensure a convergence of results, some organizations have recently proposed the determination of aggregate indicators that allow the evaluation of digital transformations based on a unified methodology, applicable at the country or regional level. Thus, specific indicators were used in the profile research, such as the Networked Readiness Index (NRI), the Digital Economy and Society Index (DESI), the ICT Development Index, or sets of indicators developed by the OECD (Organisation for Economic Co-operation and Development) and the World Bank.

Studies using NRIs have shown that digital technologies shorten operating times at the economic level [22] and positively impact competitiveness and welfare [23], economic growth [24,25], industrial development, and employment [26], facilitating social progress [27].

DESI, as an index measuring the digital competitiveness of EU Member States, is used in various studies to highlight the dynamics of digital performance across EU countries [28], to assess the extent to which the gap between rich and poor countries in the EU can be narrowed through rapid and intensive digital transformation [29], or to assess the digital convergence of markets in the EU [26].

Research that has used aggregate indicators to measure digital transformations (such as that previously presented) has provided results that cannot be generalized. This is because the analyses were conducted for different samples and periods and used different methodologies. At the same time, the increase in the use of ICT, in the conditions of a dynamic economic environment, forces periodic reassessments regarding the impact of digital transformations on macroeconomic variables. For this reason, this study has a double objective: to assess the extent to which the world's economies have responded to the need for digital transformation and to assess the impact of digital transformations on macroeconomic outcomes. To ensure the originality and representativeness of the results, the empirical research was carried out on a sample of 46 states from different areas of the globe, selected according to gross national income per capita. The research strategy was based on the hypothesis of the positive impact of digital transformations on economic growth. The results of the analyses carried out both at the sample level and at the level of groups of countries confirmed the assumed hypothesis and highlighted that (for the selected sample) GDP per capita is the indicator that best captures the impact of digital transformations (measured by an aggregate indicator, as well as through sub-initials associated with the economic environment). To our knowledge, the evaluation of the impact of the selected sub-indices (future technologies, business, and economy) has not been the subject of previous analyses. Therefore, the present study opens up new research directions and signals that the degree of access to future technologies, financial support for R&D, and the network economy may have different impacts on macroeconomic outcomes.

To achieve this objective, the paper was structured as follows. Section 2 summarizes the results of the literature research on digital transformation and the measures used to assess its macroeconomic impact. Section 3 presents the methodology of the empirical research. The results of the research and discussion of the findings are summarised in Section 4. The last section presents the main conclusions, research limitations, and future research directions.

2. Literature Review

The literature review aims to identify the concepts describing digital transformation and the indicators used to assess the degree of digitisation of economies (such as NRI). We also gathered evidence on the impact of digital transformation on macroeconomic performance, according to the latest research available in this field. The three subsections provide detailed and relevant references regarding the scientific findings of the studies performed lately.

2.1. Digital Transformation—Concept, Causes and Effects

Most of the debates regarding the digital transformation are relatively recent. As a field that has not yet reached maturity in terms of conceptual foundations, early attempts to define the concept of digital transformation have lacked convergence. Thus, digital transformation has been associated with the use of new digital technologies capable of generating improvements (such as process efficiencies), facilitating adaptability, and supporting increased performance of businesses, industries, ecosystems, or even economies as a whole [8,30]. Other authors have defined the digital transformation in terms of the causes and effects it produces. For example, Hinings et al. (2018) [6] interpreted digital transformations. Bondar et al. (2017) [31] interpreted digital transformation through the adaptive capacity of different economic or institutional actors to the new circumstances of the digital era.

To shed light on the scope and complexity of digital transformation, Vial (2019) [2] proposed four benchmarks: the target entity (which can be represented by companies, institutions, ecosystems, national economies, etc.), the scope (micro- or macroeconomic), the source of change (the technologies generating change) and the expected outcome (which can be positive or negative). Based on these benchmarks, Vial (2019) [2] has produced the most pertinent definition of digital transformation: 'a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies'.

At the microeconomic level, the digital transformation contributes to significant improvements in performance indicators (cost, quality, and service) [3] and facilitates innovation [11]. Additionally, under the impact of digital transformation, industrial competition becomes anabatic [32], consumer behaviour changes [12,13], corporate risk-taking capacity increases [33], resource and process management efficiency enhances [34], companies become more open to the information environment [35,36], the overall structure of the economy changes [37], and ecosystem conditions changes [38]. The effects of digital transformations take the form of new organisational structures, new business structures and models, new actors (and new forms of association such as associative businesses), new practices and beliefs (for both producers and consumers), new perceptions of value, etc. On the other side, new corporate strategies are formulated in the areas of innovation (process-rebuilding innovation and product-renewal innovation) [3], marketing [5,13], digital business [2] and sustainability [39].

More recent literature points to new directions of approach. For example, Okorie et al. (2023) [39] showed that digital transformation needs to be linked to business sustainability (to ensure decarbonisation of the industrial sector and facilitate the adoption of a circular economy). This correlation is possible as long as there are several scenarios for adopting digital technologies, differentiated according to stakeholder interests and options available to companies. Some authors [39] propose a resource-based approach (tangible and intangible) so that the potential for competitive advantage is correlated with corporate sustainability; companies can achieve lasting competitive advantages by carefully pooling and managing their resources and capabilities. Other authors [32] showed that digital transformation helps alleviate corporate financial constraints and improve corporate governance, thus removing barriers to corporate innovation.

These research directions indicate that researchers' attention is no longer limited to the corporate environment, but also includes environmental and business sustainability issues. Thus, the scope of the debate extends beyond the concern of aligning business with information and communication technology (ICT) trends [40]. Digital transformation is no longer limited to present technological changes [41], driven by different contexts, but forces anticipation of change and planning activities that strengthen business agility. To be sustainable, transformations at the microeconomic level must also produce changes at the level of industries and fields of activity, aiming at the macroeconomic level and longer time horizons. Micro-level transformations generate added value (by improving productivity, reducing costs, facilitating innovation, and increasing performance), contributing not only to improved outcomes at the level of industries and economies, but also to societal development [1].

2.2. NRI—A Tool for Measuring the Amplitude of Digital Transformations

Current research [25] presents three classes of indicators used to assess the degree of digitisation of economies: the ICT Development Index, which monitored and compared ICT developments at the country and period level until 2017 (the index was subsequently discontinued); Market Capitalization, designed to measure the performance of firms in the digital economy—as it only reflects digital transformations only for listed companies, this indicator has limited applicability; and the Network Readiness Index (NRI). To these indicators, we can also add: (a) the Digital Economy and Society Index (DESI), which monitors overall digital performance and measures the progress of EU countries in terms of digital competitiveness [42]; (b) the set of indicators developed by the OECD in order to measure the impact of digital technologies on companies, economies, and society [43]; and (c) the set of indicators developed by the World Bank to assess digital readiness [44].

Since the sample of countries on which empirical research was conducted in the present study includes countries from different continents, NRI was the best option. The Network Readiness Index (NRI) was developed by the World Economic Forum (WEF) to facilitate the assessment of the impact of ICT on the competitiveness of national economies. With a range from 1 to 100, the index highlights the extent to which countries are exploiting the opportunities offered by information and communication technology. As of 2019, the NRI is managed by the Portulas Institute, which has redesigned the methodology of determination precisely to reflect the ubiquitous nature of digital technologies [45].

The NRI is based on four pillars: technology (access, content, and future technologies), people (individuals, businesses, and governments), governance (trust, regulation, and in-

clusion) and impact (economy, quality of life, and contribution to sustainable development goals). Three of the four pillars (technology, people, and impact) have a sub-indicator that deals exclusively with the economic environment: future technologies, business, and economy. Each of these sub-indicators is broken down into six or seven explanatory variables. The indicator is calculated annually for 131 countries, grouped into six classes (Africa—31, Arab States—12, Asia and Pacific—21, Commonwealth of Independent States—6, Europe—41, America—20) [46].

2.3. Evidence on the Impact of Digital Transformation on Macroeconomic Performance

Some researchers [47] analysed digital transformation at the micro and macro level and showed that changes at the level of companies also enhance the development frameworks of all sectors of the economy. Other authors [21,30] showed that digital technologies are the driving force behind the current industrial revolution. They assessed the potential for digital transformation on a sample of 19 EU and OECD countries using the Digital Transformation Potential Index (DTPI) for the period 2008–2018. They showed that the potential for digital transformation is affected by economic cycles (it decreases in times of crisis and increases along with the economy's growth). At the same time, they showed that the benefits of digital technologies are more visible in economically weaker countries. Similar results were reached by Matthess and Kunkel (2020) [48], who reported that digital technologies can bridge gaps between countries, helping developing country economies move towards prosperity. Humenna et al. (2021) [49] showed that, under the impact of macroeconomic crises and imbalances, a country's macroeconomic stability depends to a large extent on the degree of digitisation of the economy.

Conducting research on a pilot sample (V4 countries), Georgescu et al. (2022) [25] assessed the interdependencies between the degree of digitisation of the economy and the dynamics of macroeconomic outcomes during the pandemic crisis (2019–2021) and showed that digital transformations have favourable economic and social impacts. Applying multiple linear regression, the authors used real GDP per capita as the dependent variable and NRI and *technology* sub-indices as independent variables. The statistically significant results indicated as follows: a one-unit increase in the NRI index increases real GDP per capita by 0.04 units. In the increase of real GDP per capita, technology has an important contribution.

By using the NRI and ICT Development Index as proxies for assessing digital transformation, Afonasova et al. (2019) [22] conducted a comparative analysis (multiple case study) on six economies (Russia, Finland, Germany, Norway, the Netherlands, and Switzerland). Their study revealed significant differences in the dynamics of selected variables and provided evidence on the conditions underlying the transition to the digital economy. The authors reiterated that a crisis can open up opportunities for growth. If these opportunities are not seized, progress towards the digital economy is slowed down.

Under the pretext of recognizing the interdependence between NRI on the one hand and a nation's competitiveness and well-being on the other, Sitnicki and Netreba (2020) [23] conducted empirical research on a group of eight Eastern European countries (Ukraine, Bulgaria, the Czech Republic, Estonia, Latvia, Lithuania, Poland, and Romania). Using exploratory factor analysis (for the period 2013–2016), the authors assessed the interdependencies between 4 sub-indices (Environment, Readiness, Usage and Impact) and tested the representativeness of the NRI from a macroeconomic perspective. The authors showed that the identified interdependencies allow for estimating global economic and social trends (the authors estimated that, in just a few months of the pandemic period, information technology use could increase by as much as three times).

Agustina and Pramana (2019) [24] analysed the dynamics of NRI and concluded that the improved competitiveness of Indonesian firms was made possible by the adoption of ICT. They conducted regression analyses (fixed effects model) and showed that 99.83% of the variation in provincial economic growth rates in Indonesia is driven by the ICT development index and local government ICT spending. Interpretation of the regression equation coefficients indicated that a one-unit increase in the ICT Index results in a 0.089 percent improvement in the economic growth rate. Analysis at the provincial level indicated that the impact of the ICT may differ, as provinces have advanced more in the area of digital transformation. As the ICT development index and public spending on ICT increase, the prospects for economic growth also increase.

Before the pandemic period (which forced the digital transformation), Stanley et al. (2018) [50] sought to explain whether the pace of growth of national economies depends on the extent of use of digital technologies. To find the answer to this question, the authors conducted analyses for both developed and developing countries. Based on a systematic literature review meta-analysis, they show that researchers' views converge, assuming that there is a positive relationship between ICT and economic growth (as measured by GDP growth or GDP per capita dynamics or productivity indicators). Specifically, the authors show that, in developed countries, all ICT-integrated media contribute to economic growth except the Internet. The exclusion of the Internet from the list of factors influencing economic growth was considered as a mistake (related either to sampling or to the meta-analysis tools used), and the authors recommend a more careful analysis of the channels through which the ICT effect on growth is transmitted (especially as the impact is quantified as relatively modest). The situation is different for developing countries, for which strong evidence has been identified on the positive impact of ICT (including the Internet) on economic growth.

Based on empirical research conducted on a sample of 145 countries, De la Hoz-Rosales et al. (2019) [27] sought to identify evidence of the interdependencies between ICT use and human development and social progress. Breaking down the analysis by groups of countries and entities (individuals, businesses, and governments) and using the NRI as an independent variable, they showed that the use of ICT to increase competitiveness and well-being is statistically significant. Specifically, for a one-unit increase in NRI, the social progress index increases by 0.93. The authors also showed that the use of ICT (at the individual and business level) has a positive impact on human development, regardless of the level of development of countries. In contrast, ICT use by governments was found to have a positive impact on human development only in developed countries. As for ICT use at the business level, the authors confirmed the positive impact on human development only at the global level (with the remark that the results were found to be statistically significant only for developing countries).

3. Materials and Methods

In the digital transition, the volume and flow of data online generates both added value (for governments, businesses and people) and inequality (for individuals, businesses and governments). At the same time, it changes the nature of work processes and leverages new factors of production at a higher level, such as digital skills, innovation, information, time, and online space.

In view of the above, this empirical research has a twofold objective. First, it aims to assess the extent to which the world's economies have responded to the need for digital transformation. Secondly, it is aimed at assessing the impact of digital transformation on economic and social outcomes. To achieve the objectives, data for the period 2018–2021 provided by Portulans Institute on the Network Readiness Index (NRI) and sub-indices, as well as data provided by the World Bank, were analysed.

3.1. The Sample

The sample was selected according to the following criteria: the rank of each country in the Portulans Institute's ranking and the income of each country [51]. According to the NRI methodology, countries were grouped according to gross national income per capita, based on data provided by the World Bank. Of the 131 countries included in the NRI report, only countries in the high-income category were selected. Out of the total of 49 countries identified, 46 countries are in the top 55 positions of the NRI ranking (according to ref. [51]).

The other three countries (Kuwait, Panama and Trinidad and Tobago) are significantly lower in the NRI ranking. To minimize discrepancies, these countries were removed from the sample. The final sample consisted of 46 countries, of which 30 are European countries, 7 are Asian and Pacific countries, 5 are Arab countries and 4 are American countries (Table 1).

Га	ble	1.	Samp	ole
Ia	ble	1.	Samp	ble

Regions	Countries
Americas States	United States (1), Canada (11), Chile (43), Uruguay (47)
Arab States	United Arab Emirates (28), Saudi Arabia (35), Qatar (42), Oman (53), Bahrain (54)
Asia and Pacific	Singapore (2), Korea, Rep. (9), Japan (13), Australia (14), Israel (15), New Zealand (19), Hong Kong, China (30)
Europe	Sweden (3) Netherlands (4), Switzerland (5), Denmark (6), Finland (7), Germany (8), Norway (10), United Kingdom (12), France (16), Luxembourg (17), Austria (18), Ireland (20), Belgium (21), Estonia (22), Iceland (24), Czech Republic (25), Spain (26), Slovenia (27), Portugal (29), Malta (31), Italy (32), Lithuania (33), Poland (34), Slovakia (37), Cyprus (38), Latvia (39), Hungary (41), Croatia (45), Greece (49), Romania (52)

Source: Own processing. Note: The number in brackets represents the position of the countries in the NRI ranking, according to the report made by the Portulans Institute [51].

3.2. Variables Used and Research Hypotheses

The Network Readiness Index (NRI) was used to assess the level of digitisation. This index was originally developed by the Word Economic Forum (WEF) to highlight the extent to which countries are exploiting the opportunities offered by information and communication technology. As of 2019, the NRI is managed by the Portulans Institute, which has redesigned the methodology of determination precisely to better capture the dynamics of digital transformation related to 2018. For this reason, our analysis is limited only to the period for which the new NRI determination methodology was used (2018–2021).

The use of NRI in recent empirical research has shown the following: digital technology increases the speed of operation in the economy [22] and has a favourable impact not only on economic growth [24,25], but also on economic development, through favourable impacts on innovation, competitiveness, and welfare [23,52]. Differently from previous research (which focused either on one country or a small group of countries), in this study, we consider a broader sample, including 4 major regions of the globe.

The Network Readiness Index (NRI) is calculated on the basis of four pillars, each structured on three levels: technology (access, content, and future technologies); people (individuals, business, and governments); governance (trust, regulation, and inclusion); and impact (economy, quality of life, and contribution to the sustainable development goals). In our research, we give priority to sub-indices that are directly associated with the economic environment:

- future technologies (from the technology pillar), indicating the extent to which countries are prepared for the future of the network economy; specifically, variables such as artificial intelligence (AI), the Internet of things (IoT), and spending in emerging technologies are considered.
- business (from the people pillar), which indicates the extent to which businesses are leveraging ICT and are providing funding for R&D.
- economy (from the impact pillar), which reflects the economic impact of participation in the network economy.

Three sets of variables were used in the econometric analysis, based on panel data. The dependent variables were represented by two macroeconomic outcome measures (for which World Bank data were used): annual GDP growth rate (%) and real GDP per capita (current USD). These two indicators were considered the best options for assessing the economic impact of digital transformation. GDP per capita is used in the research literature both as a measure of economic activity and as a measure of living standards. The NRI and its sub-indices are independent variables. A control variable—the ease of doing business index (EDB)—was introduced for greater clarity at the level of the sample countries. This index is determined by the World Bank on the basis of quantitative indicators based on regulations that facilitate starting a business, obtaining permits (building and electricity connection), registering property, obtaining credit, protecting minority investors, paying taxes, trading across borders, enforcing contracts, resolving insolvency, employing workers, and contracting with the government. As this indicator is only available for the period 2018–2020, an estimate based on changes in previous years was made for 2021.

The econometric analysis (based on correlation and regression models) was carried out to test whether: (1) the increased use of digital technologies impacted increasing macroeconomic outcomes; and (2) the contribution of the selected sub-indices—future technologies (from the technology pillar), business (from people pillar), and economy (from impact pillar)—to increasing macroeconomic outcomes may be different.

3.3. Mathematical Modelling

Correlation and regression analyses were performed to identify interdependent relationships between the selected dependent and independent variables. SPSS software was used to perform the econometric analyses. Since the sample data consider several variables, for 46 countries over a 4-year period, we used the ordinary least square (OLS) method (model fitted to panel data). The following equation was constructed to examine the impact of digital transformation on selected macroeconomic variables:

$$Y_{it} = \beta_1 X_{it} + \beta_2 V_{it} + u_{it}, \qquad (1)$$

where *i* represents the countries included in the analysis; *t* is the time (2018–2021); Y_{it} is the dependent variable (indicators of macroeconomic results); X_{it} represents the independent variables (NRI; respectively, future technology, business, and economy); V_{it} represents the control variable; β_1 , β_2 represent the coefficient; and u_{it} is the error term.

If the sign of the β coefficients is positive, then we conclude that there is a positive impact of digital transformation on macroeconomic outcomes. On the other hand, if the coefficients are negative, an inverse relationship between both variables is predicted (provided this is statistically significant).

4. Results and Discussion

The first objective of the empirical research was to map the digital transformations over the 4 years (2018–2021). For this, data was collected from Portulans Institute annual reports [45,46,51,53]. According to the representations in Figure 2, the following conclusions can be drawn for the period 2018–2021:

- The number of countries with an NRI below 60 decreases from 10 (in 2018) to 8 (in 2019 and 2020); then, in 2021, as an effect of global crises (we take into account the crises associated with the pandemic period), the number of countries with an NRI below 60 increases to 11. Most countries in this NRI range (50–60) belong to the groups of American (2), Arab (3), and European (6) countries.
- The number of countries with an NRI between 60 and 70 increases from 14 (in 2018) to 15 (in 2019) and 16 (in 2020); in 2021, only 14 countries still fall within this NRI range (60–70).
- The number of countries with an NRI between 70 and 80 increases from 14 (in 2018) to 17 (in 2019); this increase is matched by a decrease to 15 (in 2020) and a rebound in 2021, when the number of countries increases to 20. This oscillating evolution highlights that some countries have experienced difficulties in the digital transition in the context of macroeconomic imbalances. The increase in the number of countries in

the 70–80 (NRI) range can be seen as evidence that the pandemic period has forced the economies of the world's countries to pay more attention to digital transformation.

- The number of countries with an NRI greater than 80 falls from 8 (in 2018) to 6 (in 2019); the two countries falling in the rankings are the United States and Norway. The year 2020 sees a slight recovery (the number of countries rises to 7, with the United States catching up, joining the countries with the highest NRI: Singapore, Sweden, Netherlands, Switzerland, Finland, and Norway); in 2021, only the United States is still in this gap (NRI > 80).



Figure 2. NRI-annual values. Source: Own processing.

The dynamic analysis, based on the previous year, revealed that the number of countries with a decrease in the NRI index decreased from 32 (in 2019) to 15 (in 2020), showing significant progress in the digital transition. In 2021, compared to 2020, 40 states marked a decrease in the NRI index. States that marked an increase in the NRI index (in 2021 compared to 2020) were Qatar (with an increase of only 0.04); Chile, Portugal, and Korea (with increases ranging from 0.30 to 0.43); Israel (with an increase of 0.69); Saudi Arabia (with an increase of 0.86); and the United Arab Emirates (with an increase of 1.72). These dynamics can also be captured in Figure 3, which shows the dynamics of the NRI index for the 46 countries in the sample. Figure 3 provides two important pieces of evidence on the decrease in the NRI index for most countries in the sample (the yellow line being lower than the lines corresponding to the previous years' values).



Figure 3. NRI dynamics—46 states (2018–2021). Source: Own processing.

The second objective of the empirical research was to assess the impact of digital transformation on the economic and social outcomes of the sample countries. The previously analysed database (on NRI dynamics) was complemented with information provided by World Bank on GDP growth rate (%), Real GDP per capita (current USD), and the ease of doing business. Descriptive statistics for the variables used in the econometric analysis are presented in Table 2.

	Ν	Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis
NRI	184	52.87	82.75	68.54	8.40	-0.07	-1.18
FTH	184	16.47	90.60	50.68	16.55	0.12	-0.81
BUS	184	26.98	88.39	60.19	13.64	-0.41	-0.31
ECN	184	15.53	84.71	47.32	14.31	0.12	-0.72
GDP	184	-10.82	13.48	1.57	4.33	-0.58	0.37
GDPc	184	12,398.98	135,682.79	41,215.83	23,247.89	1.18	1.74
L-GDPc	184	4.09	5.13	4.55	0.24	0.03	-0.92
EDB	184	61.03	87.02	76.95	5.76	-0.58	0.09

Table 2. Descriptive statistics.

Source: Own processing. Legend: NRI—Network Readiness Index; FTH—future technologies; BUS—business; ECN—economy; GDP—gross domestic product growth rate (%); GDPc—gross domestic product per capita (US\$); L-GDPc—logarithm of GDPc; EDB—ease of doing business.

Comparing the maximum (82.75, recorded in Sweden in 2019) and the minimum (52.87, recorded in Oman in 2018) for the NRI, it can be seen that the range of variation is statistically acceptable, with a standard deviation of 8.59. This is because the sampling ensured homogeneity of the values for the countries in the sample. In contrast, selected sub-indices (FTH, BUS, and ECN) show higher levels of variation. The lowest values were recorded for Croatia (FTH 16.47 in 2019), Oman (BUS 26.98 in 2018), and Uruguay (15.53 in 2018). The maximum values were recorded for the US (FTH 90.60 in 2020), Japan (BUS 88.39 in 2020), and Singapore (ECN 84.71 in 2020).

The evolution of GDP (%) is marked by a shift from negative values (the minimum being -10.82%, recorded in Spain in 2020) to positive values (the maximum being of 13.48%, recorded in Ireland in 2021). As for GDPc, the variation gap is represented by 12,398.98

(recorded in Romania in 2018) and 135,682.79 (recorded in Luxembourg in 2021). In order to normalize, the values were processed by the logarithm (L-GDPc).

Regarding the analysis of symmetry/asymmetry of the data, descriptive statistics indicate the following. The values of the NRI and the sub-indices analysed (FTH, BUS, ECN) show a roughly symmetric distribution, with Skewness taking values between (-1/2 and +1/2); the logarithmic variable (L-GDPc) has the same distribution. The values of GDP and EDB show a moderate distribution and those of GDPc show an asymmetric distribution (the value of asymmetry being greater than one). For all variables, there is a flattening of the curve reflecting the distribution of values, with Kurtosis showing values less than 3.

To examine the impact of digital transformations on selected macroeconomic variables, the following equations were formulated:

$$GDP_{it} = \beta_1 NRI_{it} + \beta_2 EDB_{it} + u_{it}, \qquad (2)$$

$$L-GDPc_{it} = \beta_1 NRI_{it} + \beta_2 EDB_{it} + u_{it},$$
(3)

$$GDPc_{it} = \beta_1 NRI_{it} + \beta_2 EDB_{it} + u_{it}, \qquad (4)$$

$$GDP_{it} = \beta_1 FTH_{it} + \beta_3 BUS_{it} + \beta_3 ECN_{it} + \beta_4 EDB_{it} + u_{it},$$
(5)

$$L-GDPc_{it} = \beta_1 FTH_{it} + \beta_3 BUS_{it} + \beta_3 ECN_{it} + \beta_4 EDB_{it} + u_{it},$$
(6)

$$GDPc_{it} = \beta_1 FTH_{it} + \beta_3 BUS_{it} + \beta_3 ECN_{it} + \beta_4 EDB_{it} + u_{it}.$$
(7)

Correlation analysis showed a weak association between GDP and NRI (but not a statistically significant one) and a moderate association between NRI and GDPc (a positive, statistically significant association) (Table 3). The analysis showed a strong association between NRI and the logarithmic form of GDPc (L-GDPc). A weak association was found between the values of the control variable (EDB) and the other variables. As expected, there are strong associations between NRI and its sub-indices.

NRI BUS GDP GDPc L-GDPc EDB FTH ECN 0.844 ** NRI 0.834 ** 0.752 ** -0.0380.694 ** 0.795 ** 0.635 ** 1 0.844 ** 0.690 ** 0.741 ** FTH -0.1070.640 ** 0.751 ** 0.475 ** 1 0.834 ** 0.690 ** 0.695 ** 0.525 ** 0.608 ** 0.556 ** BUS 0.082 1 ECN 0.752 ** 0.741 ** 0.695 ** -0.127 * 0.504 ** 0.592 ** 0.459 ** 1 GDP -0.038-0.1070.082 -0.127 *1 0.118 0.086 0.040 GDPc 0.694 ** 0.640 ** 0.525 ** 0.504 ** 0.118 1 0.954 ** 0.292 ** L-GDPc 0.795 ** 0.751 ** 0.608 ** 0.592 ** 0.086 0.954 ** 1 0.405 ** EDB 0.635 ** 0.475 ** 0.556 ** 0.459 ** 0.040 0.292 ** 0.405 ** 1

Table 3. Pearson correlations test.

** Correlation is significant at the 0.01 level. * Correlation is significant at the 0.05 level. Source: Own processing.

To eliminate multi-collinearity, highly correlated variables were not included in the same regression model. Therefore, the equations that remain valid at this level of the analysis are (2), (4), (5), and (7).

As preliminary steps to the regression analysis, the significance of the relationship between variables was tested (Table 4). Assuming that the results of the regression analysis are statistically significant, the data in Table 4 indicate that 8% (i.e., 51.8%) of the variation in GDP (i.e., GDPc) can be explained by the variation in NRI and EDB for Equations (2) and (4). For Equations (5) and (7), 8.6% (respectively, 42.3%) of the variation in GDP (respectively, GDPc) can be explained by the variation in the variables included in the analysis (FTH, BUS, ECN, and IBD).

Equations	Multiple R	R Square	Adjusted R Square	Standard Error
(2)	0.092	0.008	-0.003	4.336
(4)	0.72	0.518	0.513	16,226.831
(5)	0.293	0.086	0.066	4.186
(7)	0.653	0.423	0.413	17,809.197

Table 4. The significance of the relationship between variables.

Source: Own processing.

To test the significance of the proposed statistical models, an ANOVA test was conducted. The results are presented in Table 5. Analysing the most significant coefficients (F and Sig.), it is observed that only in models (4), (5), and (7) do the F coefficients have an associated probability of less than 0.05, which rejects the null hypothesis and allows the assessment that only these prediction models are statistically significant.

Models							
$GDP_{it} = \beta_1 NRI_{it} + \beta_2 EDB_{it} + u_{it} (2)$							
Sum of Squares	df	Mean Square	F	Mr			
28.966	2	14.483	0.770	0.464			
3403.351	181	18.803					
3432.317	183						
	GDPc _{it} =	$= \beta_1 \operatorname{NRI}_{it} + \beta_2 \operatorname{EDB}_i$	$t_t + \mathbf{u}_{it}$ (4)				
Sum of Squares	df	Mean Square	F	Mr			
$5.1 imes 10^{10}$	2	$2.5 imes10^{10}$	97.311	0.000			
$4.7 imes10^{10}$	181	$2.6 imes 10^8$					
$9.9 imes10^{10}$	183						
$GDP_{it} = \beta_1 FTH_{it} + \beta_3 BUS_{it} + \beta_3 ECN_{it} + \beta_4 EDB_{it} + u_{it} (5)$							
Sum of Squares	df	Mean Square	F	Mr			
295.331	4	73.833	4.213	0.003			
3136.986	179	17.525					
3432.317	183						
L-GDPc	$c_{it} = \beta_1 \text{FTH}_{it}$	+ $\beta_3 BUS_{it}$ + $\beta_3 ECN$	$J_{it} + \beta_4 EDB_{it} + \beta_4 EDB_{it}$	- u _{it} (7)			
Sum of Squares	df	Mean Square	F	Mr			
$4.2 imes 10^{10}$	4	$1.1 imes10^{10}$	33.210	0.000			
$5.7 imes10^{10}$	179	$3.2 imes 10^{10}$					
$9.9 imes10^{10}$	183						
	Sum of Squares 28.966 3403.351 3432.317 Sum of Squares 5.1×10^{10} 4.7×10^{10} 9.9×10^{10} GDP _{it} Sum of Squares 295.331 3136.986 3432.317 L-GDPc Sum of Squares 4.2 × 10 ¹⁰ 5.7 × 10 ¹⁰ 9.9 × 10 ¹⁰	$\begin{array}{c c} GDP_{it} = \\ GDP_{it} = \\ GDP_{it} = \\ GDP_{it} = \\ \\ 28.966 & 2 \\ 3403.351 & 181 \\ 3432.317 & 183 \\ \hline \\ Sum of \\ Squares \\ GDP_{it} = \\ \\ GDP_{it} = \\ \\ GDP_{it} = \\ \\ \\ GDP_{it} = \\ \\ \\ \\ GDP_{it} = \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ $	ModelsGDP $_{it} = \beta_1 NRI_{it} + \beta_2 EDB_{it}$ Sum of SquaresdfMean Square28.966214.4833403.35118118.8033432.31718318.803GDP $c_{it} = \beta_1 NRI_{it} + \beta_2 EDB_i$ Sum of SquaresdfMean Square5.1 × 10^{10}22.5 × 10^{10}4.7 × 10^{10}1812.6 × 10^89.9 × 10^{10}1832.6 × 10^8GDP $_{it} = \beta_1 FTH_{it} + \beta_3 BUS_{it} + \beta_3 ECN_i$ Sum of SquaresdfMean Square295.331473.8333136.98617917.5253432.317183L-GDP $c_{it} = \beta_1 FTH_{it} + \beta_3 BUS_{it} + \beta_3 ECN_i$ Sum of SquaresdfMean Square295.33141.1 × 10^{10}5.7 × 10^{10}1793.2 × 10^{10}9.9 × 10^{10}183	ModelsGDP $_{ii} = \beta_1 NRI_{it} + \beta_2 EDB_{it} + u_{it}$ (2)Sum of SquaresdfMean SquareF28.966214.4830.7703403.35118118.8033432.317183183GDP $c_{it} = \beta_1 NRI_{it} + \beta_2 EDB_{it} + u_{it}$ (4)Sum of SquaresdfMean SquareF5.1 × 10 ¹⁰ 22.5 × 10 ¹⁰ 97.3114.7 × 10 ¹⁰ 1812.6 × 10 ⁸ 97.3119.9 × 10 ¹⁰ 183GDP $_{it} = \beta_1 FTH_{it} + \beta_3 BUS_{it} + \beta_3 ECN_{it} + \beta_4 EDB_{it} + u_{it}$ Sum of SquaresdfMean SquareF295.331473.8334.2133136.98617917.5253432.317183L-GDP $c_{it} = \beta_1 FTH_{it} + \beta_3 BUS_{it} + \beta_3 ECN_{it} + \beta_4 EDB_{it} + \beta_4 E$			

Table 5. ANOVA test.

Source: Own processing.

Given the results of the ANOVA test, regression analysis was applied only to models (4), (5), and (7), which were considered statistically significant. The results are presented in Table 6.

The coefficients of Equation (4) indicate that, for the period under analysis, NRI has a positive and significant impact on GDP per capita. For a one-unit change in NRI, GDP per capita increases by 2357.53. The analysis at the level of the NRI sub-indices (Equation (7)) shows that only FTH and BUS contributed to the increase in GDP per capita. In other words, the one-unit increase in the sub-index indicating the use of artificial intelligence (AI), Internet of things (IoT), and spending in emerging technologies increases GDP per capita by 755.275. With a more moderate (but statistically significant) contribution to GDP

per capita growth is the BUS sub-index, which indicates the extent to which businesses are leveraging ICT and providing R&D funding. A one-unit increase in this sub-index contributes to a GDP per capita growth of 321.132.

Equations/ Variables		Unstandardized Coefficients		Standardized	ŧ	Sig.	Collinearity Statistics	
		В	Std. Error	Coefficients— Beta	t	5-26	Tolerance	VIF
(4) GDPc	(Constant) NRI EDB	-42,916.162 2357.528 -1006.584	16,067.611 184.862 269.502	0.852 - 0.250	-2.671 12.753 -3.735	0.008 0.000 0.000	0.596 0.596	1.677 1.677
(5) GDP	(Constant) FTH BUS ECN EDB	$-1.832 \\ -0.048 \\ 0.118 \\ -0.081 \\ 0.034$	4.337 0.030 0.036 0.035 0.065	-0.185 0.371 -0.269 0.045	-0.422 -1.611 3.299 -2.336 0.519	0.673 0.109 0.001 0.021 0.604	0.387 0.404 0.386 0.673	2.582 2.477 2.591 1.485
(7) GDPc	(Constant) FTH BUS ECN EDB	5263.530 755.275 321.132 13.014 -289.427	18,448.462 127.795 151.941 148.097 278.339	0.538 0.188 0.008 -0.072	0.285 5.910 2.114 0.088 -1.040	0.776 0.000 0.036 0.930 0.300	0.387 0.404 0.386 0.673	2.582 2.477 2.591 1.485

Table 6. Coefficients of regression equations.

Source: Own processing.

Regarding the annual GDP growth rate (%), regression analysis indicated that BUS has a positive and statistically significant influence. A one-percent increase in the BUS sub-index increases the annual GDP growth rate by 0.118%. The results also indicate that the ECN has a negative, statistically significant influence on the GDP growth rate. A one-percent increase in the ECN sub-index decreases the annual GDP growth rate by 0.081%. This influence can be explained by the fact that, to increase the economic impact of participation in the network economy, expenditures are incurred which, in the short run, decrease GDP growth rates. Another possible explanation is that the positive externalities of the digital transition lag behind the timing of the commitment of resources to the digital transition. Therefore, present resource allocations generate effects on future macroeconomic outcomes.

Our results are in line with previous research findings that have tested the interdependence between the digital transformation at the aggregate level (assessed by NRI) and macroeconomic-level outcomes [24,25,27,47,50]. Regarding the positive impact of digital transformations (measured by variables other than NRI) on GDP per capita, our results converge with:

- Toader et al. (2018) [18], which showed that a 1% increase in the use of ICT infrastructure can contribute to an increase in GDP per capita; this contribution varies between 0.0767% and 0.396%, depending on the type of technology examined.
- Fernández-Portillo et al. (2019) [19], which showed that the sustainable economic development of nations is positively influenced by ICT (more precisely, connectivity, use of Internet and skills of human capital); their research results indicated that ICT explains 42.6% of the variance in GDP per capita.
- Mayer et al. (2019) [20], which showed that investment in broadband infrastructure accelerates the transmission of information and knowledge; specifically, each 10% increase in speed produces about a 0.5% increase in GDP per capita. These authors also indicated the causes associated with an overestimation of the economic impact.

As for the control variable EDB, the analyses indicated that its impact is statistically significant only in model (4). Increasing the EDB variable by one unit decreases GDP per capita. Similar results were also reported by Pal et al. (2022) [54], who analysed

the link between GDP and the global competitiveness index, i.e., the EDB index. This can be explained by the fact that the ease of starting a business may have the effect that previous businesses are abandoned—so as to benefit from the facilities associated with new businesses. As entrepreneurs and investors prefer to engage in less ambiguous economic environments [55], the situation may generate an inconsistency in EDB dynamics. Recent research [56] has shown that business start-ups engage factors of production (human resources, land, and capital), which contributes to value-added goods. This can only increase GDP per capita under conditions of equitable distribution of national output. An inequitable distribution can therefore have the effect of reducing GDP per capita.

In all regression equations, the tolerance level is less than 0.7. The results are statistically robust because the collinearity test (VIF—Variation Inflation Factor) shows values less than 10. To test the results obtained, but also to identify possible differences, regression models were run at the level of sub-samples represented by the four groups of countries. The results are summarized in Table 7.

 Table 7. Regression results (significance and variation coefficients)—by groups of countries.

	Am	ericas Sta	ates	A	Arab State	25	Asi	ia and Pac	ific		Europe	
		Models		Models		Models			Models			
	(4)	(5)	(7)	(4)	(5)	(7)	(4)	(5)	(7)	(4)	(5)	(7)
NRI	0.000 (+1966)			0.004 (+3038)			0.054 (+936)			0.000 (+2735)		
EDB	0.714	0.968	0.249	0.114	0.976	0.222	0.283	0.984	0.502	0.000 (-1609)	0.942	0.104
FTH		0.875	0.001 (+893)		0.548	0.363		0.291	0.724		0.068	0.002 (+687)
BUS		0.399	0.159		0.621	0.008 (747)		0.908	0.160		0.001 (+0.237)	0.011 (+808)
ECN		0.213	0.289		0.953	0.000 (+1580)		0.477	0.249		0.004 (-0.146)	0.783
Sig. (1)	0.000	0.541	0.000	0.014	0.944	0.001	0.066	0.876	0.371	0.000	0.001	0.000
\tilde{R}^2	0.954	0.229	0.961	0.394	0.046	0.673	0.195	0.049	0.163	0.541	0.114	0.470

Source: Own processing. Sig. ⁽¹⁾—model significance (ANOVA test). Significance level 95%. Statistically significant coefficients are marked in bold. Coefficients of variation are shown in brackets.

The data in Table 7 confirm the positive and significant impact of NRI on GDP per capita, for all four groups of countries (in model (4)). A one-unit increase in the NRI index increases GDPc by 1966 units in the Americas states, 3038 units in the Arab states, and 2735 units in Europe.

Model (5) was found to be valid only for European countries. In this model, (5), statistically significant (but with the opposite sign) are the influences of BUS and ECN on GDP (%). Model (7) is statistically valid only for three groups of countries. FTH contributes to GDPc growth only in American and European states. BUS has a negative influence on GDPc in Arab states and a positive influence in European states. ECN has a positive and significant contribution only in Arab states.

Judging by the R square, the intensity of the interdependence between these two indicators, the independent variables (NRI, FTH, BUS, ECN, and EBD) and the dependent ones (GDP) are stronger in the case of the Americas States group (where 95.4% of the variation in GDP per capita is explained because of NRI and EDB). In the case of European countries, the variation in GDP per capita is explained only to the extent of 54.1%. A weaker association between the variables is recorded in the Arab countries, as well as in the Asian countries and in the Pacific. Our results are confirmed by:

Niebel (2019) [57] and David and Grobler (2020) [58], which showed that, in developed countries (compared to developing countries), the contribution of ICT to economic growth is greater.

- Mayer et al. (2019) [20], which showed that the speed and pace of broadband network penetration influence GDP per capita differently depending on the level of development of national economies.
- Chen and Ye (2021) [35], which showed that ICT effects are more consistent in developed areas (compared to less developed ones).

Regarding the annual growth rate of GDP (%) (model (5)), the tests confirmed the statistically significant impact of the BUS and ECN sub-indices only for the European group of countries. Tests performed on model (7), which evaluates the impact of selected NRI sub-indices on GDP per capita, confirmed the positive impact of FTH and BUS for three groups of countries (Europe, America, and Arab states). As a novelty, the tests also indicated that, in the case of Arab states, the ECN sub-index has a positive and significant influence on GDP per capita. The control variable (EDB) was found to have a negative and statistically significant impact on GDP per capita only for European countries in model (4), as predicted by the initial analyses performed at the level of the whole sample. Since the analysed period was marked by the pandemic crisis, it was considered necessary to evaluate the impact of digital transformations on macroeconomic results separately for two periods: the pre-pandemic period (2018–2019) and the pandemic period (2020–2021). The results of these analysis are summarized in Table 8.

		2018-2019		2020–2021			
		Models			Models		
	(4)	(5)	(7)	(4)	(5)	(7)	
NRI	0.000 (+2474)			0.000 (+2283)			
EDB	0.000 (-1233)	0.111	0.370	0.064	0.575	0.707	
FTH		0.008 (-0.051)	0.002 (+614)		0.104	0.000 (+856)	
BUS		0.634	0.368		0.002 (+0.217)	0.031 (+507)	
ECN		0.586	0.242		0.089	0.334	
Sig. ⁽¹⁾	0.000	0.013	0.000	0.000	0.015	0.000	
\mathbf{R}^2	0.779	0.365	0.689	0.671	0.361	0.636	
Tolerance	<2.0	< 0.7	< 0.7	< 0.7	< 0.8	< 0.8	
VIF	<0.6	< 0.4	<4.0	<1.6	<2.4	<2.4	

 Table 8. Regression results (significance and variation coefficients)—by periods.

Source: Own processing. Sig. ⁽¹⁾—model significance (ANOVA test). Significance level 95%. Statistically significant coefficients are marked in bold. Coefficients of variation are shown in brackets.

The obtained results highlight the fact that the three models are valid for both periods. According to model (4), the contribution of digital transformations to GDPc growth was more consistent in the pre-pandemic period. However, judging by the size of the R square indicator, the results reveal that digital transformations (assessed by NRI) better explain the GDPc variation from the pre-pandemic period. The justification for this situation can be attributed to the fact that, during the pandemic period, several factors impacted GDPc (such as the suspension of some activities during the lockdown periods). The results of model (7) confirm the results of the previous regressions and reinforce the fact that FTH and BUS have a positive influence on GDPc, both in the period 2018–2019 and in the period 2020–2021. Model (7) also confirms that ECN has a statistically insignificant influence on GDPc.

The results related to model (5) confirm the results of the first regression analysis that highlighted the fact that FTH has a negative impact on GDP (%), specifying that, in the pre-pandemic period, this influence was statistically significant. A positive and statistically significant impact of BUS on GDP (%) was found during the pandemic period, which

confirms the results of the first regression analysis—relevant for the entire sample and the entire period (with the specification that, in the regression run on groups of countries, this influence proved to be statistically significant only in the case of European states.

5. Conclusions

The study focuses on analysing the impact of digital transformation (assessed on the basis of the Network Readiness Index—NRI) on macroeconomic performance (assessed on the basis of GDP dynamics, expressed in both relative and absolute measures). The assessment of the current state of knowledge revealed gaps in the research topic, with most studies focusing on assessing the impact of digital transformation at the microeconomic level. Although there are a few studies that admit that the digital transformation contributes to increased performance at the macroeconomic level, empirical research results are not convergent. The lack of convergence can be attributed to the samples analysed, the methodologies applied and the indicators used, or the time periods over which the analyses were conducted.

To shed more light on these debates, empirical research was carried out on a sample of 46 countries, classified as *high income* by the World Bank. As the NRI has undergone changes in the determination methodology, only information for the period 2018–2021 was used, where the same determination methodology was applied.

As the debate on the impact of digital transformation is relatively recent, this study contributes to filling the research gap by providing robust evidence on the impact of NRI on the annual GDP growth rate (%) and GDP per capita (USD). These results confirm the findings of previous studies. Another original element of the research, which has not been found in previous debates, is the analysis of the impact of NRI sub-indices on the above-mentioned macroeconomic variables. Specifically, sub-indices assessing the extent to which countries are prepared for the future network economy were considered: future technologies (FTH—from the technology pillar); business (BUS—from the people pillar), and economy (ECN—from the impact pillar).

The econometric analysis tested and confirmed the assumptions made. Thus, evidence supporting the claim that the use of digital technologies impacts the growth of macroeconomic outcomes was provided, with NRI being positively correlated, statistically significantly, with GDPc—according to model (4). In terms of the contribution of subindices to the growth of GDP (%) and GDPc, it was shown that higher ICT leveraging and the provision of R&D funding contribute to the growth of GDP per capita, while artificial intelligence (AI), the Internet of things (IoT), and spending in emerging technologies have a positive impact on the growth rate of GDP (%) (according to Table 6).

To test the results obtained, we re-ran the regression analysis by groups of countries and by subperiods. The regression results for groups of countries mostly confirmed the results of the first regression (performed on the entire sample), but it highlighted some specific peculiarities for each of the four groups of analysed countries. The regression results on sub-periods—pre-pandemic (2018–2019) and pandemic (2020–2021)—support and increase the robustness of the results of previous regressions. Moreover, they provide a clearer picture of the impact of digital transformations on GDP, taking into account the particularities of each period.

The results of this study have important practical implications. By exploiting them, policy-makers can propose and implement policies to facilitate access to those technologies that prove the most effective. For example, policies to support the business environment—by facilitating access to ICT and stimulating (directly or indirectly, through tax incentives) R&D activities—can contribute both to increasing macroeconomic performance and to raising the level of economic and social development. This is evidenced by the favourable impact on GDP per capita.

The adoption of initiatives to support the development of the network economy (such as digital innovation hubs) would ensure access to new technologies (such as artificial intelligence and Internet of things) for small and medium-sized enterprises (considered the engine of many economies), thus helping ensure a sustained rate of annual economic growth. These Digital Innovation Hubs (DIHs) operate on the principle of associative business structures that help different organizations to test before investing in digital technologies.

DIHs facilitate the access of economic and public entities to digital technologies, to test various software and hardware programs, innovate new products or services with digital competence, initiate or evaluate various digital research and development programs, and support technological development in the region where these centres have impact. In this way, the fair access of the interested entities to various services and products is ensured, before they make major investments in projects or new development directions that may prove to be too expensive or unrealistic or will not be used to their true value, due to the lack of expertise or request on the market [59].

Furthermore, from a more general macroeconomic perspective, increased use of ITC may further increase the demand for human capital, which play a key role in modern economic growth [60–63].

Research limitations and future research directions. This study has some shortcomings that could be addressed in future studies. Due to the data used (cross-sectional data specific to different economies of the world), the generalizability of the results is limited to the sampled countries (selected by gross national income per capita). Secondly, the non-inclusion in the analysis of variables specific to the economies analysed runs the risk of incomplete representation of the results.

An important limitation of the research is given by the fact that—although it was considered to ensure the homogeneity of the sample—the selected countries present significant differences in terms of the analysed variables. Running individual regressions (with fixed effects) at the country level could highlight structural differences while testing regression functions at the year level could better control for the effect of time, especially in pandemic years. Last but not least, this study is limited to the exclusive use of NRI. Comparative analyses of the impact of other measures associated with digital transformation could add to the knowledge framework. All these limitations open up new research opportunities to be exploited in future studies.

Author Contributions: Conceptualization, M.B.T., A.G. and S.A.; methodology, M.B.T., A.G. and S.A.; software, M.B.T., A.G. and S.A.; validation, M.B.T., A.G. and S.A.; formal analysis, M.B.T., A.G. and S.A.; resources, M.B.T., A.G. and S.A.; data curation, M.B.T., A.G. and S.A.; writing—original draft preparation, M.B.T., A.G. and S.A.; writing—review and editing, M.B.T., A.G. and S.A.; visualization, M.B.T., A.G. and S.A.; supervision, M.B.T., A.G. and S.A. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

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Smart Innovation, Systems and Technologies 337

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Marketing and Smart Technologies

Proceedings of ICMarkTech 2022, Volume 2





https://link.springer.com/book/10.1007/978-981-19-9099-1

Digital Innovation Hubs: SMEs' facilitators for digital innovation projects, marketing communication strategies and business internationalization

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Abstract. The study presents the correlations between the European Union Digital Innovation Hubs (DIHs). It assesses the connections between them, by analysing different proposed typologies, having in mind also the sectors they serve, the services they offer and their technological readiness level. We analysed data from the European Commission's Smart Specialisation Platform (S3P), by using benchmark and multivariate clustering analysis. After the general analyses we focused on understanding what types of services do DIHs offer mainly for SMEs and we noticed that those related to marketing are not very well represented, but have a great potential to be developed in this digital transformation period. This study is practical, mapping the actual status of DIHs, their expertise and how they are regionally impacting SMEs in various industries. By leveraging the results of the study, decision makers can better understand the benefits offered by accessing the DIHs services and also what countries have the great potential to develop more DIHs in order to sustain the economic development, the innovative processes and learn how to co-work better for the business and digital ecosystem growth. Research results provide valuable contributions towards the DIHs role in improving SMEs performance in EU, but also shows where there is place to develop more DIHs in specific sector with specific services, especially in the Central and Eastern Europe.

Keywords: digital innovation hubs, marketing services, business internationalization.

1 Introduction

Associative and non-associative business structures interested in fulfilling objectives of common interest represent the most appropriate way to wisely use the resources, the market expertise and to achieve results quickly and with multiple impact in various economic and academic fields [1].

Nowadays, the innovation hubs are important actors who have been assigned multiple roles: facilitating and valorizing the results of innovation, supporting the business environment, developing the economies of the countries, helping in the digital transformation transition process etc. Within them, DIHs (Digital Innovation Hubs) are distinguished, as outputs of the Digital Europe Program. Their main objective is the development of key areas, such as artificial intelligence, high-performance computing, cyber security, advanced digital skills and digitalization of public administration, interoperability and introducing digital software into economic process optimization of SMEs [2].

Depending on the coverage area of the services they offer, DIHs are the result of a regional, national or European policy initiative. From a legal and organizational point of view, DIHs are associative structures that have the role of facilitating the access of businesses or other entities interested in new digital technologies. From the point of view of their main goals, DIHs are non-profit entities, with legal personality, created by an organization or a group of organizations, which make their services available, in particular, to SMEs and companies with mid-capitalization. DIHs offer specialized services, oriented towards digital transformation, transfer of expertise and know-how, development of key areas but also of advanced digital skills [2].

A DIH can offer one or more services (from a predefined set of 16 types of services, according to the European Union standards) and cover one or more sectors (from a predefined set of 36 sectors). Moreover, the services offered by DIHs are managed on 9 technological readiness levels (TRL). Depending on the capabilities of the founders and partners, the DIHs offer specialized services adapted to the needs of the stakeholders [3]. For example, if a founder/partner has market intelligence expertise, this service can be provided upon request to all interested clients (figure 1).

Depending on the types of activity and the competences of the DIHs' founders or partners, the services offered can cover one or more sectors of activity. For example, a DIH created by organizations whose interests are in the textile industry (having a TRL 9, means that it has a model/technology that is validated and ready for commercialization) will be able to offer dedicated services for SMEs in this sector of activity.

The strength of a DIH is given by the number and diversity of capabilities of its partners and founders. The more they cover a greater number of activity sectors (and, implicitly, the more they have skills for providing more types of services, suitable for more levels of technological readiness), the better the DIH will cover the needs of businesses from a region/country/group of countries.



Fig. 1. DIHs connecting actors in the business ecosystems

The role of DIHs in society and economy has been recently the subject of several scientific studies, according to the scientometric analysis in table 1. Among the 23 selected articles, identified as the most recent, the work written by Rietveld and Schilling (2021) stands out (by the number of citations) according to the literature review on the competition platforms. In the research, the authors identify the most important variables of a competition platform (price and quality) and emphasize that "hub" platforms support the creation and capture of value in the overall business ecosystems [4].

Table 1. Scientometric analysis

Database	Web of Science
No. publications (all fields)	129
Of which, focused on the fields of economy, management and	37
business entrepreunership	
Of which, published in the period 2018-31 July 2022	23

Another work that stands out is the one developed by Crupi et al (2020), which evaluates the extent to which DIHs can be considered knowledge brokers, contributing to the digital transformation of SMEs through specific practices of open innovation. Processing primary data, the authors highlight the fact that DIHs have roles that go beyond the competences of knowledge brokers, being considered true incubators for training the skills and abilities of specialists serving SMEs enrolled in digital transformation [5]. Also in the category of relevant studies are those focused on case studies, which aim to: a) evaluate the geography of an emerging creative digital cluster (combining the analysis of spatial data with the analysis of the company's behavior) [6]; b) to provide evidence regarding the functionality and usefulness of online communities, considering innovation incubators as a foundation for civic platforms [7]; c) to evaluate the extent to which government funding (for the initial support of the hubs) end up generating effects on the economic environment and to as many as local or regional actors as possible [8].

The DIHs are not subject of research only in the recent studies. Some have more than half a century of experience, but the new element is represented by the new responsibility assigned to them through the Digital Europe Program, by helping the digital transformation process, especially for European SMEs.

The research carried out, in the present article, at the EU level, revealed that the geographical distribution of DIHs is uneven. Moreover, they have different sizes and different economic impact, have various service portfolios and do not support SMEs in all sectors, in a balanced way.

Having as an identified benchmark research problem, the present study has two objectives. First of all, it aims to map the DIHs in the EU space from the following points of view: density (assessed by the number of DIHs per member state), age (assessed by the number of years of operation), sectors served, services portfolio and level of technological maturity. Secondly, the study aims to evaluate the extent to which DIHs (through specific services, such as commercial infrastructure, ecosystem building and networking, market intelligence, voice of the customer, product consortia) contribute to the integration of SMEs in the European Union market development, by facilitating

access to digital innovation projects, business internationalization and optimisation of marketing communication strategies.

Through its structure and content, the present study facilitates the understanding (scientific and practical) of the important role of DIHs in today's society. The results of the study prove to be useful both for DIHs, who are looking for opportunities to develop their service portfolio, and for SMEs who are looking for opportunities for appropriate development in an environment deeply marked by digital transformation.

To achieve this objective, three benchmarks are taken into account: the maturity of DIHs (assessed by the number of years of activity – considering that DIHs with more years of operation can offer more alternatives for developing businesses); the services provided by DIHs (with a focus on services that facilitate the incorporation of digital market strategies into overall business strategies); the sectors of activity in which the DIHs operate (to identify the sectors that need most support).

2 Literature review on DIHs role in business development

DIHs are entities that provide support for the digital transition of SMEs [9] and for the digital development of the European economy [10]. From an organizational point of view, DIHs are associative structures [11], with the role of knowledge brokers [5], with the objective of increasing the competitiveness of its clients and partners [12,13]. Through the services they offer, DIHs respond to specific needs identified at the regional/national or global level, and adopt business models oriented towards creating value for all stakeholders [11].

Studies regarding the role of DIHs address issues related to: facilitating production processes in the digital era [14], offering new products and services [15], ensuring the development of rural areas [16], developing hub networks to support SMEs in Europe [17] etc.

Di Roma et al. (2017) analyze DIHs from the perspective of entities that ensure the sharing of knowledge and the transfer of technical skills that facilitate production processes (including creative arts). The authors also believe that the cultural side of creative processes provides support for social innovation, thus contributing to the satisfaction increase of both market and social needs.

Richner et al. (2017) were concerned with bringing new products/services to the real estate market. Therefor, innovation centers must adopt a holistic approach, creating opportunities to co-work and inovate in the entire ecosystem represented by the industry, from the idea of a product or service until the stage of the client experience.

Gernego et al (2021) were concerned with identifying the most important opportunities and challenges associated with DIHs in Europe, especially, in the rural environment. They consider IT&C as the most appropriate tool that has the ability to contribute to the improvement of the rural business environment (facilitating digital transition also).

Volpe et al (2021) extends the analysis to a network of twelve DIHs and research organizations, focusing on cross-border cooperation, which generates benefits for participants (such as: funding/co-funding opportunities, access to knowledge and equipment, information on foreign markets, transferability assessment, personnel
exchange, etc.). The authors, concerned with creating competitive advantages for SMEs, showed that SMEs with a lower level of digitization are more willing to work in a collaborative system.

Also, our previous research has shown that collaborative work within associative and non-associative business structures are an oportunity for SMEs development in the digital age. DIHs, as associative structure, share knowledge, gain insights and collaborate for new business development opportunities and can give access to new markets and relevant stakeholders [18].

3 Context, data and methods

To achieve the assumed objective, the first step of the empirical research was the construction of the database in order to evaluate the role of DIHs in the economic system of the EU. For this, the Smart Specialization Platform (S3P) was used. The database built is represented by the information related to the 625 DIHs registered in the 27 states of the European Union for which the following information is detailed: the category they represent (fully operational, in preparation or potential DIHs from H2020); the geographical coverage it provides (global, international, European, national or regional); the funds accessed for financing and the source of these funds (European, national, regional, private financing or from members); the average annual number of clients and turnover volume; the market they serve, specifying the activity sectors and the technological readiness level (TRL) - 36 sectors and 9 levels of technological maturity are defined in the platform; the services offered, according to the defined object of activitya DIH offers one or more services from the 16 predefined categories.

By capitalizing on the entire database created, much more complete information can be extracted regarding DIHs registered in the EU. Here are just a few examples:

1. The PANNONIA DIH (from Croatia) was registered in 2021 in the fully operational category. This DIH has an annual turnover of less than 0.25 million euros and offers services, at a regional level, for more than 50 clients. The funding sources used by this DIH are represented by funds attracted through projects, to which is also added the financial support from the European, national and regional level. This DIH offers only 6 of the 16 possible types of services (awareness creation; collaborative researches; ecosystem building, scouting, brokerage, networking; education and skills development; mentoring; other) and serves only 5 of the 36 sectors (agriculture and food; education; manufacture of electrical and optical equipment; manufacture of machinery and equipment; public administration). In terms of technological maturity, this DIH covers only TRL1 to TRL5 (out of 9 possible); this means that its partners can provide technologies validated either by investigation (TRL 4) or in a relevant environment (TRL5). Therefore, this DIH will not be able to provide services for an SME that plans to prototype a technology, for example (meaning, one of the services relatet to levels TRL6 to TRL9).

2. Also in the category of new established DIHs, Trakia Digital Innovation Hub from Bulgaria, registered in the category under preparation, stands out. This DIH has a turnover and number of clients comparable to the DIH in Croatia, but differs because it provides greater sector coverage (covering 16 of the 36 sectors) and offers all possible services (16 services defined according to table 1). In terms of technology maturity level, this DIH provides complete and validated systems/models at the end of development (meaning from TRL1 to TRL8).

3. In the category of the oldest DIHs, is the Jožef Stefan Institute (from Slovenia), which was established before 1960. This DIH, classified as fully operational, has an annual turnover of more than 5 million euros, it serves 28 of the 36 sectors, offers 15 of the 16 possible services and covers, through its services, all nine levels of technological maturity.

The second step of the empirical research was to provide clearer and important information from the DIHs database, focusing on: the total number of DIHs (figure 2) and their age (figure 3), the degree of sector coverage (figure 4), the structure of services (figure 5) and the degree of technological maturity (figure 6).

According to Figure 2, Spain is the country with the highest number of DIHs. Italy, Germany, France and the Netherlands represent the group of countries that have a number of DIHs between 46 and 73. Regarding the average age of DIHs (figure 3), Greece, Luxembourg, Belgium, Slovenia, France and Poland are the countries where DIHs have the longest experience (more greater than 15 years). In the list of countries with the youngest DIHs are the Czech Republic and Bulgaria (for which DIHs have an average age of 4.6 and 6.3 years).

The sectors' structure for which DIHs provide services is shown in figure 4. From the perspective of the existing DIHs, the best covered sectors with services offered by more than 200 DIHs) are manufacture of machinery and equipment (S19 covered by 291 DIHs); Education (S8 - 280 DIHs); Transport and logistics (S35 - 274 DIHs); Life sciences & healthcare (S12 - 248 DIHs); Manufacture of electrical and optical equipment (S16 - 248 DIHs); Agriculture and food (S2 - 232 DIHs); Other Manufacturring (S29 - 216 DIHs); Energy and utilities (S9 - 209 DIHs).



Fig. 2. Number of DIHs per country

Fig. 3. DIHs' average years of existence

On the opposite side, the sectors least served by the services offered by DIHs are: Defense and security (S7 - 5 DIHs); Aeronautics and Space (S1 - 6 DIHs); Professional, Scientific and Technical Activities (S30 - 12 DIHs); Telecommunications, Information and Communication (S33 - 13 DIHs); Mobility (incl. Automotive) (S28 - 14 DIHs); Culture and Creative industries (S6 - 15 DIHs); Consumer goods/products (S5 - 18 DIHs); Environment (S10 - 22 DIHs); Mining and quarrying (S27 - 50 DIHs).

Legend:



Fig. 4. Sector coverage

S1-Aeronautics and Space; S2-Agriculture and food; S3-Community, social and personal service activities; S4-Construction; S5-Consumer goods/products; S6-Culture and Creative industries; S7-Defence and security; S8-Education; S9-Energy and utilities; S10-Environment; S11-Financial services; S12-Life sciences & healthcare; S13-Manufacture of basic metals and fabricated metal products; S14-Manufacture of chemicals, chemical products and man-made fiber's; S15-Manufacture of coke, refined petroleum products and nuclear fuel; S16-Manufacture of electrical and optical equipment; S17-Manufacture of food products, beverages and tobacco; S18-Manufacture of leather and leather products; S19-Manufacture of machinery and equipment; S20-Manufacture of other non-metallic mineral products; S21-Manufacture of pulp, paper and paper products; publishing and printing; S22-Manufacture of rubber and plastic products; S23-Manufacture of textiles and textile products; S24-Manufacture of transport equipment; S25-Manufacture of wood and wood products; S26-Maritime and fishery; S27-Mining and quarrying; S28-Mobility (incl. Automotive); S29-Other Manufacturing; S30-Professional, Scientific and Technical Activities; S31-Public administration; S32-Real estate, renting and business activities; S33-Telecommunications, Information and Communication; S34-Tourism (incl. restaurants and hospitality); S35-Transport and logistics; S36-Wholesale and retail

Figure 5 indicates that some services are offered by almost all DIHs, while others are offered by less than a fifth of them. The services provided by most DIHs are: Ecosystem building, scouting, brokerage, networking (EB offered by 486 DIHs); Collaborative Researches (CR - 468 DIHs); Education and skills development (ES - 464 DIHs); Awareness creation (AC - 433 DIHs); Concept validation and prototyping (CV - 418 DIHs).

On the opposite side, the services that are found slightly in the portfolio of DIHs are: Market intelligence (MI - 215 DIHs); Commercial infrastructure (CI - 141 DIHs); Precompetitive series production (PP - 141 DIHs); Voice of the customer, Product consortia (VC - 122 DIHs); Other (O - 112 DIHs).



Fig. 5. Services offered by DIHs

Legend:

AF - Access to Funding and Investor Readiness Services; AC - Awareness creation; CR - Collaborative Researchs; CI - Commercial infrastructure; CV - Concept validation and prototyping; DM - Digital Maturity Assessment; EB -Ecosystem building, scouting, brokerage, networking; ES - Education and skills development; IS - Incubator/accelerator support; MI - Market intelligence; M - Mentoring; O - Other; PP - Pre-competitive series production; TV - Testing and validation; VS - Visioning and Strategy Development for Businesses; VC - Voice of the customer, product consortia

Regarding the technological readiness level (figure 6), the analysis of EU DIHs indicates an orientation towards the intermediate levels: TRL5-TRL7. Of the 625 DIHs, 440 have expertise on the TRL6 level; 420 on TRL7 level and 410 on TRL5 level. The least covered are the levels TRL1 (212 DIHs), TRL9 (224 DIHs), TRL2 (275 DIHs).



Legend:

TRL1 - Basic principles observed and reported; TRL2 - Technology concept and/or application formulated; TRL3 - Analytical and experimental critical function and/or characteristic proof of concept; TRL4 - Component and/or breadboard validation in laboratory environment; TRL5 - Component and/or breadboard validation in relevant environment; TRL6 - System/subsystem model or prototype demonstration in a relevant environment; TRL7 - System prototype demonstration in an operational environment; TRL8 - Actual system completed and qualified through test and demonstration; TRL9 - Actual system proven through successful mission operations

This preliminary analysis (the context evaluation and database general evaluation) highlighted the preliminary research problem of this article: the existing DIHs do not ensure all SMEs (regardless the activity and the sectors in which they operate) fair access to digital innovation projects, business internationalization and expertise for marketing communication strategies in the European ecosystem.

In order to answer the research problem identified, attention was directed to the four services that have the role of supporting SMEs in the process of business internationalization and implementation of marketing communcation strategies: commercial infrastructure (CI); market intelligence (MI); voice of the customer, product consortia (VB); ecosystem building, scouting, brokerage, networking (EB). A reorganization of the existing database was carried out and four separate databases were created (Table 2).

Database no	Selection criteria	No of DIHs
1	Only DIHs that have the CI services in their portfolio	141
2	Only DIHs that have the MI services in their portfolio	215
3	Only DIHs that have the VC services in their portfolio	122
4	Only DIHs that have the EB services in their portfolio	486

Table 2. New emerged database- regarding four services offered by DIHs

To carry out the analyses, there was used a statistical method known as multivariate clustering analysis. This analysis applies a principle that aims to reduce the sets of large databases to a summary in the form of illustrated typologies, results based on common features. The particularities of the resulting typologies can be interpreted based on the boxplots obtained from the analysis.

A boxplot is based on presenting a variable using six values: minimum, maximum, median, mean, first quartile and third quartile. It should be noted that the average of the multivariate clusters is not represented by the general average of the variable used, the averages in this case being represented by the average of the group. In the present study, DIHs were organized into 4 groups with different typologies.

Using this method, three global analyses were carried out, at the level of all DIHs registered at the EU level and four specific analyses at the level of the services selected and relevant for this research.

The first analysis presents aspects of the diversity of the sectors DIHs activity, highlighting where DIHs operate in the same sectors of activity and can form a specific cluster.

The second analysis, with a more exploratory role, tries to identify a series of common particularities based on the variables inserted in the analysis. All variables used for the second analysis were standardized.

According to the collected data, a mapping of the DIHs was carried out by the authors as a benchmark of the four selected services, on one hand, and four exploratory variables, on the other hand: the number of DIHs, the age of the DIHs, the sectors on which they cover the TRL.

The ultimate goal of these analyzes was to identify useful information such as: countries (in the EU) where the selected services are offered by more or less DIHs; the activity sectors covered by the DIHs providing the selected services; the TRL associated with the 4 selected services.

The intended practical utility for this research can be translated as follows:

- from SMEs' perspective, they will have an actual status of the EU DIHs and an orientation towards the DIHs that best meet their needs (from the perspective of the sectors or the efficiency of omnichannel and marketing communication services offered by DIHs); by viewing the maps based on the diversity criteria, SMEs can choose (from the multitude of possible choices) the entities that best suit their needs;

- from DIHs' perspective, they will know the potential of other DIHs and can adopt strategies to diversify/restrict services in order to better adapt to the market, innovation projects and new digital marketing strategies for entering or serving new markets.

The global database, corresponding to the 625 DIHs registered in the EU, was used to create the maps. Excel, XLSTAT, ArcGIS Pro and Philcarto programs were used for the database creation, analysis and graphic representation.

4 **Results and discussions**

4.1. Global perspective on European Union DIHs

At the European Union level, there are a number of 625 Digital Innovation Hubs, most of which are located in Spain, Italy and Germany. The three states together own 36.5% of the digital innovation hubs present at European level.

At the opposite pole, the states with the fewest digital innovation hubs are: Malta, Slovakia, Luxembourg and Cyprus. Together, these four states have 17 DIHs, less than 3% of the total number of DIHs.

Regarding the years of activity, it can be observed that the oldest DIHs in Europe are those in Greece, with an average of approximately 20 years, 9 years above the average of 11 years registered at the level of the European Union. In general, DIHs represent a fairly recent field, most entities being developed in the last 7 years.

A global perspective of DIHs in the EU is presented in figures 7 and 8.



Fig. 7. DIHs Average age and percentage share in UE

Following the analysis to identify some common features regarding the diversity of sectors where DIHs operate, four typologies/classes were obtained.

In the first typology (class I) there were included the countries in which DIHs have the most balanced distribution at the level of sectors. This selection indicated two countries: France and Germany (which have, on average, 10 DIHs per sector). For the second typology, there where selected the DIHs that have the largest number of hubs divided by sector. This typology included Spain (where the S17 sector is served by the largest number of DIHs – 48; no DIH operates on the S7 sector) and Italy (where in S12 operate 39 DIHs and in S35 operate 38 DIHs; sectors S5, S6 and S7 are each served by one DIH). At the level of these two states, the large number of DIHs and the diversity of distribution by sector, place them as outliers in the analysis carried out.

Several attempts to identify new typologies resulted into new grouping of states (not included in previous typologies) as follows: class III included the states whose average number of DIHs per sector is predominantly below the median value at the sector level: Poland, Slovenia, Greece and Cyprus; class IV included the states whose average number of DIHs per sector is predominantly above the median value at the sector level; most of the states answered this criterion. The last two classes represent the most common typologies within the European Union.



a) DIHs types according to the 4 typologies identified by the authors



Following the analysis to identify common features on the diversity of services offered by DIHs (figure 8), four typologies were obtained.

Class I with a well-defined development of services. Two countries were grouped in this class: France and Germany.

The second typology grouped the states with the hubs with the greatest diversity of services offered at the level of the European Union, Spain and Italy. Diversity in these

two states is so high that they have an outlier character in the analysis, which is easily linked to a strong concentration of digital innovation hubs in the two states.

Class III and IV grouped most states within the European Union, also representing the defining typologies of existing services at the European level, or rather the two classes represent the most common typologies within the European Union.

The last analysis carried out, based on the multivariate cluster method, has the role of presenting the four types of services specifically targeted by this research, with some exploratory variables also added: the average age of IDHs, the total number of IDHs and a composite index showing the level of maturity of the services offered by all DIHs present at the European level (figure 9).



a) DIHs types according to the four typologies identified by the authors

14



b) Representation of specificity of the analysed services Fig. 9. DIHs mapping accordind to the 4 services (CI, EB, MI, VC) covered in EU

The four realized typologies have the following particularities:

Class I is represented by the typology with most of the variable values located below the median. At the same time, this resulting typology includes the least developed states in terms of DIHs that offer these 4 analyzed services: CI, EB, MI, VC. Most states in this typology are located in Eastern Europe.

The second class is a typology of positive outlier type, according to all the variables used in the analysis. Spain stands out here, the country with the most DIHs that offer the most varied range of these four services in the analyzed sectors. The exception of this class consists in the fact that the DIHs with the longest tradition, as years of experience, are not included.

The third classification included the states with high values regarding the variables used, many of these values being outliers. This class also includes states with a long tradition in digital innovation. Most of the states in this class are located in Western Europe.

The last class included the states with values above the median of the boxplots in the analysis, the activity in digital innovation is less compared to the third class, but instead the digital innovation is superior to the first class. In this class were included several states from Eastern Europe, some Central European states, Scandinavia, Greece and the Netherlands.

Analyzing the four services, that can help SMEs to innovate faster in the digital area, to better communicate in their marketing strategies and internationalize their businesses, we have noticed some differentiators explained as follows.



4.2. Commercial infrastructure – DIHs support services for SMEs

The components of a commercial infrastructure are: transport networks (air, land and sea), communications and power generation, systems logistic for institutions responsible with research and education, ensuring the functionality of markets and legal standardisation [19].

The performance of a commercial infrastructure also depends on the "natural" features specific to each country. The following are considered: the availability and accessibility of natural resources - which facilitate exploitation, transport and commercialization; climatic characteristics; countries that have favorable weather for both commercial transport and trade are favored; geoeconomic particularities; some countries have access to water transport, others are integrated into road transport networks, etc.; the efficiency of the production factor markets (including the labor market) – these markets can present geographic concentration, degree of openness/freedom and specialization; cultural and social norms - which promote positive attitudes towards work, education, trade and legal institutions [19].

Also, trade infrastructure (along with other specific determinants) has a very important role in innovation-oriented countries with a high level of competitiveness. Therefore, DIHs that offer services associated with commercial infrastructure can be of real interest to SMEs looking for opportunities to place their products and services on new markets [20].

According to our analyses (figure 10), only 22,56% of the total number of DIHs have this service in their portofolio. Spain is the country with the biggest number of DIHs offering specialised services and know-how in the commercial infrastructure area (25 Spanish DIHs). Then, there are Latvia (12 DIHs) and Italy (11 DIHs). The countries that do not offer this service are: Slovakia and Malta.

4.3. Market intelligence- DIHs support services for SMEs

Market intelligence is a very important benchmark for planning and implementing market-oriented strategies. Providing information on changes in the business environment, the market intelligence represents the premise of implementing the most appropriate on-line and off-line marketing programs and penetrating new markets [21]. The efficiency of market intelligence services depends on several factors: individual, environmental, organizational and extra-organizational. Furthermore, it has been shown that market intelligence strategies depend on the organization's size, strategic approach and organizational resources.

In the case of SMEs - as small medium-sized entities that do not always have sufficient financial and human resources with specific expertise and skills - DIHs have an important role in providing specific market intelligence services, through appropriate market studies, consulting and specialized support in this field.

According to Figure 11, only 34,40% of the 625 DIHs at EU level have the competence to provide these services. Spain (33 DIHs), Italy (33 DIHs) and France (28 DIHs) have the most DIHs that can offer marketing intelligence services to SMEs.

4.4. Voice of the customer, product consortia- DIHs support services for SMEs

Voice of the customer (VC) is a market research term for the process of collecting, analyzing and implementing customer feedback data according to its needs, wants, expectations and preferences [22]. VC becomes a product-development technique based on the customers insights and the innovation and production capabilities of the organisation [23]

DIHs can provide this type of services that help SMEs to understand and capitalize the voice of customers and improve the market information regarding its products, thus facilitating the adaptation according to the needs and requirements of the market. This helps also to improve the customer relationships and developing new products and services. The analysis of the vocal behaviors (proactive and/or prohibitive) of customers have great impact over the enterprise's marketing approach and innovation or optimisation of products or services in any industry [24].

Only 19,52% of the DIHs registered at the EU level offer services that allow SMEs to capitalize on the "voice of the customer" or to create products consortia to better respond to customer needs (figure 11). Spain (22 DIHs), France (13 DIHs) and The Netherlands (12 DIHs) are the countries that are more offering these services.

4.5. Ecosystem building, scouting, brokerage, networking– DIHs support services for SMEs

Creating and developing digital business ecosystems is another responsibility assigned to DIHs. Suuronen et al (2022) conducted a literature review and emphasized the importance of integrating digital ecosystems into business ecosystems. The authors raise an alarm signal about the efficiency of business ecosystems in the digital age (which lose the necessary capabilities for production development). To be effective, digital business ecosystems must integrate (in addition to the two ecosystems – business and digital) digital platforms through which to facilitate access, interaction, leadership and value creation.

Digital business ecosystems provide a series of benefits, such as: new business opportunities, the participation of all members in value co-creation, the promotion of innovation, the creation of competitive advantages, the joint exploitation of resources (including knowledge), risk reduction, increased cost management efficiency, better satisfaction of customer needs [25].

Ecosystem building is also analysed for the the utility of a digital service ecosystem. An ecosystem model can be focused on five aspects: connection, content, computation, context, and commerce. But, while desired by ecosystem members, platform-oriented business models are not yet within everyone's reach [26].

The analysis at the EU level reveals that the vast majority of DIHs offer specialized services for building ecosystems, for research, intermediation and networking (figure 12). Of the 625 registered DIHs, 77,76% offer such services. Spain (75 DIHs), Italy (61 DIHs), France (47 DIHs) and Greece (45 DIHs) are the countries more specialised in offering these type of services.

5 Conclusions and future research

DIHs' main objective is the development of key areas, such as artificial intelligence, high-performance computing, cyber security, advanced digital skills and digitalization of public administration, interoperability and introducing digital software into economic process optimization of SMEs and other entities. Due to these digital areas, SMEs can innovate more, incorporate new tehnologies to improve their products and services, develop new markets and increase their annual revenue.

The present research revealed that countries like Spain, Italy, Germany, France and the Netherlands have the majority of the DIHs in European Union, offering the great majority of the services and give access to technology according to their level of technological maturity. Central and Eastern Europe countries, at a relatively beginner stage in the DIHs actively helping SMEs to develop easier, testing before invest and incorporate new technology in the digital transformation process, could learn from these Western Europe DIHs and see how they can adapt localy and regionally examples of good practice. Also, there is big potential for the new DIHs (in preparation or proposed for H2020) in Eastern Europe to acces new regions and new partners or clients in order to be imediatedly operational and able to offer as many services in many sectors as possible. Eastern European SMEs also have the opportunity to learn to work together in different projects with other entities for their personal or collective good of others, and DIHs are the answer to help then faster transition the digital transformation process, necessary especially during and after the pandemic period.

The services provided by most DIHs are: Ecosystem building, scouting, brokerage, networking, Collaborative Researches, Education and skills development, Awareness creation, Concept validation and prototyping. On the opposite side, the services that were found slightly in the portfolio of DIHs are: Market intelligence, Commercial infrastructure, Pre-competitive series production, Voice of the customer, Product consortia. These services are offered mainly by DIHs from Spain, France, Italy, Germany and The Netherland. These countries are known to have great experience and knowledge in these marketing services (off-line and on-line marketing strategies integrated with the help of different digital platforms), by helping companies to develop long-term strategies, innovate more and developing their businesses at national and international level.

Our analysis highlighted once more the preliminary research problem of this article: the existing DIHs do not ensure all SMEs (regardless the activity and the sectors in which they operate) fair access to digital innovation projects, business internationalization and expertise for marketing communication strategies in the European ecosystem.

This means a great opportunity for actual and future DIHs to expand their services in this area of digital marketing services, internationalisation, market intelligence and offer more expertise in the area of the voice of the consumer and product consortia. Coworking in this area could bring new market opportunities (consultancy services, studies, testing, financing), new cooperations and help SMEs develop faster on-line and off-line worldwide.

From our comparition, only the ecosystem building, scounting, brokerage, networking service was offered by almost 78% of the analysed DIHs. This is most likely to be accessed by SMEs because integrating digital ecosystems into business ecosystems it is a trend and a necessity also for a company to remain relevant on the market nowadays. These ecosystems are also easier to be built because they involve co-creation, joint innovation and there are multiple actors that can bring value, not only for one SME, but for the use of many more.

In the same time, the potential of the other services that are not now in the DIHs' focus could be easily integrated in the digital marketing strategies, by testing and developing new platforms in communicating better with potential clients all over the world (e-commerce platforms, social media strategies, AI, virtual reality, 3D presentation platforms, live interactions, chatboxes etc). Also these could be easily integrated with the main focuses of DIHs' key areas of interest.

The future research has into consideration the cantitative and calitative analyses in understanding better why DIHs (from Central and Eastern Europe) do not focus on these four services related to marketing strategies and business internationalisation (see if there is no expertise, no interest from the potential stakeholders, no bugets etc.). Also we can interview SMEs from these regions to understand if these services are of importance for their business development or if they want to develop them internaly to enhance their strategic advantage. Also, we could analyse if they know how DIHs can actually help them better form a commercial, digital marketing strategic point of view.

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FINANCIAL PERFORMANCE – DETERMINANTS AND INTERDEPENDENCIES BETWEEN MEASUREMENT INDICATORS

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Received 22 March 2022; accepted 11 April 2022

Abstract. *Purpose* – the study has a dual purpose. First, to assess the impact of the most important determinants of financial performance, which have been measured through four generations of indicators. In addition, the study provides the first quantification of interdependencies between different financial performance measures: profit margin (PM), profit growth rate (PGR), return on assets (ROA), return on equity (ROE), and economic value added (EVA).

Research methodology – the primary data was collected from the AMADEUS database. Empirical research was conducted on a relatively homogeneous sample from the automotive industry, using the panel data method for the period 2010–2019. Two models were tested. The first model highlights the relationships between performance measures and selected determinants. The second model highlights the relationship between the different performance measures and the determinants used in the first model.

Findings – the determinants analysed have different influences on the selected performance measures. For example, in the first model, the results statistically significant indicated the following. The current ratio has a positive influence on ROA, but a negative one on ROE and EVA. Gearing has a negative influence on PM and ROA, but a positive one on EVA. The growth rate of sales has a positive influence on PM, but a negative one on ROA and EVA. The size of the company has a positive influence on three performance measures (PM, ROA, and EVA). Regarding the relationships between the different performance measures (second model), the research indicates that EVA is negatively influenced by PGR and ROA. In this model, the determinants analysed maintain their meaning and intensity of influences.

Research limitations – the article has several limitations. The representativeness of the results is valuable only at the level of the researched industry. In addition, it should be noted that the analyses are focused only on financial performance, assessed by accounting measures. The authors are considering conducting comparative analyses at the level of fields/branches of activity to capture not only the impact of determinants on financial performance but also to assess organizational resilience.

Practical implications – The research provides clues to managers and financial decision-makers to increase the financial performance of the companies they lead.

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Originality/value – the originality of the study lies in the presented methodological approach. Unlike previous research, which usually evaluated performance on only one indicator, this paper aims to assess the impact of the most important determinants on five performance measures. In addition, the analysis of the interdependencies between the different performance measures is another novelty of this research.

Keywords: financial performance, determinants, economic value-added, automotive industry.

JEL Classification: C58, G30, G32, L25.

Introduction

The automotive industry is an important performer in both national and global economies (Adane & Nicolescu, 2018). The success of companies in this field attracts the attention of investors, who evaluate performance based on an indicator or a set of indicators considered relevant. At the same time, the success of companies in this field was a point of interest for researchers, who sought to assess financial performance (Herciu & Ogrean, 2013; Safaei Ghadikolaei et al., 2014; Pelloneova & Stichhauerova, 2019) or to identify its main determinant factors (Majtan et al., 2017; An & Kim, 2019; Sabbagh et al., 2019; Zainudin et al., 2021). In the research conducted, the performance profile was determined either based on information from the financial statements of the companies, based on information provided by the capital market, or based on perception measures (determined by survey).

The gap in the literature on defining and measuring performance is the first research issue that underpinned this article. Concerning the agreed financial performance indicators, the literature notes that stakeholder preferences have changed over time. We have thus witnessed a shift from the use of simpler, short-term relevant indicators to more complex, long-term relevant indicators. The importance of the research problem is supported by the fact that the correct measurement is a precondition for improving performance. Moreover, the selection of the most appropriate performance measures is of the utmost importance because there is evidence of the interdependence between the quality of management tools and techniques used and the recorded organizational performance (Afonina, 2015).

In terms of determinants of financial performance, a review of the existing literature has shown that research abounds in mixed results. The complexity of the performance, the diversity of the determinants, the samples, the processed data, the indicators used, and the applied analysis models make that the research results cannot be generalized. For this reason, this research focuses on the analysis of financial performance and its determinants for a sample of companies in the automotive industry. Therefore, empirical research was conducted on a sample from the automotive industry (89 companies), using the panel data method (for the period 2010–2019) and secondary data.

Motivated by the lack of convergence of the results of previous research, this paper aims to provide: a) an image of the progress made in terms of defining and measuring performance; b) a comprehensive analysis of the relationship between financial performance and its determinants, relevant to the automotive industry; c) an analysis of the interdependencies between the different performance measures. The ultimate goal is to facilitate the definition of some performance strategies which can ensure business sustainability. Unlike previous research,

which evaluated performance (and the impact of its determinants) on only one indicator, this paper aims to assess the impact of the most important determinants on five performance measures. In addition, another novelty of this research is the contribution to the advancement of knowledge on the line of interdependencies between different performance measures.

To meet the objectives assumed, the research was organized as follows: reviewing the literature and establishing research hypotheses, detailing the methodology, presenting the results and discussing them, respectively, concluding about the results obtained. The research has important theoretical and practical implications. It provides a scientific basis for integrative performance management and can also serve as a guide for decision-makers to increase the financial performance of the companies they lead, taking into account the interests of all stakeholders involved.

1. Theoretical background and hypothesis

1.1. Financial performance and its measures

Performance management and financial performance management, are intensely debated but still current topics. The proof is the multitude of studies published over the years. For example, in our search on the Web of Science platform (for the period March 1, 2021 – March 1, 2022), using the keywords financial performance management, it was found that in just twelve months about 2300 studies were published (in October 2021 there were over 22.5 thousands of papers, of which more than 17 thousand were assigned to relevant fields, such as management, business, and economics). Maintaining interest in these research topics is justified by the fact that common and convergent ideas on defining and measuring financial performance have not yet been reached. Summarizing the debates on performance, we identified the following:

- In the early stages of research, the concept of *performance*, considered a vital goal of any company, was defined from the perspective of achieving or not achieving organizational goals; subsequently, the pillars that explained performance were: efficiency, effectiveness, and value creation for stakeholders (Lupton, 1977);
- After several decades of performance research, *few studies use consistent definitions and measures* (Kirby, 2005);
- 10 years later, the literature shows a *lack of understanding or sufficient clarification in defining the concept of performance* (Jenatabadi, 2015), which makes the results of research remain inconclusive both in terms of measuring instruments and their determinants (Ayako et al., 2015);
- Current research (Golubeva, 2021) indicates that opinions on defining and measuring performance are weakly convergent, with the recommendation of taking a more comprehensive and creative approach.

The difficulty of defining the concept of *performance* derives from its multidimensional character (Prahalathan & Ranjany, 2011), integrating aspects related to management, finance, accounting, corporate governance, microeconomics, and more. For example, Hamann and Schiemann (2021) indicate that organisational performance has four dimensions: profitability, liquidity, growth, and stock market performance. Therefore, the internal architecture of the concept of financial performance is represented by various components that may (or may not)

be interdependent. To argue the tendency to abandon the concerns of defining the concept, it has been acknowledged that "performance is so important in management research that its structure and definition are rarely explicitly justified" (Richard et al., 2009).

Taking into account the opinions of predecessors, but also the difficulty of defining the concept, it was admitted that performance can be considered an artifact based on which the success of an organization is appreciated (Tudose & Avasilcai, 2020). The arguments in favour of this classification are explained below. First of all, performance is a result of human creation, managerial decisions being attributed exclusively to the human factor. Secondly, the achievement of performance (reaching a certain level of performance) involves specific actions (different from one organization to another, without the possibility of replication), the result of the actions being an original one (like a work of art). Third, past actions can be adapted to the present to achieve superior performance in the future.

Approached from a financial perspective, the performance was assessed based on the financial results obtained by a company in a given period. Therefore, to admit that a company is financially successful, its monetary outputs must be higher than the expenses related to its realization. The latest definitions of financial performance integrate aspects such as the efficiency and effectiveness of a company in the use of resources (Egbunike & Okerekeoti, 2018; Mahrani & Soewarno, 2018) and in achieving objectives (Suhadak et al., 2019). Therefore, financial performance reflects a company's ability to create economic value (Orozco et al., 2018) and to attract and generate returns for investors (Al-Sa'eed, 2018).

The dynamism of the economies, the changes at the level of the business environment or the level of the organizational strategy oblige to re-evaluate the usefulness of the performance measures. Concerns about the development of performance measurement systems/models have intensified in the last century. Analysing the research on the evaluation of financial performance, the authors opined that evaluation systems have developed in two stages (Rajnoha et al., 2016): in the first stage the focus was on profit, profitability, and productivity; in the second stage, as a result of changes in the world market, performance evaluation focused more on strategic priorities, the indicators of quality (of products/services) and business flexibility becoming important in gaining and maintaining competitive advantage.

Summarizing the research on financial indicators, other authors (Pavelková & Knapková, 2005) noted the substantiation and use overtime of four generations of financial performance indicators: 1. profit margin; 2. profit growth rate; 3. return on assets (ROA), return on equity (ROE), return on investment (ROI); 4. added value for the company and shareholders.

1. *The profit margin* reflects a company's ability to generate profit based on sales (Brigham & Huston, 2012; Nguyen et al., 2020). This indicator was considered important to follow because a significant decrease may generate the risk of bankruptcy (Husna & Desiyanti, 2016). Other authors point out that one of the challenges faced by financial managers is identifying the conditions under which profit growth does not significantly affect a firm's competitive advantage (Nguyen et al., 2021). It has been recognized that careful profit margin management can be a solution to avoid or anticipate declining profits, with a positive future effect on the company (by controlling competitiveness and minimizing the risk of bankruptcy). Imhanzenobe (2020) showed that the profit margin is an indicator of short-term performance appreciation (reflecting the company's net revenue per unit of sales), being different from the indicators that report the profit to the elements recoverable over more than one year (such as ROA or ROE).

2. The evaluation of performance based on *the rate of increase of profit* marked the transition from static measurement to the dynamic measurement of financial performance. The profit growth rate was associated with the growth rate of the company (from the perspective of sales dynamics) to highlight sustainable development. Relatively recent research (Izquierdo, 2015) has been concerned with explaining why some companies grow faster than others, in a context that shows that the relationship between profitability and growth is neither universal nor generally reciprocal. Analysing the dynamics of the profit growth rate, some authors (Endri et al., 2020) have shown that an increase in the profits of listed companies can be obtained if they operate efficiently (with increasing revenues and profit margins) and carefully manage current liquidity, precisely to encourage higher sales growth.

3. *Profitability rates* describe the extent to which the use of a company's resources and funds generates profit. The most used rates of return are: return on assets (ROA) and return on equity (ROE). A high level of the two performance measures indicates the efficiency of a company in the use of its resources and funds. Also included in this category is the return on investment (ROI), which balances net profit and total investment value, being used to assess the level of efficiency of the company as a whole (Siahaan et al., 2021).

Due to the easy way of determining (but also due to the ease of interpretation), financial rates were considered useful tools to assess and monitor financial position (Demmer, 2015), as also trend analysis, cross-sectional analysis, and comparative analysis (Sebastian & Siauwijaya, 2021). The main criticisms of these performance measures were: the use of historical information, the evaluation of performance at a given time, and the priority treatment of the consequences and not of the causes that determined a certain performance (Kiseľáková et al., 2016).

4. The limitations of profit margin measurement systems, profit growth, and profitability rates have led researchers to focus on increasing the *value of the company*, i.e. increasing value for shareholders. Thus, there is a fourth generation of indicators that measure *the economic added value*, both for the company (through economic value added – EVA – or market value added) and for shareholders, investors, or other interested parties (by shareholder's value-added, free cash flow or cash flow return on investment). By balancing the net operating profit and the opportunity cost of the invested capital, the EVA analysis makes it possible to interrelate two areas often approached separately: operational management and financing management (focusing on the cost of these financing). Due to the complexity of the determination, EVA was considered one of the most appreciated performance evaluation indicators, as it involves all the resources used (and implicitly all the costs of running a business) and allows decentralization of decision making (Morard & Balu, 2010).

1.2. Financial performance determinants. Review of the literature and hypothesis

In general, the determinants of performance are grouped into two levels – micro and macroeconomic, respectively, internal and external. To find out the current state of knowledge on the determinants of financial performance, Tudose and Avasilcăi (2020) identified two groups of determinants: financial and non-financial. The results of the bibliographic research conducted on this topic are summarized in Table 1. The methodological framework for assessing the interdependencies between financial performance and its determinants is shown in Figure 1.

The researchers noted that few studies are addressing the organization's problems, and they stated that more attention was needed for this category of determinants. This is why, in this paper, we focus on the most representative internal factors that impact financial performance. In their research, the authors opt for a set of indicators, associated with one or more categories of determinants (detailed in Table 1). Regardless of whether they are company/ industry/country-level analyses, there is a preference of researchers for certain internal determinants. Relevant indicators from the literature are used for these determinants, such as

Table 1. Determinants of financial performance (source: elaborated by the authors)

Internal determinants (specific to the company, its activities, and products/services)	Financial determinants: business liquidity (Khidmat & Rehman, 2014; Husna & Desiyanti, 2016; Durrah et al., 2016; Egbunike & Okerekeoti, 2018; Kanakriyah, 2020; Imhanzenobe, 2020; Endri et al., 2020; Batrancea, 2021); capital structure (Dinu & Vintilă, 2017; Nenu et al., 2018; Muthoni, 2019; Mehmood et al., 2019; Dinh & Pham, 2020); sales volume and dynamics (Humera et al., 2011; Burja, 2011; Margaretha & Supartika, 2016; Husna & Desiyanti, 2016; Dinh & Pham, 2020; Endri et al., 2020; Le Thi Kim et al., 2021); company size, assessed by a number of employees or volume of assets, (Al-Jafari & Al Samman, 2015; Margaretha & Supartika, 2016; Ichev & Marinc, 2018; Fuertes-Callén & Cuellar-Fernández, 2019; Dinh & Pham, 2020; Golubeva, 2021), nature of assets, capital investment intensity, working capital (Bolek, 2014; Al-Jafari & Al Samman, 2015), market share (Capon et al., 1990; Izquierdo, 2015), financial sustainability (Imhanzenobe, 2020; Orazalin et al., 2019).
	Nonfinancial determinants: TQM practices (Sabbagh et al., 2019); shareholder and structure or size of the board (Al-Sa'eed, 2018; Ayako et al., 2015; Orozco et al., 2018); the number of employees (An & Kim, 2019); dividend policy (Kanakriyah, 2020; Sebastian & Siauwijaya, 2021); corporate lobby (Lin, 2019); leadership practices (Suriyankietkaew & Avery, 2016); research and development, diversification (An & Kim, 2019; Zainudin et al., 2021); competitive advantage (Nguyen et al., 2021); product/service quality, corporate social responsibility (Mahrani & Soewarno, 2018; García-Sánchez & Martínez- Ferrero, 2019); business sustainability (Imhanzenobe, 2020); management practices, innovation capacity (Fuertes-Callén & Cuellar-Fernández, 2019; Nguyen et al., 2020); corporate governance (Humera et al., 2011).
External determinants	Specific to the economic environment: industry size, concentration, or industry affiliation (Izquierdo, 2015; Margaretha & Supartika, 2016; Nguyen & Nguyen, 2020; Golubeva, 2021); capital investment, advertising, business ecosystems (Micheli & Muctor, 2021); legal framework, market specificity, barriers to entry, consumer/user behaviour (Capon et al., 1990); competitiveness (Herciu & Ogrean, 2013).
	Specific to the economic context: economic growth (Dinu & Vintilă, 2017; Golubeva, 2021; Asimakopoulos et al., 2009); economic cycle (Vu et al., 2019), crisis (Batrancea, 2021); interest rate, inflation rate, exchange rate and the gross domestic product growth rate (Egbunike & Okerekeoti, 2018); stock market performance (Hamann & Schiemann, 2021); internationalisation (Zainudin et al., 2021), consumer price index, cost of financing (money and financial market); the degree of development of financial markets, the degree of openness of national economies, the balance of trade, exchange rate volatility.



Figure 1. The causal model between financial performance and its determinants (source: elaborated by the authors)

the current ratio as an expression of business liquidity; gearing ratio or levier, which reflects the influence of financial structure on performance; the growth rate of sales, as an expression of business growth; company size, admitting that the larger ones have a higher competitive power compared to the smaller ones; this is because they have higher market shares, have easier access to the capital market and demonstrate operational experience and efficiency (Ichev & Marinc, 2018; Golubeva, 2021). The results obtained are not convergent due to the diversity of samples, the periods for which the analysis is performed, and the indicators used (for dependent/independent/control variables). For example, some studies (focused on financial performance) report a positive impact on liquidity (Khidmat & Rehman, 2014; Durrah et al., 2016; Dinu & Vintilă, 2017; Nenu et al., 2018; Egbunike & Okerekeoti, 2018; Imhanzenobe, 2020), financial structure (Al-Jafari & Al Samman, 2015; Muthoni, 2019; Dinh & Pham, 2020), sales growth (Endri et al., 2020; Dinh & Pham, 2020; Humera et al., 2011; Le Thi Kim et al., 2021) and size company (Egbunike & Okerekeoti, 2018; Fuertes-Callén & Cuellar-Fernández, 2019; Kanakriyah, 2020; Dinh & Pham, 2020; Golubeva, 2021). Other studies find negative influences on performance, when they introduce in the analysis the current ratio (Fuertes-Callén & Cuellar-Fernández, 2019; Endri et al., 2020), the gearing ratio, or the levier (Khidmat & Rehman, 2014; Dinu & Vintilă, 2017; Nenu et al., 2018; Mehmood et al., 2019; Le Thi Kim et al., 2021), the sales growth rate (Khidmat & Rehman, 2014; Margaretha & Supartika, 2016) and the company size (Khidmat & Rehman, 2014; Margaretha & Supartika, 2016; Nenu et al., 2018).

In the light of those presented, two hypotheses are assumed in this study:

H1: Current ratio, gearing, turnover growth rate and size of the company from the automotive industry have a direct influence on the financial performance assessed by the profit margin, profit growth rate, returns on assets, return on equity and economic value-added.

H2: There are relationships of direct determination between different measures of financial performance.

According to research predecessors (Leończuk, 2016), performance measurement should be done in a particular context. This is why, in the present study, the analysis is limited to one field of activity (automotive industry) and covers the pre-pandemic period. The formulation of the hypotheses was based on the three benchmarks that underlie the performance assessment: effectiveness (which highlights the relationship between the results obtained and the objectives pursued), efficiency (which highlights the relationship between resource consumption and added value), and satisfaction of stakeholders.

2. Methodology

This study is based on hypothetical-deductive reasoning. The aim is to predict an explanatory theoretical model which will further be the subject of empirical research. The choice for this research strategy was justified by the fact that the literature provides evidence that the relationships between determinants and business performance are not always clear. The methodological framework of the research is presented in Figure 2.



Figure 2. The framework of methodology (source: elaborated by the authors)

Although considered first-generation indicators, profit margin and profit growth rate are often used in research over the last decade (Al-Jafari & Al Samman, 2015; Durrah et al., 2016; Husna & Desiyanti, 2016; Mahdi & Khaddafi, 2020; Endri et al., 2020). More intensely, ROA and ROE (considered third-generation indicators) are used in research focused on assessing the financial performance of companies (Khidmat & Rehman, 2014; Al-Jafari & Al Samman, 2015; Durrah et al., 2016; Kanakriyah, 2020). Considering that financial rates are not sufficient to assess performance in today's competitive economy (Safaei Ghadikolaei et al., 2014), the literature has focused on measures based on economic added value. EVA, considered a fourth-generation indicator, has come to the attention of researchers by allowing managers to perform four types of interventions (Kijewska, 2016; Tudose et al., 2021): a) increase the net profit margin (expression of increased efficiency activity); b) increase in sales; c) diminution of the value of the invested capital when it is not fully capitalized; d) optimization of the capital structure.

As shown in Figure 2 for realizing the empirical analysis we focused on two models. The first model considers five variables in turn that define the financial performance of companies, and four determining factors. The equations tested for Model 1 are presented below:

1. performance analysis, evaluated based on the first generation indicator - PM:

$$PM_{it} = CR_{it}\,\beta 1 + G_{it}\,\beta 2 + GRS_{it}\,\beta 3 + S_{it}\,\beta 4 + U_{it}.$$
(1)

2. performance analysis, evaluated based on the second generation indicator - PGR:

$$PGR_{it} = CR_{it}\beta 1 + G_{it}\beta 2 + GRS_{it}\beta 3 + S_{it}\beta 4 + U_{it}.$$
(2)

3. performance analysis, evaluated based on third-generation indicators - ROA & ROE:

$$ROA_{it} = CR_{it}\,\beta 1 + G_{it}\,\beta 2 + GRS_{it}\,\beta 3 + S_{it}\,\beta 4 + U_{it},\tag{3}$$

$$ROE_{it} = CR_{it}\beta 1 + G_{it}\beta 2 + GRS_{it}\beta 3 + S_{it}\beta 4 + U_{it}.$$
(4)

4. performance analysis, evaluated based on the fourth-generation indicator - EVA:

$$EVA_{it} = CR_{it}\beta I + G_{it}\beta 2 + GRS_{it}\beta 3 + S_{it}\beta 4 + U_{it}.$$
(5)

The variables included in the models described above are defined in Table 2.

Variables	Symbol	Formulas		
Profit margin	PM	Net profit / Sales		
Profit growth rate	PGR	Net profit $_{n}$ / Net profit _{200x} (200x is the base year)		
Return on assets	ROA	Gross profit / Total assets		
Return on equity	ROE	Net profit / Shareholder's equity		
Economic value added	EVA	Net operating profit after taxes –Invested capital <i>x</i> Cost of capital		
Current ratio	CR	Current assets / current liabilities		
Gearing	G	Total debt / total financing		
The growth rate of sales	GRS	Turnover $_{n}$ / Turnover $_{200x}$ (200x is the base year)		
Size of the company	S	Total assets		

Table 2. Independent and dependent variables (source: elaborated by the authors)

For the second model, we proposed to test the interdependencies between the performance indicators considered in the first model. Thus, the equation we intend to test is:

$$EVA_{it} = PM_{it} \beta 1 + PGR_{it} \beta 2 + ROA_{it} \beta 3 + ROE_{it} \beta 4 + CR_{it} \beta 5 + G_{it} \beta 6 + GRS_{it} \beta 7 + S_{it} \beta 8 + U_{it},$$
(6)

where *i* represents the firm, *t* is the time; $\beta 1$, $\beta 2$... $\beta 8$ represent the coefficients; U_{it} is the error term.

From the perspective of the objective assumed and transposed in this second model, it is necessary to specify that no similar research strategy has been found in the literature, to assess the interdependencies between the measures of financial performance assigned to different generations. The searches in this direction of research indicated that research was limited to analysing the interdependencies between two performance indicators, namely: net profit margin and firm value (Mulyadi et al., 2020); profit growth rate and net profit margin (Endri et al., 2020); ROA and net profit margin (Imhanzenobe, 2020); EVA and ROA (Sliman, 2017; Agustina et al., 2020; Tudose et al., 2020). As an exception to the above, the research of Safaei Ghadikolaei et al. (2014) proposed a hybrid approach to assessing the financial performance of companies in the automotive industry, in which context they ranked (companies) according to financial performance, introducing accounting measures and economic values in a process of Fuzzy analysis.

Besides the theoretical aspect of the study, we focused also on quantitatively testing a set of hypotheses. Thus, the main purpose of the empirical part is to find out which are the determinant factors of the financial performance of firms and also to identify the interdependencies between them. For reaching this purpose we have selected the data for the firms from the AMADEUS database. The data were selected only for Romanian companies, for companies in the automotive industry (CAEN codes related to group 29 Manufacturing of

motor, trailers, and semitrailers). On the first search, the platform indicated the existence of 607 companies, of which only 571 companies are active. In order to ensure representativeness, out of the 571 companies, only large and very large companies were selected, therefore remained only 118 companies. Out of the 118 companies, realizing the cleaning of the database we gave up to 5 companies that did not have data transmitted for the last year (2019); 4 companies that did not have operational income/employees in the first years (2010–2011); 20 companies for which data were not available for more than 4 consecutive years. Thus, the resulting final sample consists of 89 companies. The study is mainly based on secondary financial data for a period of ten years, 2010–2019.

As empirical methods of analysis we used correlation and regression analysis. Because our analysis focuses on a set of 9 indicators, for 89 companies, over ten years, we use panel data models. Eviews programme was used for performing econometric analysis. Thus, the first step in the analysis was to test the variables for the existence of a unit root. Also, because EVA appears in absolute size, we calculated the natural logarithm for this variable. The next step is to analyse the descriptive statistics, followed by testing the correlation and regression models with panel data. We run three different models: OLS adapted to panel data, fixed effects, and random effects. And then tested to see which of these models fit best. The tests performed (Hausman test and Redundant fixed effects test) showed that the model with fixed effects is the most suitable for our data. Therefore, the regression analysis consisted in applying the fixed effects.

3. Results and discussions

The results obtained after running the descriptive statistics are described in Table 3. Thus, they point out that the companies considered in the sample are very varied, so we have companies that have high performance but also companies at the other extreme with poor performance, with negative results for the indicators measuring performance. The highest standard deviation is obtained for return on equity followed by profit growth rate and return on assets.

Variables	Mean	Max.	Min.	Std. Dev.	Obs.
Profit margin	6.109	54.910	-5.828	10.364	854
Profit growth rate	0.006	37.547	-6.136	22.613	852
Return on assets	9.511	99.915	-4.239	15.351	870
Return on equity	16.925	434.210	-6.130	55.755	833
Economic value added	7.073	11.930	-1.397	1.798	809
Current ratio	1.825	14.286	0.039	1.703	872
Gearing	73.265	926.180	0.000	110.805	708
The growth rate of sales	2.128	714.348	0.000	24.764	843
Size of the company	9.843	14.591	2.314	1.531	872

Table 3. Descriptive statistics of the variables (source: authors' own calculations)

For independent variables, the largest variation is recorded for gearing rate and growth rate of sales. Also, the average value for gearing of 73% shows the high degree of indebtedness of the companies included in the study. For the growth rate of sales, although the maximum value is high, the average is relatively low, showing that many of the companies considered have low sales growth rates. The values obtained for the size of the company show that our sample consists of an increased proportion of very large companies. The different values obtained for the number of observations for each variable show us that some variables lack data for certain years.

In Table 4 we have centralized the results obtained after running the regression analyses for the two proposed models. Thus, the results obtained for Model 1, point out that a part of the variables considered have a significant influence on the financial performance of the firms from the automotive industry. Therefore, the *current ratio* resulted in positively determining ROA and negatively determining ROE and Economic value-added. When a company has higher liquidity, and greater capacity to cover the short-term liabilities will determine an increase in ROA. This result is in line with the findings of Crespo and Clark (2012), Khidmat

	Model 1				Model 2	
Dependent variable	Profit margin	Profit growth rate	ROA	ROE	Economic value added	Economic value added
Current ratio	0.604 (0.640)	0.109 (0.180)	0.749** (0.245)	-1.522* (0.910)	-0.140*** (0.032)	-0.139*** (0.322)
Gearing	-0.014*** (0.003)	-0.007 (0.005)	-0.021*** (0.002)	0.004 (0.047)	0.001** (0.001)	0.001*** (0.001)
Growth rate of sales	1.673* (0.842)	0.001 (0.001)	-4.214*** (1.062)	2.426 (6.593)	-0.195*** (0.051)	-0.247*** (0.065)
Size of the company	1.950*** (0.576)	0.009 (0.407)	1.390* (0.802)	-4.363 (4.509)	0.788*** (0.090)	1.039*** (0.087)
Intercept	-13.912 (6.650)	1.073 (4.597)	-4.199 (8.040)	6.756 (4.561)	-0.410 (0.936)	-2.663*** (0.204)
Profit margin	-	_	-	-	-	0.004 (0.005)
Profit growth rate	-	_	-	-	-	-0.006*** (0.001)
Return on assets	-	-	-	-	-	-0.007*** (0.002)
Return on equity	-	_	-	-	-	0.001 (0.003)
Obs.	695	697	696	696	683	681
R-squared	0.667	0.131	0.724	0.434	0.931	0.861
R-squared adjusted	0.615	0.005	0.680	0.345	0.920	0.859
F-statistic	12.722***	0.961	16.616***	4.858***	84.104***	86.146***

Table 4. Regression analysis results (source: authors' own elaborations)

Note: *, ** and *** represent that the values are significant at 1%, 5%, respectively 10%. Standard errors in parenthesis.

and Rehman (2014), and Durrah et al. (2016). Contrary to these findings, Bolek (2014) – analysing the issue of return on current assets and return on working capital, correlated with the cost of equity – showed that in a conservative working capital management strategy the influence on ROE can be negative. Regarding the link between the current ratio and EVA, previous research confirms the negative relationship (Agustina et al., 2020) or signals a lack of statistical representativeness for this link (Tudose et al., 2020).

The gearing ratio resulted in negatively determining *profit margin* and ROA and positively determining the *economic value-added*. These results can be explained by the fact that when a firm has higher debt it will need more resources for paying this debt, with negative effects on its performance measured by *profit margin* and/or ROA. Similar results were obtained by Asimakopoulos et al. (2009), Al-Jafari and Al Samman (2015), and Kanakriyah (2020). At the same time, supplementary debt can be translated into a good investment, which will then increase performance (Burja, 2011; Humera et al., 2011). Al-Sa'eed (2018) showed that the gearing ratio has a significant positive impact on performance measured by ROA and a significant negative impact on performance measured by ROE and net profit margin. Regarding the gearing ratio and EVA, studies confirm the positive relationship (Agustina et al., 2020).

The variable *growth rate of sales* positively influences *profit margin* and negatively *ROA* and *EVA*. The positive link between sales growth and profit margin is supported by the fact that both indicators use sales volume as the main variable. Increasing sales from one period to another (highlighted by an increasing growth rate) will generate higher profits.

When the profit growth rate is higher than the sales growth rate, the profit margin will increase. Previous studies (Rice, 2016) confirm the positive relationship, arguing that sales revenues materialize into actual or potential cash inflows (when they take the form of credit receivables/sales). According to other researchers (Endri et al., 2020), the increase in sales from one period to another reflects the success of the business and the foundation for predicting future profit growth.

When the growth rate of gross profits will be lower than the growth rate of assets, the increase in sales revenue will result in a deterioration of the ROA. This situation is specific to companies that are expanding their production capacity (marking an increase in the volume of assets held). To better capture this situation, some authors have proposed the use of a composite indicator – *asset turnover*. Based on this composite indicator, determined as the ratio between total revenue and total assets, the literature provides evidence of the positive and consistent impact on financial sustainability (Imhanzenobe, 2020).

Other research (Agustina et al., 2020) provides evidence on the lack of statistical significance of the link between asset turnover ratio and EVA. To understand the interdependencies between the growth rate of sales and EVA, it is important to identify the relationship between two indicators:

$$EVA = NOPat - IC \ x \ WACC, \tag{7}$$

and

where, *NOPat* – Net operation profit after tax; *IC* – Invested capital; *WACC* – Weighted average cost of capital.

According to the relationship presented, the increase in sales is a precondition for the increase in EVA. Still, when the growth rate of NOAPt is lower than the growth rate of invested capital, the tendency is to decrease EVA. Evidence of this is provided by Pramanik and Sahoo (2016), who showed that an increase in investment in fixed assets can have a negative impact on the performance assessed by EVA.

The *size of the company* resulted to be positively related to the financial performance of firms measured by profit margin, ROA and economic value-added. This shows that larger firms have higher effects on their potential investors, creditors, stakeholders, and even consumers. Our results are in line with the findings of other studies in the literature (Stierwald, 2009; Vijayakumar, 2011; Ayele, 2012; Erasmus, 2013; Al-Jafari & Al Samman, 2015; Kana-kriyah, 2020; Nguyen & Nguyen, 2020). Contrary to these findings, other authors have provided evidence of the negative relationship between firm size and ROE (Dinh & Pam, 2020) respectively ROA (Margaretha & Supartika, 2016; Imhanzenobe, 2020). Other authors have confirmed that the size of the company does not influence the rate of profit growth (Endri et al., 2020; Vu et al., 2019).

The value of R-squared adjusted is different according to the variable considered for measuring the performance of the companies. Therefore, looking at the values from Table 4 we can affirm that 61% of the variation of the profit margin of the considered companies can be explained by the variation of the variables included in the analysis. Also, 68% from the variation of ROA, 34% from the variation of ROE, and 92% from the variation of EVA can be explained by the variation of the independent variables considered.

For Model 2 we observe that EVA is negatively related to current ratio, growth rate of sales, profit growth rate, and ROA, and positively related to gearing ratio and the size of the company.

The negative relationship between the current ratio and the growth rate of sales, on the one hand, and EVA, on the other hand, have been detailed in the context of the Model 1 debates. The arguments presented can be considered valid to explain the negative relationship between *profit growth rate* and *ROA*. The interpretation from the perspective of the research sample can be attributed to the fact that during the 11 years (2010–2019), companies made investments in fixed assets (Figure 3), which had a negative impact on the performance assessed by EVA (Pramanik & Sahoo, 2016).

Regarding the positive relationship between the *gearing ratio* and the *size of the company*, on the one hand, and EVA, on the other hand, our research provides evidence that EVA increases if: a) the rate of increase of remuneration claimed by financiers is lower than the growth rate of net operating profit; b) there is a consensus of financiers on the reduction of



Figure 3. Dynamic of assets (thousand euros) (source: elaborated by the authors)

the current level of remuneration in favour of future higher financial remuneration (Tudose et al., 2020). This is also the reason why the literature (Safaei Ghadikolaei et al., 2014) considers that measures based on economic added value are more important compared to measures based on financial rates.

Subsequently, taking into account the situation identified in the primary analysis data (for one of the sampled companies the ROA was negative during the analysed period while EVA was positive) it is confirmed that EVA reflects the true economic profit of a business (Orazalin et al., 2019).

Model 2 resulted to be statistically significant and the value of R-squared adjusted shows that 85% of the variation of the Economic value-added can be explained by the variation of the independent variables.

Conclusions

Due to the multidimensional nature of performance, the diversity of its determinants, as well as the diversity of methods, techniques, and tools used for evaluation, performance research has been and remains a topic of interest. The central idea around which the studies on this topic revolved was to identify the most appropriate performance measures, which provide a true picture of reality and allow for resilience and business sustainability.

This study aimed to comply with one of the rigors of scientific research, according to which research must provide both theoretical and practical knowledge to facilitate the overcoming of organizational problems. For this, both rational thinking and creative thinking were used (to ensure originality in research). At the same time, it was intended that the paradigm questions (which facilitated the understanding of the brilliant scientific achievements and the construction of a cognitive transcript) take precedence over the method questions.

The objectives assumed in this study are subsequent. Highlighting the advancement of knowledge on the definition and measurement of performance is followed by two analyses: one focused on the relationship between financial performance and its determinants and one focused on the interdependencies between different performance measures.

The bibliographic research carried out allowed the formulation of the following conclusions: the difficulty of defining the concept of performance is maintained; progress has been made in substantiating and implementing performance measures (the option for a specific set of measures depends on the preferences of stakeholders); evidence was provided on the interdependence between the quality of the management tools and techniques used and the organizational performance; analyses at the level of performance determinants implement causal models between a dependent variable (financial performance) and one or more explanatory variables (financial or non-financial).

The success of companies in the automotive industry has been a point of interest for researchers, who have sought to assess financial performance or identify its main determinants. However, the literature review provided evidence that the relationships between determinants and firm performance are not always clear. To shed more light, two causality models are defined and tested in this study: the first model evaluates the interdependencies between different performance measures and a set of determinants; the second model evaluates the links between the different performance measures. As signals were identified that performance analysis differed by period, country, and industry, interdependencies were tested on a relatively homogeneous sample of 89 large and very large companies in the automotive industry; the construction of a representative database for 9 indicators, for 11 years allowed the cross-sectional analysis, based on the panel data methods.

The results of the analyses at the level of the first causality model proved to be statistically significant and indicated that the *current ratio* has a positive influence on ROA, but a negative one on ROE and EVA; *gearing* has a negative influence on PM and ROA, but positive on EVA; the *growth rate of sales* appears as a significant determinant in the models that evaluate the financial performance through ROA and EVA; company size has a positive influence on PM and EVA. As shown in the results and discussion section, the vast majority of them confirm the results of previous research.

The results of the analyses at the level of the second causality model proved to be statistically significant and scientifically important. The output of this research increases in value because (from the perspective of those consulted so far) previous research has limited themselves to analysing only the interdependencies between two performance measures. The results of the interdependence analysis of the 4 performance measures, calibrated according to four control variables (current ratio, gearing, growth rate of sales, size of the company), confirm the results of the first model tested, in the sense that EVA is negatively related to current ratio, the growth rate of sales, PGR and ROA and positively correlated with gearing ratio and the size of the company. The situation was explained by the fact that in the period 2010–2019 the companies in the automotive industry intensely financed the investments in assets, which diminished the performance related to the analysed period, but created a foundation for the expansion/growth/development of the business.

From the perspective of the results obtained, this study contributes to the advancement of knowledge (because it assesses the current state of research and proposes an original methodology that better captures the multidimensional nature of performance) and has important practical implications. Knowing the impact of different variables on financial performance (evaluated through the prism of several indicators), managers have a wider range of activities to achieve the objectives assumed by the company.

Although much of the results of the existing literature have been valued in the elaboration of this paper, the study is not intended to be exhaustive. In future research, we consider overcoming the limitations of this research (related to the representativeness of the data only at the level of the researched sample) and identifying and including in the empirical analysis some new determinants relevant to the selected samples. At the same time, we are considering conducting comparative analyses at the level of fields/branches of activity to capture not only the impact of determinants on financial performance but also to assess organizational resilience.

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Article An Empirical Investigation of the Link between Entrepreneurship Performance and Economic Development: The Case of EU Countries

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Abstract: Theory and practice suggest that entrepreneurship is the engine of economic growth. The speed with which a nation moves from economic growth to economic development depends on the performance of entrepreneurial initiatives. Given the role played by entrepreneurship for the development of an economy, increasing its performance can help the development of national markets and the increase in national competitiveness. The main objective of our paper is to investigate the link between entrepreneurial performance and economic development of countries. The research was carried out on a sample of 27 European Union countries in a period of twelve years. We used panel data regression models. As dependent variables for expressing the economic development, we considered the global competitiveness index and the gross domestic product per capita growth. As independent variables, we used a set of indicators measuring entrepreneurial performance for enhancing the economic development of EU countries. We also find that some indicators expressing entrepreneurial performance might have different effects on the economy depending on the stage of economic development of countries. Our research provides empirical evidence regarding the need for performant entrepreneurial activities for enhancing economic development.

Keywords: entrepreneurial performance; competitiveness; economic growth; stage of economic development; panel data

1. Introduction

One of the main problems of economies is to determine the factors that can enhance their development and national competitiveness and sustain economic growth. Entrepreneurship was considered an important determining factor because it: (i) contributes to the economic development of countries and the well-being of society [1–7], having a differentiated impact depending on the degree of development of the economy [8–10]; (ii) is the engine of economic growth, contributing to the creation of new jobs and the generation of new employment opportunities [11,12]; (iii) stimulates competition [13] and competitiveness [14–16]. Entrepreneurship is the heart of innovation, productivity growth, competitiveness, economic growth and job creation [17] and is one of the main public policy issues [18,19].

Starting from these statements, our study comes as a complement to the literature that has analysed the relationship between entrepreneurship, competitiveness and economic growth. In the literature, the fact that entrepreneurship is an important factor that can



Citation: Rusu, V.D.; Roman, A.; Tudose, M.B.; Cojocaru (Diaconescu), O.M. An Empirical Investigation of the Link between Entrepreneurship Performance and Economic Development: The Case of EU Countries. *Appl. Sci.* 2022, *12*, 6867. https://doi.org/10.3390/ app12146867

Academic Editor: Jianbo Gao

Received: 14 June 2022 Accepted: 6 July 2022 Published: 7 July 2022

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Copyright: © 2022 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https:// creativecommons.org/licenses/by/ 4.0/). sustain economic growth and can increase the competitiveness of a country was highlighted. However, we have changed the direction from which we look at things and we considered that not only the effective number of entrepreneurs is significant to the economy but their quality and performance. Therefore, in this paper, we intend to analyse things in more depth and to point out that not only quantitative indicators measuring entrepreneurship are significant for an economy but more so the quality and the level of entrepreneurial performance.

The database was created by collecting data for a set of indicators that measure entrepreneurial performance for a sample of 27 European Union countries, for a period of twelve years (2008–2019). We also collected data regarding economic growth and national competitiveness. In the following, we applied econometric models to identify the relationship between variables. We tested several regression models to identify the one that best suited our sample.

The novelty of our study derives from the inclusion in the analysis of several indicators measuring the entrepreneurial performance. Previous studies have considered only quantitative indicators of entrepreneurship, so the inclusion in the analysis of a set of indicators that measure the performance of entrepreneurship is something new. The indicators considered for our analysis were selected from the set of relevant indicators recommended by the OECD-Eurostat Entrepreneurship Indicators Programme (EIP) [20]. The Entrepreneurship Indicators Programme aims to develop a list of indicators and standard definitions and concepts to facilitate the collection of statistics on entrepreneurship [21]. We chose the EIP because it is the only one that proposes a complete and complex set of indicators and expresses several aspects of entrepreneurial activity: firms' dynamics on the market, employment and the wealth of firms. Only a minimal number of studies from the literature have focused on analysing some of these indicators that measure entrepreneurial performance.

Another element of novelty of this study is the fact that we perform a comparative analysis of the relationship between entrepreneurship performance, competitiveness and economic growth by groups of EU countries depending on their stage of economic development. We chose a comparative analysis because we want to identify whether the relationship between performant and successful entrepreneurship and the development of economies, expressed by national competitiveness and economic growth, is different depending on the stage of economic development of the countries.

Our paper complements the literature in the field by pointing out the need for researchers to focus more on indicators that measure the quality and performance of entrepreneurship when analysing its relation with economic growth and/or national competitiveness of countries. To date, studies have focused on identifying the relationships between entrepreneurship and economic development using indicators for measuring entrepreneurial activity, especially quantitative indicators (number of entrepreneurs, percentage of entrepreneurs, etc.).

The rest of this paper is organised as follows. First, we briefly describe the literature linking entrepreneurship to competitiveness and economic growth, after which we present our model and the description of the variables used in the analysis. Our study continues with presenting and discussing the results. Finally, the study highlights some relevant conclusions.

2. Theoretical Background and Hypothesis

2.1. The Relationship between Entrepreneurship and National Competitiveness

Focusing on the relationship between entrepreneurship and competitiveness, several researchers [14–16,22–24] have pointed out that there is a direct relationship between them. In an environment which can be defined as being competitive, entrepreneurs will be more focused on finding opportunities and therefore will better contribute to regional economic growth [25]. Entrepreneurship is significant for a country's competitiveness and development because entrepreneurs create new businesses which generate new jobs, more competition and may even increase productivity through innovation [26]. However, Ferreira et al. (2017) [16] have shown that different stages of the economy imply other characteristics of entrepreneurial activities and, therefore, the importance of entrepreneurship depends on the stage of economic development and can have either a positive or negative impact on the global competitiveness of countries. Using enterprise policy as a tool for improving regional competitiveness or for addressing economic and social disadvantage can be efficient, but especially in the long term [24]. To date, there are no studies that have analysed the relationship between entrepreneurship performance and national competitiveness. Thus, for achieving one of the main purposes of the paper, we have formulated a set of hypotheses that will guide our future empirical analysis:

Hypothesis 1 (H1). *Higher entrepreneurial performance is positively related to national competitiveness.*

Hypothesis 2 (H2). *The relationship between entrepreneurial performance and national competitiveness depends by the stage of economic development of the country.*

2.2. The Relationship between Entrepreneurship and the Development of the Economy

The contribution of entrepreneurship to the development of the economy is discussed by an increasing number of studies from the literature [1–3,17,25,27–31]. However, the results of these studies are different depending on the type of entrepreneurship examined. Additionally, the results of the mentioned studies are influenced by the particularities of the environment in which the entrepreneurs carry out their activity, and also according to the stage of development of countries. Likewise, there are differences between countries, depending on the institutional context but also on specific cultural factors [32–34].

Other studies [8–10] also show that entrepreneurship plays a different role in countries in various stages of economic development, pointing out that the effects of entrepreneurship on economic growth are higher in developed countries compared to developing ones. Discussing the contribution of different types of entrepreneurship to economic growth, Wong et al. (2005) [35] find that only high growth potential entrepreneurship would have a significant impact on economic growth. According to Valliere—Peterson (2009) [36], entrepreneurship is a crucial factor in economic growth, and countries that support innovation-based entrepreneurship would achieve better results in terms of economic performance. Completing these findings, Dvouletý et al. (2018) [37] point out the role of institutional context and of the regional economic development for explaining the relationship between entrepreneurship and economic growth.

Lately, the focus has changed a bit because studies are beginning to show that not only is the number of entrepreneurs essential for the economies of countries, but the quality of their activity [38]. To measure entrepreneurial performance, different indicators that express the dynamics of the companies on the market can be used, according to the Entrepreneurship Indicators Programme (EIP) (OECD 2010) [20]. However, only a small number of studies from the literature evidence the role of some of these indicators. Entrepreneurship performance is too little used in the literature and also too little analysed in relation to the economic development of countries. For instance, Acs (2006) [39] has shown that creating new enterprises can generate positive effects on economic development as they will result in creating new jobs and might increase competition, determining high levels of economic growth. Focusing on a different aspect, Albiol (2014) [40] has emphasised that the death of enterprises is beneficial to the economy. This is because the dynamics of enterprises on the market allow the exploitation and exploration of new technological and entrepreneurial opportunities. In addition, the exits of the enterprises from the markets can indirectly stimulate the entry of new ones by releasing resources into the economy [41,42]. The continuous rejuvenation of the entrepreneurship base is beneficial for the economy as a whole and also determines a positive evolution of national competitiveness.

Other studies [43,44] have focused on emphasising the significant role played by young enterprises because they are the largest contributor to job creation and employment

growth with positive effects on the economy. The owners of older enterprises can lower their commitment and involvement compared to young ones; therefore, their performance is usually diminished as the enterprises ages [45–47].

However, the analysis of the effects of entrepreneurship performance indicators on the economic development of countries is still insufficiently studied. Therefore, we include in our analysis the indicators proposed by the Entrepreneurship Indicators Programme (EIP) [20]. As shown above, some of these indicators can generate effects on the competitiveness of countries but also on their economic growth. However, the question is what is the intensity of these effects and whether the stimulation of evolutions of these performance indicators (through appropriate policies) could generate the desired effects at the general macroeconomic level.

A large part of the mentioned studies does not include indicators that measure the performance of entrepreneurship but only indicators that quantitatively measure entrepreneurship. Therefore, our primary purpose is twofold: we want to test the relationship between entrepreneurial performance, competitiveness and economic growth of countries, but we also want to identify if this relationship is different when the countries are more or less developed.

The hypotheses formulated for the second part of the study are:

Hypothesis 3 (H3). *Higher entrepreneurial performance is positively related to economic growth.*

Hypothesis 4 (H4). The relationship between entrepreneurial performance and economic growth depends on the stage of economic development of the country.

The literature review shows that, for the time being, there are no empirical studies focused on EU countries, which examine the link between a country's entrepreneurial performance, national competitiveness and economic growth. Thus, our study contributes to filling the gap in the literature.

3. Data and Method

For identifying the relationship between entrepreneurial performance, national competitiveness and economic growth, we have considered a sample of 27 European Union (EU) member countries for a period of twelve years, 2008–2019. We excluded Greece from the sample because we did not find enough data for the indicators that measure the entrepreneurial performance. On 1 February 2020, the United Kingdom withdrew from the EU, however, considering that we analysed a past period, we kept this country in the sample.

As shown in the literature [10,31,48], the analysis of the relationship between entrepreneurship and economic growth has provided different results for the cases of developing or developed countries. Therefore, because we set out to identify the particularities of the relation between the entrepreneurial performance, national competitiveness and economic growth according to the stage of development of countries, we have classified the countries into two groups, following the study conducted by Schwab—Sala-i-Martin (2017) [49]. The authors considered the level of gross domestic product (GDP) per capita as the criterion for classifying the countries into five groups. We have selected only those groups that fit the countries of the European Union, as follows: efficiency-driven economies, in transition between efficiency and innovation and innovation-driven economies. The variation ranges for the GDP per capita for the three groups are: between USD 3000 and 8999 for the economies considered to be efficiency-driven (Bulgaria), between USD 9000 and 17,000 for the countries in transition between efficiency and innovation (Croatia, Hungary, Latvia, Lithuania, Poland, Romania and Slovak Republic) and over USD 17,000 for the innovation-driven group of countries (Austria, Belgium, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Malta, Portugal, Slovenia, Spain, Sweden, the United Kingdom) [49,50]. As Bulgaria is the

only country included in the efficiency-driven stage, for our further analysis, we included it in the transition stage. Therefore, we focused our empirical analysis on two groups of EU countries: economies in transition and innovation-driven economies.

To realise the empirical investigation, we have considered a set of indicators measuring the competitiveness level, the level of economic growth and also the entrepreneurial performance. Therefore, the dependent variables in our study are *the competitiveness index* and *gross domestic product (GDP) per capita growth*. The global competitiveness index (GCI) is composed of twelve pillars that measure a wide range of aspects of development [49]. These are represented by institutions, infrastructure, macroeconomic environment, health and primary education, higher education and training, goods market efficiency, labour market efficiency, financial market development, technological readiness, market size, business sophistication and innovation. The GCI is an index calculated by the World Economic Forum for measuring the competitiveness of countries and results in an aggregation of 103 individual factors. Each component of the index is expressed by a progress score, on a scale from 0 to 100, where 100 represents an ideal state where an issue ceases to be a constraint to productivity growth [51]. Data for these indicators were obtained from the World Bank (2020) [52].

To measure economic growth, we used the *GDP per capita growth* indicator, which measures the annual percentage growth rate of GDP per capita based on constant local currency. The data for this indicator were gathered from World Development Indicators [53]. The use of GDP per capita growth for measuring the economic growth of countries is a common practice in the literature [10,31,48] so we have adopted this indicator for our analysis.

The independent variables consist of a set of business demography indicators that can describe the entrepreneurial performance. The selection of these indicators was made starting from the Entrepreneurship Indicators Programme from the OECD [20]. This programme gathers a set of indicators which consider three key topics on entrepreneurship: the performance, its determinants and impact expressed as policy targets. For measuring performance, the programme proposes 18 indicators targeting different dimensions of entrepreneurial performance and are classified into three groups, namely: the first group includes indicators relating to firms (such as firm births and deaths, firm survival), the second group concerns employment (e.g., employment in new firms) and the third group refers to wealth (for example, value-added created by young firms, the contribution of small and young firms to productivity growth, the export performance of small firms). In our empirical investigation, we took into account the most representative of these indicators depending on the availability of data in the Eurostat database [54]. The considered indicators offer a clear image on business dynamics, also regarding the effect on innovation and productivity. We chose PPE because it is the only programme we found that proposes a complete and complex set of indicators for measuring entrepreneurship performance.

Table 1 briefly describes the independent variables included in the analysis, their definition, abbreviation and measurement.

Variables	Abbreviations [Measures]	Definitions
Enterprise birth rate	Birth [%]	number of enterprise births in the reference period (t) divided by the number of enterprises active in t
Enterprise death rate	Death [%]	number of enterprise deaths in the reference period (t) divided by the number of enterprises active in t
Business churn	Churn [%]	birth rate + death rate

Table 1. Description of the independent variables.

Variables	Abbreviations [Measures]	Definitions
Net business population growth	Bpop [%]	net increase in the number of businesses in reference period (t) compared to previous period $(t - 1)$
Survival rate 3	Surv3 [%]	number of enterprises in the reference period (t) newly born in t $-$ 3 having survived to t divided by the number of enterprise births in t $-$ 3
Survival rate 5 Surv5 [%]		number of enterprises in the reference period (t) newly born in t $-$ 5 having survived to t divided by the number of enterprise births in t $-$ 5
Employment share of 3-year-old enterprises	Empl3 [%]	number of persons employed in enterprises newly born in t $-$ 3 having survived to t, divided by the number of persons employed in the population of active enterprises in t
Employment share of 5-year-old enterprises Empl5 [%]		number of persons employed in enterprises newly born in t $-$ 5 having survived to t, divided by the number of persons employed in the population of active enterprises in t
3-year-old enterprises' share of the business population	Old3 [%]	number of enterprises newly born in $t-3$ that have survived in $t\ divided\ by$ the active enterprises in t
5-year-old enterprises' share of the business population	Old5 [%]	number of enterprises newly born in t -5 that have survived in t divided by the active enterprises in t
Average size of three-year-old enterprises	Size3 [number]	number of persons employed in the reference period (t) among enterprises newly born in t $-$ 3 having survived to t divided by the number of enterprises in t newly born in t $-$ 3 having survived to t
Average size of five-year-old enterprises	Size5 [number]	number of persons employed in the reference period (t) among enterprises newly born in t $-$ 5 having survived to t divided by the number of enterprises in t newly born in t $-$ 5 having survived to t

Table 1. Cont.

Source: authors' own work based on the information provided by Eurostat database [54].

We also included in the sample three control variables: education, population size and resource endowment. For the variable expressing education, we considered the indicator measuring the quality of primary education, from the fourth pillar of competitiveness: health and primary education. From 2018, the structure of indicators that are part of the GCI was changed, therefore we considered the data for a new indicator skillset of graduates. For measuring resource endowment, we considered total natural resource rents. The data for this variable were obtained from World Bank databases [52,53].

To test our hypotheses, we resorted to empirical methods and we used panel data estimation techniques. We applied an OLS model adapted to panel data, random effects and fixed effects models. The general equation of our model is presented below:

$$y_{it} = \beta_1 enperf_{it} + \beta_2 control_{it} + \mu_{it}$$
(1)

where: *i* represents the country and *t* is the time; *y*: the dependent variable; *enperf*: the indicators measuring entrepreneurial performance (independent variables); β_1 and β_2 : the coefficients; *control*: the control variables; μ : the error term.

The specific models adapted to our case are:

$$GCI_{it} = \beta_1 enperf_{it} + \beta_2 control_{it} + \mu_{it},$$
(2)

$$GDPC_{it} = \beta_1 enperf_{it} + \beta_2 control_{it} + \mu_{it}.$$
(3)

For the empirical investigation, we first ran a descriptive statistics analysis. Secondly, we transformed the variable measuring population. This variable is in absolute value, therefore we applied the natural logarithm. After, we tested for the existence of correlation between variables. In the last step, we applied the regression models to our data. To

identify which model is a better fit to our data, we used the *Hausman specification test* and the *redundant fixed effects test*.

4. Results and Discussions

Using previous research as a starting point, we have analysed the relationship between entrepreneurial performance and national competitiveness but we have differentiated our analysis by using two types of countries: in transition and innovation-driven. In Table 2, we show the results of the descriptive statistics of the independent and dependent variables considered in the analysis.

	Mean	Median	Max.	Min.	Standard Deviation	Observations
GCI	4.735	4.548	5.612	3.928	0.485	243
GDPC	0.816	1.317	23.940	-14.559	3.801	243
Birth	10.482	9.995	24.880	3.040	3.781	234
Death	9.211	8.650	29.050	0.960	3.607	231
Churn	19.681	18.650	49.090	5.650	3.607	231
Врор	1.685	1.300	35.470	-13.640	4.605	212
Surv3	60.155	58.750	100.000	23.230	13.649	223
Surv5	46.422	44.480	86.730	17.910	12.583	192
Empl3	2.783	2.575	7.710	0.930	1.075	224
Empl5	2.527	2.310	7.150	0.000	1.055	205
Old3	5.753	5.630	12.350	1.960	1.484	229
Old5	4.266	4.150	8.080	0.000	1.059	210
Size3	3.335	2.980	8.670	1.140	1.274	207
Size5	2.716	2.490	7.030	0.840	0.909	227
Educ	4.861	4.800	6.800	3.200	0.714	243
LPop	15.868	15.947	18.226	12.922	1.420	243
Res	0.570	0.348	2.579	0.001	5.800	234

Table 2. Descriptive statistics of the variables.

Source: authors' own calculations.

The summary of the descriptive statistics emphasises the fact that the *global competitiveness index* data are distributed between a minimum level of 3.92 (in Bulgaria, 2008) and a maximum of 5.61 (in Sweden, 2012). The value of the standard deviation showed relatively small variations in this index between the EU countries and also for the analysed period. The other dependent variable, *GDP per capita growth*, varied between a minimum of -14.55% (in Estonia, 2009) and a maximum of 23.94% (in Ireland, in 2015).

From the category of independent variables, the *survival rate* has the highest variation. The *survival rate at 3 years* had the highest value of 100% in Malta (2014) and the lowest of 23% in Lithuania (2010). Similar results were obtained for the *survival rate at 5 years*, which has the highest value of 86.73% in Malta (in 2016) and the lowest of 18% in Lithuania (in 2012). The positive results obtained by Malta can be explained by the support offered by the government in this country for small and medium enterprises. The initiative is called the Family Business Act and is the first of its kind in Europe, initiated in 2011 [55]. This initiative comprises a set of measures aimed at improving the survival rate of enterprises by two financing schemes. On the other hand, the low survival rate of enterprises in Lithuania could be determined by actual deaths, indicating a deterioration in the business environment of the country, or could be determined by break-ups or mergers.

Net business population growth varied significantly between countries and over the twelve years analysed. In Romania (in 2011), the highest growth rate of the business population was found (of 35%). The significant increase in the business population in Romania in 2011 was due to the fact that the economy started to recover from the depression due to the financial crisis, and entrepreneurs had the courage to be involved in entrepreneurial activities again. This increase was registered especially at the level of micro-enterprises because most companies that were born in 2011 in Romania were micro-sized enterprises (having between one and four employees).

In Lithuania (in 2009), the highest decrease of the business population was found (of 13%). The case of Lithuania might be explained by the fact that the birth rate in 2009 had its lowest value for all the analysed years and the death rate was very high (more than 20%) because of the manifestation of the financial crisis.

The birth rate for the EU enterprises varied between a maximum of 24.88% (in Lithuania, in 2012) and a minimum of 3.04% (in Malta, in 2016). On the other hand, *death rate* reached the highest value of 29.05% in Lithuania in the context of the recent financial crisis (in 2008), and the lowest value in Ireland (0.96% in 2016). Lithuania also registered the highest business churn rate, while the smallest value of this indicator was in Cyprus.

As regards the control variables, the highest values of basic education received by the population are registered in Finland (2012–2013) and the lowest in Spain (in 2010). The largest population was registered in Germany (in 2019) and the smallest in Malta (2008). The resource endowment variable had the highest value in Estonia (2011) and the lowest in Cyprus (2016).

All these findings confirm our assumptions that entrepreneurial performance is different according to the country and its level of economic development, and also support the reason why we decided to carry out our further econometric analysis on groups of countries.

To highlight the existent differences between the two groups of countries regarding the indicators selected in the analysis, we have compared the average values (see Table 3). The results suggest that, regarding competitiveness, the innovative countries are better situated than the countries in transition. In contrast, the situation is precisely the opposite when we consider GDP per capita growth.

	Innovation Countries	Transition Countries
Global competitiveness index	4.93%	4.26%
GDP per capita growth	0.35%	1.20%
Birth rate	9.17%	13.67%
Death rate	8.11%	11.89%
Business churn	17.26%	25.59%
Net business population growth	1.18%	2.95%
Survival rate at 3 years	62.75%	53.82%
Survival rate at 5 years	49.10%	39.90%
Employment share at 3 years	2.31%	3.90%
Employment share at 5 years	2.07%	3.55%
3-year-old enterprises	5.36%	6.69%
5-year-old enterprises	4.09%	4.65%
Average size of 3-year-old enterprises	2.43%	3.41%
Average size of 5-year-old enterprises	2.84%	4.45%
Education	5.32%	4.28%
Total population	21,309,693	11,018,867
Resource endowment	0.40%	0.93%

Table 3. Comparing average values of indicators for transition and innovation countries.

Source: authors' own calculations.

Additionally, the dynamics of the number of enterprises are higher in the countries in transition. These countries have higher birth rates but also higher death rates. The entry rates in transition countries are higher compared to innovative ones because in developing countries there exist fewer high-paying jobs and individuals decide to become entrepreneurs to earn their living. At the same time, in more developed and wealthier countries individuals find more attractive employment options than becoming self-employed [56]. However, higher entry rates do not translate into higher rates of competitiveness for transition countries. The innovative group of countries has higher competitiveness rates, almost 0.70% compared with transition economies. Thus, these results point out that successful firm entry is what determines an increase in competitiveness and not necessarily just the number of enterprise births.

Likewise, in transition countries, the net business population growth is higher, almost 2%, but the survival rate at 3 at 5 years is lower by around 10%. The percentage of young enterprises is higher in transition countries, as well as employment share, at 3 and 5 years.

These results point out the fact that in less developed countries, more people are looking to enter into entrepreneurship, as an escape from unemployment. Meanwhile, in more developed countries, there is greater stability of the economic and business environment, which gives the companies better prospects for development and survival. The population and also the percentage of people who receive basic education are larger in more developed countries. Meanwhile, the resource endowment is higher in less developed countries.

The correlation matrix of the variables (see Table 4) shows that there exists correlation between some of the considered variables (correlation coefficient above 0.70). Thus, business churn is highly correlated with birth and death rate. Survival rate at 3 years is highly correlated with survival rate at 5 years. Employment share at 3 years is highly correlated with employment share at 5 years. Average size of 3-year-old enterprises is highly correlated with average size of 5-year-old enterprises.

Table 4. Correlation matrix.

	GCI	GDPC	Birth	Death	Churn	Врор	Surv3	Surv5	Empl3	Empl5	Old3	Old5	Size5	Size3	Educ	Lpop	Res
GCI	1.000																
GDPC	-0.121 (0.103)	1.000															
Birth	-0.411 (0.000)	0.230 (0.001)	1.000														
Death	-0.458 (0.000)	-0.072 (0.336)	0.547 (0.000)	1.000													
Churn	-0.493 (0.000)	0.093 (0.213)	0.885 (0.000)	0.874 (0.000)	1.000												
Врор	-0.091 (0.225)	0.265 (0.000)	0.440 (0.000)	-0.084 (0.261)	0.208 (0.005)	1.000											
Surv3	0.301 (0.000)	-0.052 (0.000)	-0.472 (0.000)	-0.563 (0.000)	-0.587 (0.000)	0.173 (0.020)	1.000										
Surv5	0.353 (0.000)	-0.155 (0.038)	-0.554 (0.000)	-0.623 (0.000)	-0.668 (0.000)	0.005 (0.938)	0.751 (0.000)	1.000									
Empl3	-0.648 (0.000)	0.180 (0.015)	0.562 (0.000)	0.426 (0.000)	0.563 (0.000)	0.221 (0.002)	-0.187 (0.011)	-0.279 (0.000)	1.000								
Empl5	-0.627 (0.000)	0.062 (0.403)	0.474 (0.000)	0.419 (0.000)	0.508 (0.000)	0.172 (0.021)	-0.198 (0.007)	-0.183 (0.013)	0.786 (0.000)	1.000							
Old3	-0.211 (0.004)	0.180 (0.015)	0.420 (0.000)	0.315 (0.000)	0.419 (0.000)	0.159 (0.032)	-0.002 (0.968)	-0.124 (0.095)	0.689 (0.000)	0.505 (0.000)	1.000						
Old5	-0.120 (0.107)	0.038 (0.608)	0.193 (0.009)	0.242 (0.001)	0.247 (0.000)	-0.015 (0840)	-0.042 (0576)	0.008 (0.914)	0.361 (0.000)	0.661 (0.000)	0.485 (0.000)	1.000					
Size3	-0.366 (0.000)	0.027 (0.715)	0.520 (0.000)	0.437 (0.000)	0.545 (0.000)	0.250 (0.000)	-0.155 (0.037)	-0.191 (0.010)	0.543 (0.000)	0.584 (0.000)	0.426 (0.000)	0.230 (0.001)	1.000				
Size5	-0.314 (0.000)	-0.010 (0.884)	0.452 (0.000)	0.376 (0.000)	0.472 (0.000)	0.174 (0.019)	-0.148 (0.046)	-0.210 (0.004)	0.524 (0.000)	0.431 (0.000)	0.247 (0.000)	0.231 (0.001)	0.829 (0.000)	1.000			
Educ	0.632 (0.000)	-0.771 (0.304)	-0.255 (0.000)	-0.464 (0.000)	-0.406 (0.000)	0.030 (0.684)	0.288 (0.000)	0.385 (0.000)	-0.481 (0.000)	-0.469 (0.000)	-0.154 (0.038)	-0.150 (0.044)	-0.340 (0.000)	-0.365 (0.000)	1.000		
Lpop	0.180 (0.015)	-0.028 (0.707)	-0.238 (0.001)	-0.062 (0.407)	-0.173 (0.020)	-0.147 (0.049)	-0.066 (0.376)	-0.080 (0.286)	-0.071 (0.341)	-0.089 (0.234)	-0.221 (0.002)	-0.112 (0.135)	-0.113 (0.132)	-0.165 (0.026)	-0.174 (0.019)	1.000	
Res	-0.218 (0.003)	0.216 (0.003)	0.315 (0.000)	0.340 (0.000)	0.372 (0.000)	0.220 (0.003)	0.016 (0.827)	-0.158 (0.033)	0.424 (0.000)	0.412 (0.000)	0.527 (0.000)	0.409 (0.000)	0.278 (0.000)	0.370 (0.000)	-0.168 (0.024)	-0.120 (0.108)	1.000

Source: authors' own work. Note: high correlation coefficients are marked with bold (with values above 0.70). The correlation coefficients between 0.40 and 0.70 are marked with italics.

To ensure that we obtained accurate results, we eliminated from the analysis some of the highly correlated variables (business churn, the survival rate at 5 years, employment share at 5 years and average size of 3-year-old enterprises). In addition, because other variables have quite high correlation coefficients (above 0.40), we ran alternative regressions with these variables to eliminate the problem of multicollinearity.

Our empirical analysis has a dual purpose: (i) to identify the link between entrepreneurial performance and competitiveness; (ii) to identify the link between entrepreneurial performance and economic growth.

The first part of the empirical analysis considers as a dependent variable the national competitiveness (see Table 5). Therefore, to find the best model fitting to our sample we ran the regression analysis by applying three different models: *ordinary least squares* (OLS), *fixed effects model* (FE) and *random effects model* (RE). We used the three models for each group

of countries: a total of 27 EU countries, including innovative economies (19 countries) and economies in transition (eight countries). As the results are different for each model applied, we have tested to see which model better describes the relationships between variables. We ran two tests: the Hausman test and the redundant fixed effects test.

Table 5. Effects of entrepreneurial performance on competitiveness.

Dependent Variable	27 EU Countries (OLS)		Innovation (Cross Section	Countries Fixed Effects)	Transition (Cross Section	Transition Countries (Cross Section Fixed Effects)	
GCI	Model A1	Model A2	Model B1	Model B2	Model C1	Model C2	
Birth	0.016 (0.009)	-	0.024 ** (0.004)	-	0.010 ** (0.006)	-	
Death	-	-0.021 *** (0.005)	-	-0.014 *** (0.013)	-	-0.004 (0.008)	
Врор	0.002 (0.003)	-0.005 (0.005)	-0.001 (0.003)	0.006 (0.002)	0.002 (0.004)	0.001 (0.002)	
Surv3	0.006 (0.002)	-	0.002 ** (0.001)	-	-0.002 ** (0.001)	-	
Empl3	-0.229 *** (0.043)	-	-0.018 ** (0.058)	-	-0.016 ** (0.011)	-	
Old3	-	0.025 ** (0.011)	-	0.007 *** (0.003)	-	0.062 *** (0.010)	
Old5	0.082 (0.025)	-	0.008 (0.008)	-	0.002 (0.005)	-	
Size5	-	-0.033 * (0.017)	-	0.044 *** (0.020)	-	-0.044 *** (0.020)	
Educ	0.318 *** (0.029)	0.408 *** (0.029)	0.113 *** (0.020)	0.093 *** (0.021)	0.099 *** (0.018)	0.093 *** (0.021)	
Lpop	0.105 *** (0.004)	0.108 *** (0.005)	1.352 *** (0.263)	1.166 *** (0.159)	1.235 *** (0.164)	1.166 *** (0.159)	
Res	0.001 (0.021)	-0.029 (0.032)	0.009 (0.016)	0.005 (0.017)	0.009 (0.016)	0.005 (0.017)	
Obs.	186	189	129	133	129	133	
R-squared	0.633	0.519	0.975	0.973	0.759	0.739	
R-squared adjusted	0.616	0.500	0.970	0.968	0.701	0.681	
F-statistic	38.18 ***	27.93 ***	117.37 ***	168.01 ***	67.53 ***	68.36 ***	

Note: *, ** and *** represent 10%, 5% and 1% level of confidence, respectively. The statistically significant coefficients are in bold. Source: authors' own work.

For *Model A*, which comprises all the 27 EU countries, the results of the Hausman test point out that the H0 hypothesis (random effects are preferred) is strongly accepted because p values = 1.000. On the other hand, the results for the redundant fixed effects test show that the fixed effects are preferred. As p values are less than 0.05, this means that we reject the null hypothesis (H0: the fixed effects are redundant). The contradiction between the results of the two tests points out that the pooled OLS regression is a better fit for *Model A* [57].

For *Model B*, including only the innovation EU countries, the results of the Hausman test indicate that the H0 hypothesis (random effects are preferred) is strongly accepted (p values = 1.000). After running the regression with fixed effects and applying the redundant fixed effects test, we observe that the null hypothesis is firmly rejected for cross section and combined fixed effects (p values < 0.05, H0: the fixed effects are redundant). When testing only for period fixed effects, the result shows that H0 is accepted (p values > 0.05), and that period fixed effects are redundant. This result emphasises that the cross section fixed effects are statistically significant for *Model B*.

The number of observations for *Model C* (targeting transition countries) allows us to run only the pooled OLS and fixed effects model. Applying the redundant fixed effects test shows that H0 is accepted (p values > 0.05) and that period fixed effects are redundant. As cross section and combined fixed effect p values are less than 0.05, we strongly rejected H0. Therefore, the cross section fixed effects are the best fit to this model.

The results summarised in Table 5 emphasise that almost all the indicators measuring entrepreneurial performance significantly influence national competitiveness of EU countries. In addition, they highlight that the relationship between entrepreneurial performance and national competitiveness is different according to the economic situation of the analysed countries. Hypotheses 1 and 2 are thus confirmed.

In the following, we analyse each indicator in turn. Thus, *enterprise birth rate* has a positive relation with national competitiveness for all three models, but this relationship is statistically significant only when we consider the countries by groups (*Model B* and *Model C*). This result is somewhat expected because an increase in the number of companies on the market puts the companies in a position to face competition. Therefore, they have to become more efficient, seeking to apply innovative processes, and to adopt new technologies to increase overall productivity, thus positively influencing national competitiveness. As shown in the literature [58–60], intense rivalry among enterprises, pressure and challenges are seen as significant factors for increasing national competitiveness. Creation of new enterprises on the market will cause enterprises to develop new skills but, at the same time, new entrants will bring a novel approach to competing.

On the other hand, some studies [61] argue that the quality of the new enterprises created is as important as the quantity, maybe even more important. To ensure the increase in national competitiveness through new enterprise creation, it is necessary for a country to create the preconditions for enterprise growth: market share, innovation, technological progress, financial efficiency and sustainability of employment levels [22].

The enterprise death rate has a negative relation with national competitiveness for all three models, but this relation is statistically significant only for *Models A* and *B*. Higher exit rates will determine a decrease in national competitiveness, because they will determine a reduction in the number of competitors. The companies remaining on the market will face less competition, not being motivated to invest as much in innovation, generating adverse effects on national competitiveness. For the transition countries, the indicator measuring enterprise death rates does not have a statistically significant effect on national competitiveness.

As regards the *survival rate at 3 years*, our findings highlight a positive relation between this indicator and competitiveness for innovation countries, and a negative relation for transition countries. In the case of developed countries, higher survival rates stimulate national competitiveness. In the transition countries, higher survival rates lower competitiveness. The data on entrepreneurship have shown that many enterprises in the countries in transition are motivated by necessity. The individuals who set up enterprises in these countries most often are seeing entrepreneurship as an escape from unemployment, and then their survival will negatively affect national competitiveness. Comparatively, in the innovative countries, the companies are predominately motivated by opportunity and follow business opportunities and are interested in obtaining greater profits by applying innovative techniques and processes. Survival of these companies has positive effects on national competitiveness because earnings of opportunity entrepreneurs are significantly higher compared to those of necessity entrepreneurs [62].

Additionally, in the literature it has been shown that the survival rate of enterprises is closely related to the economic and political environment of that country. The relation of the enterprises with the economic environment and some location-specific factors (such as access to markets and financial services) contribute significantly towards explaining their survival probability [63]. In addition, the funding programs offered by different authorities (national, regional or international) have a positive impact on the survival rates of small enterprises during their early years of operation [64,65]. The economic practice shows

that public policies promoted in EU countries would play a significant role in ensuring the survival of enterprises. Thus, it is found that countries that promote different public policies for sustaining the survival of small businesses on the market have higher survival rates [66].

In our analysis, the survival rate at 3 years and at 5 years has higher values for the innovation countries compared to transition ones. This is usually because the more developed countries recognise the role played by the enterprises in economic development and promote public policies to support their survival. The European Commission programme 'Early Warning Europe: helping small and medium-sized enterprises to survive and prosper' emphasises that early intervention can rescue companies in financial difficulties and bring positive results, turning around their economic performance. The programme was launched in December 2016 and has the purpose of helping companies avoid bankruptcy by identifying which ones face difficulties and giving them relevant and timely advice and support. In the last 3 years, the 'Early Warning Europe' project helped more than 3300 companies from four target countries, namely: Greece, Italy, Poland and Spain. In addition, the project is in the process of launching in another six European countries: Croatia, Finland, Hungary, Lithuania, Luxembourg and Slovenia [66].

Employment share at 3 years has a negative relationship with national competitiveness for all the groups of countries. The increase in employment share at 3 years would reflect a deterioration of the entrepreneurial perspective, and a reduction in the number of employees in older companies on the market, either due to their exit from the market or due to a reduction in the number of jobs, or in the conditions of restricting their activity. Negative evolution of the old companies will have negative effects on national competitiveness. However, these results should be interpreted with caution because labour migration (from older to younger enterprises) may be due to innovation embodied in automation and robotisation of production lines (resulting in redundancies). Our empirical results (see Table 5) show that this approach is all the more justified as the impact of employment share at 3 years is higher for innovative countries.

The literature on job creation provides evidence that small enterprises and newly formed enterprises create a substantial number of new jobs. Several studies emphasise that small and new enterprises are the source for most of the new jobs created [43,67]. Small enterprises are indeed driving forces of aggregate employment growth. However, such high growth is mostly driven by the entry of very small enterprises, which is offset by job destruction of a similar magnitude [68].

The indicator measuring the *age of the enterprises* (3-year-old enterprises) has a positive and statistically significant relationship with national competitiveness for all three models. The higher number of young enterprises will determine an increase in national competitiveness, regardless of the group of countries we are considering. This is explained by the fact that young enterprises, which are usually SMEs, are the largest contributor to job creation and employment growth with positive effects on the economic development of countries [43,44]. In older enterprises, the owners might lower their commitment and involvement compared to young enterprises. Thus, an enterprise's performance is usually diminished as the enterprise ages [45–47,69,70].

The indicator measuring the *average size of five-year-old enterprises* represents the ratio between the number of employees in young companies that have survived for three years and the number of companies that have survived for 5 years. According to our results, this indicator appears to have a positive and statistically significant relation with national competitiveness in the case of innovation countries and a negative relation for the transition countries. These results can be explained by the fact that, in developed countries, larger enterprises can spread investment costs over greater output so that returns of those investments will enhance competitiveness [71]. In the countries in transition, taking into account the business environment characteristics (such as lack of access to certain resources and capabilities), even if the enterprises were larger, no positive effects on national competitiveness would be felt.

The other variables such as *net business population growth* and *5-year-old enterprises* do not result in a statistically significant influence on global competitiveness index.

From the control variables included, education and population have a positive and statistically significant effect on the global competitiveness index, regardless of the group of countries analysed. The variable measuring resource endowment did not significantly influence the competitiveness of countries.

The value of R-squared adjusted for *Model A* is between 0.50 and 0.61. This result shows that between 50 and 61% of the change in the competitiveness of EU countries can be explained by the variation in the indicators measuring entrepreneurial performance. For *Model B*, around 97%% of the variation in competitiveness in innovation-driven EU countries can be explained by the changes in entrepreneurship performance. For the transition countries, around 70% of the variation in competitiveness can explained by the entrepreneurial performance.

Moving on to *the second part* of our empirical analysis, for identifying the best model that explains the link between entrepreneurial performance and economic growth, we ran the regression analysis by applying on our sample three different models: ordinary least squares, fixed effects model and random effects model. We obtained three models, each one analysing a different group of countries: total 27 EU countries—*Model D*—innovative economies—*Model E*—and economies in transition—*Model F*.

As summarised in Table 6, the results are different for each model. Therefore, we have tested to see which model best describes the relation between variables. We ran two tests: the Hausman test and the redundant fixed effects test.

Dependent Variable	27 EU Countries (Fixed Effects)		Innovation (Fixed)	(Countries Effects)	Transition (Fixed)	Countries Effects)
GDPC	Model D1	Model D2	Model E1	Model E2	Model F1	Model F2
Birth	0.315 (0.264)	-	-0.007 (0.005)	-	0.037 ** (0.360)	-
Death	-	-0.005 *** (0.005)	-	0.542 *** (0.404)	-	0.452 * (0.404)
Врор	0.075 *** (0.089)	0.182 *** (0.058)	0.003 (0.005)	0.296 (0.124)	0.270 (0.177)	0.296 (0.124)
Surv3	0.049 (0.043)	-	0.001 (0.001)	-	0.046 (0.113)	-
Empl3	0.347 (0.346)	-	-0.024 (0.012)	-	-0.470 *** (0.041)	-
Old3	-	0.135 (0.062)	-	0.288 (0.183)	-	0.288 (0.183)
Old5	-0.157 (0.159)	-	-0.006 (0.005)	-	-0.212 (0.161)	-
Size5	-	-0.963 (0.263)	-	-0.222 (0.214)	-	-0.222 *** (0.214)
Educ	-0.351 (0.499)	-0.558 (0.416)	-0.115 *** (0.031)	-0.975 (0.641)	-0.177 (1.021)	-0.975 (0.641)
Lpop	-3.652 *** (3.663)	-2.899 *** (0.654)	-1.970 *** (0.494)	-6.101 *** (0.264)	-6.322 *** (0.520)	-6.101 *** (0.264)
Res	1.074 *** (0.390)	1.335 ** (0.683)	2.030 ** (0.117)	2.511 ** (0.449)	1.339 ** (0.614)	2.511 ** (0.440)
Obs.	186	189	129	133	129	133
R-squared	0.727	0.714	0.799	0.743	0.563	0.713
R-squared adjusted	0.652	0.640	0.729	0.664	0.508	0.660

Table 6. Effects of entrepreneurial performance on economic growth.

Dependent Variable	27 EU Countries (Fixed Effects)		Innovation (Fixed	n Countries Effects)	Transition Countries (Fixed Effects)	
GDPC	Model D1	Model D2	Model E1	Model E2	Model F1	Model F2
F-statistic	9.69 ***	9.57 ***	41.32 ***	9.45 ***	2.35 ***	9.74 ***

Table 6. Cont.

Note: *, ** and *** represent 10%, 5% and 1% level of confidence, respectively. The statistically significant coefficients are in bold. Source: authors' own work.

For *Model D*, the results of the Hausman test point out that the H0 hypothesis (H0: random effects are preferred) is strongly rejected, because the p value is equal to 0.000. On the other hand, the results for the redundant fixed effects test show that the fixed effects are preferred because p values are less than 0.05 and we reject the null hypothesis (H0: the fixed effects are redundant). Thus, the model that is a better fit for variant D is the fixed effects model.

For *Model E*, including only the innovation EU countries, the results of the Hausman test indicate that the H0 hypothesis (H0: random effects are preferred) is strongly rejected (*p* values = 0.000). After running the regression with fixed effects and applying the redundant fixed effects test, we observe that the null hypothesis is rejected (*p* values < 0.05) (H0: the fixed effects are redundant). Therefore, the fixed effects are statistically significant for *Model E*.

For the model that includes the transition countries (*Model F*), we obtained similar results to those of the other models. Therefore, we conclude that fixed effects are the best fit for *Model F*.

The results of the fixed effects models emphasise the existence of a significant relationship between some of the indicators measuring entrepreneurial performance and economic development. They also show that this relationship is different according to the economic situation of the countries analysed. These findings confirm our hypotheses (H3 and H4).

In the following, we analyse each indicator in turn. Our findings emphasise that *enterprise birth rate* has a positive relation with economic growth for all groups of countries considered, but this relation is statistically significant only for the transition ones. Our results are supported by the findings of other studies [59,72,73] which highlight that the entry of new enterprises on the market creates the premises for the introduction of new ideas and innovation which would represent a source of long-term economic growth. Additionally, entrepreneurs are considered agents of change and bring new ideas to markets and stimulate growth through a process of competitive firm selection [35]. The formation of new, independent firms is important for the development of regional economic wellbeing [74].

The indicator measuring *death rate* resulted in a negative and statistically significant relationship with economic growth for the group of 27 countries. When grouping the countries, the results show a positive and statistically significant relationship between death rate and economic growth for both innovation and transition countries.

The interpretation of the relationship between enterprise death rate and economic growth in the literature shows that there can be both a positive and a negative relationship. Thus, on one hand, higher exit rates determine a reduction in the number of competitors. The firms that remain on the market will face less competition, and will no longer have the same motivation to invest much in their development and innovation. All this will have negative effects on economic growth.

On the other hand, higher exit rates can have beneficial effects on economic growth. If those companies that leave the market are non-performing companies, their maintenance in the economy would not help in any way. Thus, the relationship between exit rates and economic growth is positive when the death of enterprises in fact implies a cleansing of the economy of non-performing enterprises. Enterprise deaths are not harmful to the economy because they can be seen as a catalyst that ensures the continuous regeneration of the stock of enterprises in the economy. In addition, the dynamics of the firms on the markets allow the exploitation and exploration of new technological and entrepreneurial opportunities [40]. Moreover, enterprise exits might indirectly stimulate enterprise entry by releasing resources into the economy [41,42], with positive effects on economic growth.

At the same time, we can explain the positive relation between death rate and economic growth through the idea of creative destruction. As shown by [75], creative destruction of the existent enterprises on the market can have beneficial effects on the economy as a whole, but in correlation with other economic factors.

The *net business population growth* has a positive relation with economic growth for all three models considered, but is statistically significant only for the group of all 27 EU countries. The net business population growth will generate positive effects on economic growth because it is seen as a value-added generator (through investment and innovation). Each new enterprise (seen as a combination of factors of production) is based on the principle of economic rationality and efficiency, increasing the number of enterprises that will contribute to GDP growth and thus to economic growth. The practical proof of the contribution of the net business population to economic development is that most countries have adopted policies that encourage the creation of new businesses. Empirical evidence was also provided by [76], who argued that new businesses promote innovation and facilitate the introduction of new technologies, which ultimately translates into an increase in the overall performance of the economy. Addressing the issue from the perspective of start-ups, [77] revealed that the establishment of a new enterprise (and, implicitly, the generation of new jobs) is one of the key factors influencing economic growth.

Our results also emphasise a negative relationship between *employment share at 3 years* and economic growth for all three groups of countries, but the relation is statistically significant only for the transition countries. Thus, an increased share of individuals employed in young enterprises might be seen as a reduction in the number of employees in older companies on the market. The reduction can be either due to the exit from the market of the old companies or a reduction in the number of jobs offered by them due to the restricted activity. This negative evolution of the old companies on the market negative effects on economic growth. A one percentage point increase in the share of large firms to total employment is associated with a 0.34 percentage point decrease in entrepreneurial activity, 0.21 percentage points for opportunity-driven entrepreneurs and 0.10 percentage points for necessity-driven entrepreneurs, keeping all other factors constant [78]. In addition, there is an expected 0.53 percentage point decrease in entrepreneurial intentions with a higher large firm dominance, other factors remaining constant.

The indicator measuring the *average size of five-year-old enterprises* has a negative and statistically significant relationship with economic growth only for the group formed by the transition countries. A possible explanation of this result is related to the findings of [79] which show that increased size of the firms negatively impacts on their growth. If the growth of the firms is affected, this might generate negative effects on economic growth. This result obtained for the transition countries could be related to the poor quality of the institutional environment, reflected, for example, by a series of both financial and regulatory constraints, which led to the high share of grey economy, corruption, unfair competition, etc. [80]. The other variables did not have a statistically significant influence on economic growth for any of the analysed models.

From the control variables included, population and resource endowment have a statistically significant effect on the economic growth, regardless of the group of countries analysed. While resource endowment has a positive effect, the population size has a negative effect. The variable measuring education did not significantly influence the economic growth of the countries.

The value of R-squared adjusted for *Model D* is 0.65, and shows that 65% of the change in the economic growth of the EU countries can be explained by the changes in entrepreneurial performance. For *Model E*, between 66% and 72% of the variation of economic growth in innovation-driven countries can be explained by the changes in entrepreneurial performance. For the transition countries, analysed in *Model F*, between

50% and 66% of the variation in economic growth can be explained by the dynamics of the entrepreneurial performance.

5. Conclusions

In this paper, we aimed at investigating the impact of changes in the entrepreneurial performance on national competitiveness and economic growth when the stage of economic development of countries is different.

Our findings confirm the four hypotheses formulated and point out the significant role played by a sustained entrepreneurial performance for increasing the competitiveness and economic growth of countries. Additionally, the results draw attention to the fact that this relationship is different according to the economic situation of the analysed countries. The empirical results point out that a large number of the indicators measuring entrepreneurial performance significantly influence the competitiveness and economic growth of the EU countries. The results of our research show that, at the level of the 27 EU countries, the indicators measuring death rate and employment share at 3 years are negatively related to national competitiveness. At the same time, the indicator measuring the age of enterprises is positively related to competitiveness. When considering the countries grouped according to their GDP per capita, we obtained different results. The national competitiveness in the case of innovative countries is positively influenced by birth rates, the survival rate at 3 years, the share of 3-year-old enterprises and the average size of 5-year-old enterprises, and negatively influenced by death rate and employment share at 3 years. For the transition countries, national competitiveness appears to be positively related to birth rate and the share of 3-year-old enterprises, and negatively to the survival rate at 3 years, employment share at 3 years and average size of 5-year-old enterprises.

The second part of the study focuses on economic growth. Our findings show that for the 27 EU countries analysed, death rate is negatively related to economic growth while net business population growth is positively related. For the innovation countries, the economic growth is positively influenced only by the death rate of enterprises. In the case of transition EU economies, the economic growth is positively influenced by enterprise birth and death rates and negatively influenced by employment share at 3 years and the average size of 5-year-old enterprises.

The added value of our study results from including in the analysis an extended sample of 27 EU member countries. Moreover, grouping them according to the stage of development allows us to perform comparative studies and the identification of a set of particularities for each category of countries. Another novelty that we bring through this paper is the fact that we have included in the analysis the indicators measuring the performance of entrepreneurship, and we have analysed their relationship with national competitiveness and economic growth. In the literature, there are no studies that have analysed the effects of entrepreneurial performance on national competitiveness and economic growth by groups of countries. Therefore, through this research, we intended to fill this literature gap. If we can identify which performance indicators influence economic growth and national competitiveness, then decision makers can know in which direction they should intervene and formulate policies. Thus, for example, if the survival rate of firms plays a significant role for the economy as a whole, decision makers should formulate policies to help keep firms in the market. This is similar in the case of the other indicators analysed. From the empirical results, we observe that there are countries where the death rate has positive effects, and here the decision makers should intervene through policies and measures to keep the innovative, competitive companies on the market.

Overall, our research emphasises the need to adopt public policies that will promote and stimulate entrepreneurial performance or that will sustain the entry of new entrepreneurs into the market. Our study also points out the need to develop specific programs that support the survival of enterprises that develop innovative and high-quality activities. Thus, our findings could be of interest to policy makers who intend to develop measures to enhance national competitiveness and economic growth. The limitations of the present study come from the fact that data were not available for all 18 indicators proposed by the Entrepreneurship Indicators Programme to measure entrepreneurial performance. This study represents a starting point of our research regarding the effects of entrepreneurial performance on national competitiveness and economic growth of countries. We intend to extend and develop our analysis to deepen the empirical investigation by adding other indicators (such as the idiosyncrasy of the job market in the countries under study, similar to Bak-Grabowska 2014 [81]) for measuring entrepreneurial performance but also to expand the sample of countries by including in the analysis a group of countries outside the European Union. Another limitation of this paper comes from the fact that the study was conducted on the ranking of countries according to their economic development at the time of its initiation. In future studies, we intend to consider the migration of countries between categories that occurs from year to year.

Author Contributions: Conceptualisation, V.D.R., A.R., M.B.T. and O.M.C.; methodology, V.D.R., A.R. and M.B.T.; software, V.D.R., A.R. and M.B.T.; validation, V.D.R., A.R., M.B.T. and O.M.C.; investigation, V.D.R., A.R., M.B.T. and O.M.C.; writing—original draft preparation, V.D.R., A.R., M.B.T. and O.M.C.; writing—review and editing, V.D.R., A.R., M.B.T. and O.M.C. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

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Determinants of Entrepreneurial Intentions of Youth: the Role of Access to Finance

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crossref http://dx.doi.org/10.5755/j01.ee.33.1.28716

This study aims to highlight the role of access to finance as one of the determinants on the decision to enter into entrepreneurship of students regarded as potential entrepreneurs. For achieving our main objective, we created a questionnaire. As a method of analysis, we run the least square logistic regression, with entrepreneurial intentions as a dependent variable and knowledge, education and availability of financial resources as predictors. We also included gender, university and locality as control variables. The sample is formed of 181 students from two universities from the North-Eastern region of Romania. The results reveal that access to finance is a significant determinant of the decision to enter into entreprenenruship for young people. Moreover, we show that the relation between access to finance and entrepreneurial intentions changes according to gender, university and locality of origin. Female students' entrepreneurial intentions are influenced by the availability of bank loans and personal savings, while in case of male students - only by the availability of funds coming from family and friends. The funds coming from family and friends also determine students' entrepreneurial intentions coming from rural or urban areas. Entrepreneurial intentions are negatively related to education for male students and those coming from an economic profile university, and positively related to business knowledge only for students from rural areas. The results obtained could be important for financial resources providers (because they offer insight into how easy access to finance stimulates the entrepreneurial intentions of youth), for education providers (who can adapt their training programs and extracurricular activities to strengthen entrepreneurial intentions), and for decision makers (which may adopt appropriate policies to stimulate the economic development of an area).

Keywords: Entrepreneurial Intentions; New Business; Access to Finance; Youth, Education.

Introduction

Rising youth unemployment and the concerns for economic, local, regional and national development have determined the decision-makers to promote entrepreneurship among students. Educational institutions were also involved in these public policies. Thus, most tertiary education institutions have set up entrepreneurial centres to develop students' appetite for identifying and exploiting business opportunities. For example, in Romania, within the higher education institutions, student entrepreneurial societies have been created with the purpose to create entrepreneurial skills and to change the way students think about entrepreneurship. The ultimate goal is to balance the demand and supply of labour, respectively, the demand and supply of jobs. Through developing entrepreneurial skills, it is expected that the number of graduates applying for labour will decrease in favour of students who (through viable entrepreneurial ideas) can become job creators.

In the elaboration of the research, we started from the premise that in order to achieve the goals assumed through public and institutional policies, it is necessary to understand in more detail how students' entrepreneurial intentions are formed. For this reason, the research is based on behavioural theories to provide a broader perspective on the problem regarding the influence of access to financial resources on entrepreneurial intentions. Specifically, this paper focuses on developing knowledge regarding how students' entrepreneurial intentions are translated into concrete behaviours and actions under the influence of financial constraints.

From an economic and managerial point of view, starting a business requires human capital and financial capital (GEM, 2018; Zhao *et al.*, 2020; Alaref *et al.*, 2020). These are the two basic factors of production without which entrepreneurial initiatives cannot materialize. In this study, attention is focused on a certain segment of human capital - students.

The involvement of students in extracurricular learning activities (in entrepreneurial societies, entrepreneurship clubs, business plan competitions and boot camps) exceeds the traditional (pedagogical) tasks of universities. The literature notes that this new direction of stimulating entrepreneurship is less likely to be based on academic research (Maniam and Everett, 2017; Mason *et al.*, 2020). Specifically, if the literature is generous in researching the global determinants of entrepreneurship, assessing entrepreneurial intentions in accordance with the possibilities of access to funding sources has received less attention. Access to finance means access to financial information and the promotion of financial education (Sayed & Silimane, 2014).

Due to the fact that the transition from school to professional life has changed significantly in the last decade (Vivas & Alvarez-Hevia, 2017), and students' entrepreneurial intentions depend on a number of circumstances that differ from one period to another and from one country to another (Engle *et al.*, 2010; Ozaralli and Rivenburgh, 2016; Raty *et al.*, 2019), scientific research on student entrepreneurial intentions remains relevant and requires a permanent assessment of its determinants.

The literature (Katekhaye *et al.*, 2019) mentions that people aged 18 to 24 years have the lowest entrepreneurial inclination. Therefore, stimulating students' entrepreneurial initiatives becomes a public responsibility (attributed to policymakers and the associated institutions, such as educational institutions).

The research of students' entrepreneurial intentions has received special attention, but most studies have analysed entrepreneurial intentions from the perspective of the environment and personal factors. Only a few studies provide explicit evidence of the interdependencies between entrepreneurial intentions and access to finance (Urban and Ratsimanetrimanana, 2019; Nguyen, 2020). The results of these studies cannot be generalized because they processed information that corresponds only to certain samples and certain economic, social and cultural environments. For this reason, this study seeks to fill the research gap by providing additional evidence on a sample that has not been researched before.

The literature review revealed that access to finance was approached from two points of view: macroeconomic (context in which the degree of development of financial markets was assessed) and microeconomic (context in which the possibilities of access to finance for individuals/groups were assessed). Depending on the classification, access to finance was measured based on specific indicators, such as domestic or private credit divided by GDP (Klapper et al., 2010; Morales Urrutia and Rodil Marzábal, 2015), incomes/ savings of individuals/ households (De Clercq et al., 2013; Matshekga and Urban, 2013). Because some authors (Fraser et al., 2015) have pointed out that the proxies used did not to include all possible funding alternatives, attention has turned to assess the perception of access to finance (Urban and Ratsimanetrimanana, 2019; Katekhaye et al., 2019). Findings regarding the impact of access to finance on the students' entrepreneurial intentions are inconsistent in the literature. In order to provide a more accurate knowledge of the interdependencies between students' entrepreneurial intentions and access to finance, we opted for the analysis of data collected from primary sources. The collection of information was based on a questionnaire adapted to the

respondents and the economic and social environment in which they are likely to start a business.

The main objective of this study is to explain the behavioural patterns of students from an entrepreneurial perspective (access to finance) and to provides a profile of the entrepreneurial intentions of students enrolled in two relatively different fields of study (economics; engineering and management) with accents on access to financial resources. Thus, we aim to better understand the extent to which access to finance influences entrepreneurial intentions among the Romanian students at the level of a less developed region. Unlike previous research, this study emphasizes the role of access to finance on the decision to enter into entrepreneurship of students seen as potential entrepreneurs.

The research results are useful from at least three points of view: theoretically (because they present a stage of knowledge in the field of students' entrepreneurial intentions); methodological (because it implements an original research methodology) and practical (because it provides information on business development prospects in a given economic area and on the importance of access to finance for potential entrepreneurs).

For achieving our purpose, we structured the paper into the following sections: section 2 analyses the theoretical background regarding the determinants of entrepreneurial intentions and presents the research hypotheses; in section 3, we describe the variables included in the analysis and the empirical methods used; section 4 is dedicated to presenting the results and discussing them. Section 5 concludes the paper.

Theoretical Background and Hypothesis

Before forming their intention, individuals (including students) make assessments for or against certain behaviour. The individuals outline an attitude towards certain circumstances, which triggers their intention. The manifestation of human behaviour is based on intention, understood as the degree of effort that people intend to do to accomplish that behaviour (Entrialgo and Iglesias, 2016). substitution, economic theory By admits that entrepreneurial intent (based on a certain attitude) will significantly determine subsequent entrepreneurial behaviour (Carsrud and Brannback, 2011) and understanding how the entrepreneurial intentions are formed (on which knowledge is based) is essential (Krueger and Day, 2010). This is because entrepreneurship is an intentional process and a planned (Krueger et al., 2000; Iakovleva et al., 2011) and volitional (Krueger et al., 2000) behaviour.

The results of many researchers have confirmed that the adoption of a specific attitude towards entrepreneurship can have a significant impact on entrepreneurial intent in various cultural environments (Linan *et al.*, 2011; Fitzsimmons and Douglas, 2011; Moriano *et al.*, 2012; Douglas and Fitzsimmons, 2013; Al-Jubari *et al.*, 2019). Few studies have shown that, due to cultural differences, attitude could not predict entrepreneurial intent (e.g., Siu & Lo, 2011). The research focused on entrepreneurial behaviour has confirmed the presence, in many countries, of entrepreneurial intentions. However, some researchers

(Engle *et al.*, 2010; Ozaralli & Rivenburgh, 2016) point out that entrepreneurial intentions do not have common patterns. They are structured differently depending on the culture, needs and expectations of individuals or nations.

Once an entrepreneurial attitude is adopted, a certain entrepreneurial intention is outlined that motivates the individual to an economic action, determining him to an active life (Fayolle *et al.*, 2014; Fayolle & Linan, 2014).

For explaining the entrepreneurial intentions of the students, a series of theories were considered: TPB-theory of planned behaviour (Siu & Lo, 2011; Moriano et al., 2012; Kautonen et al., 2013); SDT-self-determination theory (Andersen et al., 2000; Ryan & Deci, 2000), and BPNTbasic psychological needs theory (Broeck et al., 2010; Teixeira et al., 2012). By adopting a positive heuristic, researchers' efforts have been strengthened as follows: because the TPB does not indicate why a person pursues a certain entrepreneurial behaviour (and does not distinguish between beliefs and the assessment of behavioural outcomes), the focus shifts to motivation. This motivation is inherent for growth and achievement; thus, people are motivated to undertake activities through which they can meet their needs for optimal development and functioning (thus reaching SDT). From motivation, we then move on to self-determination and psychological needs (such as: the need for autonomy, competence and interaction) that generate an intrinsic value to the individual in search of well-being. According to BPNT, the three needs are considered universal, with no differences between people and cultures; meeting these needs is the basic motivational mechanism that generates people's behaviour (implicitly also entrepreneurial behaviour).

In the literature many factors are considered to be determinants of entrepreneurial intentions: both internal factors of the individual perception or attitude and external factors. We decided to consider the most representative for our study and which will help us achieve the proposed objective. Thus, we focus mainly on the role played by access to finance. But the access to finance cannot be analysed alone; it is related to the entrepreneurial education that formed the potential entrepreneurs and the knowledge they have regarding the business environment. A lack of entrepreneurial education or knowledge leads to an impossibility of accessing funding sources even if they are available.

Access to finance is a key factor in determining the success of SMEs regardless of the country's level of development (Matshekga & Urban, 2013). Usually, the financial resources needed for the start-up SMEs come from personal savings or money from families; therefore youth, women and individuals from rural areas are disadvantaged when they decide to start a new business (GEM, 2018).

Several studies from the literature (Shree and Urban, 2012; De Clercq *et al.*, 2013) have provided evidence that access to financial, human and social capital positively influences the start of a new business. Urban and Ratsimanetrimanana (2019) affirm that individuals who have access to financial resources have a higher probability of becoming entrepreneurs. The findings of their study show the significant role of access to finance as a moderating variable in the relation between entrepreneur commitment to starting a business, perceived behavioural control and entrepreneurial intentions.

On the other hand, the study of Nguyen (2020) emphasizes that are differences between countries when analysing the relationship between access to finance and business start-up intention. Thus, the author shows, that in developing countries, like Vietnam, access to finance has a positive but statistically insignificant relation with entrepreneurial intentions. He explains the results by the fact that students from this country focus more on other barriers coming from the environment compared to the financial issues.

Starting from the approaches used in the literature to explain how these factors determine entrepreneurial intentions, we also formulated a series of hypotheses that we will test in the empirical part.

Access to the necessary financial resources is among the most important factors influencing entrepreneurship (Aghion et al., 2007; Klapper et al., 2010; Vidal-Sune & Lopez-Panisello, 2013; Sayed & Slimane, 2014; Arin et al., 2015). Moreover, young people and firms in their early stages face the greatest difficulties in obtaining the money they need. This hapens because lenders see them as risky investments due to the fact that they do not have a credit history, and have very few assets that can be used to guarantee the loans (UNCTAD, 2015). Zhao et al. (2020) analyse the influences of capital (traditional and psychological) on the students' entrepreneurial intention and argues that individual financial capital plays a significant role in promoting entrepreneurial intentions, but the research results disprove this hypothesis. Their questionnaire projects three elements to analyse the financial situation of students: the financial support coming from families for entrepreneurship, other financial resources and also the technology and equipment that was achieved through different external channels. Also, referring to the necessary financial resources of young business, other studies have pointed out that limited access to capital is seen as a barrier to entering entrepreneurship in the case of students (Mustar & Wright 2010; Wright et al., 2006).

The family plays a key role in youth entrepreneurial intentions and through financial security offered. Parents who are entrepreneurs can facilitate the necessary capital to create a new business, facilitating the process of becoming entrepreneurs for youth (Aldrich & Cliff, 2003; Dunn & Holtz-Eakin, 2000). However, we must consider the problem presented in the literature that refers to the fact that financial resources from families and friends are in fact a "poisoned gift" (Sieger & Minola, 2016). They are considered to be a gift because they help the firms to cope with financial constraints that are related to the creation of a new business (Steier, 2003), but they are considered to be poisoned because they imply a strong dependence and additional obligations (Arregle et al., 2015). These can lead to negative effects for the newly established company as well as for families or friends.

Hypothesis 1. Easy access to financial resources is positively related to the entrepreneurial intentions of youth.

Treated separately, access to finance is considered insufficient to influence entrepreneurial intent (Nguyen, 2020). Access to finance of potential entrepreneurs must be seen in relation to potential entrepreneurs' business knowledge and with ecosystem particularities in which they operate. The study of Malebana (2014) showed that the knowledge of entrepreneurial support is statistically significant related to the intention of creating a business. The analysis in the field have shown that lack of knowledge regarding entrepreneurial activities, difficulties in attracting the capital needed in the incipient phase, difficulties in developing a viable business plan, difficulties in assessing real competition, fear of failure and lack of political / institutional support have their imprint on entrepreneurial intentions of students (Blesia et al., 2021). Strengthening the foundation for entrepreneurial knowledge is a task recently assigned to higher education institutions, which have taken over the attribute of "entrepreneurial university". From this new investment, universities have taken on responsibilities such as: disseminating research results and promoting knowledge-based enterprises (Kirby, 2006); providing knowledge together with generating strategies that benefit societv (Guerrero & Urbano, 2012); interaction, collaboration and cooperation in partnerships, networks and also other relations with both public and private organizations (Blesia et al., 2021). According to predecessor researchers (Kuckertz and Wagner, 2010), the business knowledge and entrepreneurial orientation are important factors that sustain the successful implementation of sustainable business models. The researchers considered that to strengthen entrepreneurial intentions, students must have adequate knowledge, acquired through educational training programs, and practical activities (apprenticeship) and continuous monitoring in different business environments (Zhang et al., 2014; Gelaidan & Abdullateef; 2017). To develop truly sustainable enterprises, transformative programs that value the knowledge, skills and attitudes necessary for entrepreneurs are considered (Starik and Rands, 2010). Therefore, coordinators within entrepreneurial universities need to be genuine sources of knowledge (who share their own experience) and less focused on teaching efforts (Daub et al., 2020).

Hypothesis 2. Business knowledge is positively related to the entrepreneurial intentions of youth.

As a component of human capital, the level of education is instrumental to the generation of knowledge and skills. As long as university programs create professional competencies, the university environment is expected to make its mark on students' entrepreneurial intentions. For sustaining the potential entrepreneurs, one of the necessary elements that the university environment has to have is the appropriate educational support through a set of appropriate lectures and trainings. These should also be related with a clear and resume evaluation but also with supervision of the evolutions (research confirming these results: Zhang *et al.*, 2014; Mustafa *et al.*, 2016; Gelaidan & Abdullateef, 2017).

Analysing entrepreneurial education, some authors (Mason *et al.*, 2020) found that the university's offer in the field of entrepreneurship has expanded and diversified. However, previous research draws attention to the fact that the diversification of university programs is not a sure way to intensify and materialize the entrepreneurial intentions of students (Oosterbeck *et al.*, 2010; Bae *et al.*, 2014; Mazzarol *et al.*, 2016; Nabi *et al.*, 2018). This is because entrepreneurship education is either present only in economic higher education institutions (Mazzarol *et al.*,

2016), or is mainly based on traditional teaching-learningassessment methods (Mason *et al.*, 2020), or neglects training transversal skills needed to start a new business (Kuratko & Morris, 2018).

For an entrepreneurship education program to produce positive effects on the business environment, some authors (Costa *et al.*, 2018; Morris *et al.*, 2017) recommend learning by doing. This turns the student into an active subject, able to identify not only the opportunities in the business environment, but also viable ideas adapted to this environment.

Unlike the above, other authors have shown that universities are increasingly involved in providing entrepreneurship education, sustaining entrepreneurship and thus having an important role in ensuring social and economic welfare (Ahmed et al., 2017; Budyldina, 2018). Also, as shown by the studies of Guerrero et al. (2017) and Dalmarco et al. 2018), universities are implied in sustaining local development. Research confirms that there is a consensus as regards the importance of supporting entrepreneurial education (Bergmann et al., 2016). Also, emphasise universities that support stimulates entrepreneurial intentions, as it promotes students' confidence in their own skills and in their ability to open and operate a business (Zhang et al., 2014).

Urban and Ratsimanetrimanana (2019) findings show that the level of education plays a key role in the formation of entrepreneurial intentions.

Meyer and Hamilton (2020) point out that entrepreneurial training and education could increase female intentions to grow their own business. Their study emphasizes the importance of entrepreneurial training, especially for females, as it can stimulate their growth ambition as entrepreneurs. They complement the results obtained by Westhead and Solesvik (2016), which showed that increasing entrepreneurial education student skills and knowledge raises female students' entrepreneurial intention.

Hypothesis 3. Entrepreneurial education is positively related to the entrepreneurial intentions of youth

Several other studies have analysed the differentiation of entrepreneurial intentions of individuals depending on the locality of origin: urban or rural. Urban regions are seen as more favourable for setting up and running businesses both in that they are more supportive but also more competitive (Glaeser et al., 2010; Freire-Gibb & Nielsen, 2014; Faggio and Silva, 2014). This is the result of the fact that they are more developed from an economic point of view but also offer a diversity of economic activities (Bosma and Stenberg, 2014). Viewed from these points of view, entrepreneurial activities in rural areas are disadvantaged, so important analysing differences appear when entrepreneurial intentions of young potential entrepreneurs coming from rural areas (Davidsson, 1991). Similarly, the results obtained by Katekhaye et al. (2019) show that the level of education and income for a rural entrepreneur will influence his or her entrepreneurial motivation.

Therefore, we aim to see if this is also true for our sample and if the entrepreneurial intentions are higher for young people from urban areas compared to rural ones.

Hypothesis 4. Entrepreneurial intentions are higher among potential entrepreneurs coming from urban areas.

Going further, gender differentiation is an important side of the analysis. The rate of females who decide to become entrepreneurs is on the rise globally, but the number of female-owned businesses is still way behind the manowned businesses. The biggest differences being in developing countries (World Bank, 2020). The findings from the literature are very diverse on this matter. For example, some studies show that the university students who are females have higher intentions in becoming entrepreneurs because of several environmental and sociocultural factors that sustain women's entrepreneurial activities (Anggadwita et al., 2017). Other studies are concerned with how to determine an increase in female entrepreneurs and point out the significant role of education and training in increasing their interest and involvement (Westhead & Solesvik, 2016; Meyer & Hamilton, 2020)

Different results were obtained by Daim *et al.* (2016) which show that usually male and female entrepreneurs operate in different sectors of activity related to their interests, and that they find different ways to grow their business (results obtained from a study conducted in 15 European Union and US member states). This study also showed that increasing the number of women entrepreneurs is beneficial to the economy because it increases the entrepreneurial variety, especially in emerging economies.

At the same time, the findings of Strydom *et al.* (2020) have shown that students generally displayed positive intentions towards entrepreneurship and that male and female students had similar intentions towards entrepreneurship.

Given the mixed results from the literature, we will formulate the hypothesis on the major tendency of men to be entrepreneurs.

Hypothesis 5. Entrepreneurial intentions are higher among men compared to women.

Zhang *et al.* (2014) showed that the individuals who study at technical universities express the intentions to become entrepreneurs in a higher proportion than the individuals that study at other universities. Starting from this, we also intend to test the entrepreneurial intentions differences between the students from a technical university and one with an economic profile.

Methodology

For achieving the main objective proposed in this paper, we focused our empirical analysis on a group of university students from two universities located in Iasi County, Romania: Alexandru Ioan Cuza University of Iasi (UAIC), and Gheoghe Asachi Technical University of Iasi (UTGA).

From UAIC we have chosen a sample formed by students who attend the Faculty of Economics and Business Administration (final year, study program Finance and Banking). From UTGA we have chosen a group of students who attend the Faculty of Industrial Design and Business Management (field of Engineering and Management). We chose this component of the sample because, by the specifics of the courses they take, the students should know the procedures of opening a new business and how to manage it. Thus, we consider these young people as having the potential to become entrepreneurs. The data for the study was obtained in the period October 2019 - February 2020 by applying a newly created questionnaire that we named "Entrepreneurial intentions of students and access to finance". We applied the questionnaire in the academic year 2019–2020 in the classroom. It comprises a set of 20 items. The time required to complete it is between 10 and 15 minutes. Students were not asked for personal identification data and were informed of data protection. The questionnaire comprises of a set of demographic questions, followed by two types of questions: ones where the respondents had to choose between two answers (1 - yes or 0 - no), and other with answers formulated according to the Likert scale of 5 points (1-strongly disagree; 2- disagree, 3- undecided, 4- agree, 5-strongly agree).

The items from this questionnaire focus on identifying the role of specific education and the regulations for starting up a business and easy access to finance for potential entrepreneurs. For formulating the items that focus on the access to finance we used as a starting point the Business Start-up Barometer in Romania (EY Romania, 2017) and Flash Eurobarometer, No. 283 (European Commission, 2010).

Initially, we conducted a pilot test on a small number of respondents (20 students) to verify the understanding of the questions and the way of formulating the answers.

Depending on the results obtained in the pilot test, we improved the questionnaire and then applied it to the extended sample. The questionnaire was applied to a larger sample of 203 students (111 students from UAIC, and 92 students from UTGA), but we obtained valid answers only for 181 questionnaires. The composition of our sample is described in Table 1. Our sample is formed from 55 % students coming from UAIC and 45 % students from UTGA. The gender distribution shows that 29 % of valid responses were from males and 71 % from females. According to the locality of origin, the distinction shows that 68 % of respondents come from an urban area while 32 % from a rural zone.

The dependent variable considered expresses the entrepreneurial intentions of students. To quantify this variable, students answered "Yes" (value 1) or "No" (value 0) to the question of whether they intend to become entrepreneurs in the next five years. The main independent variables included in the analysis are *doing business knowledge, education* and *resources availability*.

Table 1

Distribution of the Sample

	Number	Percentage					
	University						
UAIC	100	55.25 %					
UTGA	81	44.75 %					
Total	181	100 %					
	Gender						
Female	128	70.72 %					
Male	53	29.28 %					
Total	181	100 %					
	Locality						
Urban	123	67.96 %					
Rural	58	32.04 %					

Source: authors own calculations

To estimate the score of the components of each variable, we used the following equations:

Doing Business Knowledge $=a_1 \cdot DBK_1 + a_2$	·DBK2 -
a ₃ ·DBK3	(1)
$Education = b_1 \cdot E1 + b_2 \cdot E2 + b_3 \cdot E3 + b_4 \cdot E4$	(2)
Resources Availability = $c_1 \cdot RA1 + c_2 \cdot RA2 + c_2 \cdot RA2$	c ₃ ·RA3
$+ c_4 \cdot RA4 + c_5 \cdot RA5 + c_6 \cdot RA6$	(3)

Where $a_{i,} b_{j}$ and c_{z} are the estimation parameters for doing business knowledge, education and resources availability. Each factor of influence is expressed as the mean of each component.

The control variables included in the empirical analysis are: gender, university and locality of origin. The gender is measured through a dichotomous variable and takes the value 1 for male and the value 0 for female. The variable university is also a dichotomous one and takes the value 0 when the respondent is from UAIC and the value 1 when the respondent is from UTGA. The variable locality took also two values: 0 for urban area and 1 for rural area.

For measuring the internal consistency between items in each scale, we use Cronbach's Alpha (see Table 2). For exploratory studies, values above 0.70 are considered acceptable, but as shown in the literature (Cortina, 1993; Nunnally & Bernstein's, 1994; Streiner, 2003; Serbetar & Sedlar, 2016) the value of the Cronbach alpha is influenced by the length of the scale. Thus, in the case when the construct has less than ten items, the Cronbach's alpha should be equal or higher than 0.5. The reliability for Education is 0.849 which is good. The value of Cronbach's Alpha was higher than 0.6 for knowledge which remained satisfactory for the analysis because this scale has only 3 items. Regarding the resources availability, we observe that the value of the Cronbach's Alpha is only 0.354, which is poor.

Therefore, in our further analysis, we will use each item separately as a variable and not the whole construct. Thus, we will have as variables measuring access to finance: the availability of bank loans, EU funds, non-reimbursable funds, personal savings, leasing and family and/or friends' funds.

Table 2

(4)

Cron	bach	's /	4lp	ha
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Scale	Cronbach's Alpha
Knowledge scale	0.626
Education scale	0.849
Resources availability scale	0.354

Source: authors own co	alculations in SPSS
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We used binary logistic regression modelling to express the link between entrepreneurial intentions and the independent variables. The equations used for estimating the logit models applied to our sample are:

 $EI = \beta_0 + \beta_1 \cdot Knowledge + \beta_2 \cdot Education +$

 β_3 ·Resources availability + μ

Model 2:

 $EI = \beta_0 + \beta_1 \cdot Knowledge + \beta_2 \cdot Education +$

 β_3 ·Resources availability + β_4 ·Gender + β_5 ·University +

$$\beta_6$$
·Locality + μ (5)

Where β_i represent the coefficients and μ is the error term.

Results and Discussions

To analyse the results of our empirical investigation, we first run the descriptive statistics for the variables and for the variables constructs considered. The variable *Entrepreneurial intentions* takes values between 0 and 1: 0 expressing the answer "no", while 1 expressing the answer "yes" to the question "Do you intend to open a business in the next five years?". For measuring the variable *Education*, we used Likert Scales; thus this variable takes values between 1 and 5, where 3 expresses the indifference value. Therefore, Table 3 shows the minimum, maximum, mean and standard deviation for all the variables included in the analysis.

Table 3

	Minimum	Maximum	Mean	Standard Deviation
Entrepreneurial intentions	0.00	1.00	0.64	0.481
Knowledge	0.00	1.00	0.60	0.367
Education	1.00	4.75	3.07	0.668
Bank loans availability	0.00	1.00	0.72	0.448
EU fund availability	0.00	1.00	0.83	0.378
Non-reimbursable funds availability	0.00	1.00	0.60	0.491
Personal savings availability	0.00	1.00	0.71	0.454
Leasing availability	0.00	1.00	0.62	0.487
Family and/or friends funds availability	0.00	1.00	0.54	0.500

Descriptive Statistics of the Variables

Source: processed by the authors

From Table 3 it can be observed that the mean for entrepreneurial intentions is 0.64 which indicates that, on average 64 % from the respondents chose the answer "yes" showing their interest in opening a business in the next five years. With respect to the knowledge about the procedures and funds needed to start a business, on average 60 % of the respondents declared to have them. Also, for the six variables measuring the availability of financial resources for entrepreneurs, the means are between 0.54 and 0.83, showing that more than half of the respondents consider that the main sources of financing mentioned in the study are perceived as available for starting a new business.

Analysing the descriptive statistics for the variables considered but grouped according to gender, we obtain important differences (see Table 4). Descriptive Statistics of the Variables by Gender Groups

	N		Me	an	Standard deviation	
Variables	Female	Male	Female	Male	Female	Male
Entrepreneurial intentions	128	53	0.660	0.580	0.474	0.497
Knowledge	128	53	0.601	0.603	0.350	0.408
Education	128	53	2.084	2.051	0.646	0.726
Bank loans availability	128	53	0.730	0.700	0.443	0.463
EU fund availability	128	53	0.840	0.810	0.372	0.395
Non-reimbursable funds availability	128	53	0.580	0.700	0.511	0.503
Personal savings availability	128	53	0.730	0.680	0.447	0.471
Leasing availability	128	53	0.630	0.620	0.502	0.489
Family and/or friends funds availability	128	53	0.550	0.510	0.500	0.505

Source: processed by the authors

So, our findings show that female students have expressed in a greater proportion their intention to become entrepreneurs in the future compared to male students. These results do not confirm hypothesis 5. With respect to the knowledge of opening a new business, the average values were almost the same, slightly higher for male respondents, showing that regardless of gender, the level of knowledge of young people is the same. Thus, on average, 60% of the students have the necessary knowledge regarding procedures and funding sources for new businesses. The average value of education for female students (2.084) was slightly higher compared to male students (2.051). This result emphasizes that education influences almost equally the decision of female and male students to become entrepreneurs. Regarding the availability of financial resources, the average values for female respondents were higher than that of male respondents (for all the variables except for nonreimbursable funds). Therefore, women believe to a greater extent that is easy to access financial resources to open a new business, compared to men.

When splitting the sample according to the respondents' university of origin, we also obtain significant differences (see Table 5).

Thus, the results (see Table 5) emphasize that the respondents from UTGA expressed a greater interest in starting a new business (0.690) compared to the respondents from UAIC (0.600). The arguments justifying these differences are diverse. First, the qualifications (for the labor market) acquired within UTGA are technical.

Their employability depends very much on the experience gained. To overcome this barrier, graduates are forced to find alternatives, and setting up a business is seen as a solution. Secondly, the establishment (within its own organizational structure) of a new structure (student entrepreneurial society), partnerships with the business environment and participation in entrepreneurial competitions strengthen students' entrepreneurial intentions. Thirdly, accessing non-reimbursable funds allowed the implementation of projects aimed at the training of entrepreneurial skills and the financing of student start-ups.

Table 5

	Ν		Mean		Standard deviation	
Variables	UAIC	UTGA	UAIC	UTGA	UAIC	UTGA
Entrepreneurial intentions	100	81	0.600	0.690	0.492	0.465
Knowledge	100	81	0.621	0.586	0.361	0.375
Education	100	81	2.175	1.950	0.637	0.689
Bank loans availability	100	81	0.710	0.740	0.456	0.441
EU fund availability	100	81	0.830	0.830	0.378	0.380
Non-reimbursable funds availability	100	81	0.660	0.560	0.517	0.500
Personal savings availability	100	81	0.780	0.630	0.416	0.486
Leasing availability	100	81	0.670	0.570	0.473	0.523
Family and/or friends funds availability	100	81	0.570	0.490	0.498	0.503

Descriptive Statistics of the Variables by Home University Groups

Source: processed by the authors

Focusing on the knowledge needed to open a new business, the average values were higher for UAIC respondents. This results is showing that a higher share of the UAIC students consider that they have the necessary business knowledge to help them start a new business compared to UTGA students. The average value for education is higher for UAIC students (2.175) than UTGA students (1.950), showing that UTGA students were less likely to be influenced by the education when deciding to become entrepreneurs. Regarding the availability of financial resources, the average values for UAIC

respondents were higher for four of the resources (nonreimbursable, EU and family and/or friend's funds and leasing). These results pointed out that UAIC respondents were more likely to consider these financial resources to be available for starting a new business. Moreover, UTGA students consider bank loans as being available for the early stages of a business. For the EU funds, the means had equal values (0.830).

Splitting the sample according to the locality of origin, we can also emphasize some differences between groups (see Table 6).

	N		Mean		Standard deviation	
Variables	urban	rural	urban	rural	urban	rural
Entrepreneurial intentions	123	58	0.690	0.530	0.464	0.503
Knowledge	123	58	0.596	0.614	0.362	0.378
Education	123	58	2.079	2.064	0.674	0.661
Bank loans availability	123	58	0.730	0.710	0.445	0.459
EU fund availability	123	58	0.800	0.900	0.404	0.307
Non-reimbursable funds availability	123	58	0.570	0.710	0.497	0.530
Personal savings availability	123	58	0.700	0.740	0.460	0.442
Leasing availability	123	58	0.620	0.640	0.488	0.520
Family and/or friends funds availability	123	58	0.540	0.052	0.500	0.504

Descriptive Statistics of the Variables by the type of Locality of Origin Groups

Table 6

Source: processed by the authors

Therefore, our findings emphasize that the respondents coming from urban localities are more interested in starting a business (0.690) than the respondents from rural localities (0.530), confirming Hypothesis 4. The knowledge needed to open a new business had higher average values for rural respondents, showing that students from rural areas consider it more important to have the necessary knowledge regarding procedures and sources of funding for starting their own business than students from urban areas. The average value for education is slightly higher for students from urban areas (2.079) compared to students from rural areas (2.064). This result shows that students coming from urban areas were more likely to be influenced by the education when deciding to become entrepreneurs. The means for the availability of financial resources are higher for the students from rural area for EU funds, nonreimbursable funds, leasing and personal savings. The students from urban areas had higher values of funds availability for the bank loans and funds coming from family and/or friends. These results highlight that students from rural areas consider to a higher extent that the financial resources are available for starting a new business, compared to students from urban areas.

To investigate how knowledge, entrepreneurial education and financial resources availability influence the future intentions of students to start a business, we used the least square logistic regression method. *Entrepreneurial intentions* of students was the dependent variable. *Knowledge, education* and *financial resources availability* were the independent variables. We also included a set of control variables, such as: gender, university and locality of origin. The results obtained after running the logistic analysis are summarized in Table 7 and 8.

For testing the four hypotheses formulated, we applied different logistic models, to assess the impact of knowledge, entrepreneurial education and financial resources availability on the intentions of youth to open up a business in the next five years. Table 7

Model		Model 1		М	lodel 2			
Dependent variables	Entrepreneurial intentions Entrepreneur				eurial intention	rial intentions		
Independent variables	Coefficient B (S.E.)	Exp (B)	Wald	Coefficient B (S.E.)	Exp (B)	Wald		
Constant	0.892 (908)	2.440	0.966	1.256 (0.951)	3.510	1.742		
Knowledge	0.876* (0.476)	2.402	3.384	0.906* (0.487)	2.475	3.468		
Education	-0.492* (0.263)	0.611	3.503	-0.473* (0.273)	0.623	2.993		
Bank loans availability	0.383 (0.382)	1.467	1.006	0.360 (0.391)	1.433	0.847		
EU fund availability	-0.353 (0.463)	0.703	0.580	-0.288 (0.471)	0.750	0.375		
Non-reimbursable funds availability	0.516 (0.351)	1.676	2.159	0.680* (0.363)	1.975	3.511		
Personal savings availability	-0.180 (0.397)	0.835	0.206	-0.184 (0.411)	0.832	0.200		
Leasing availability	-0.642* (0.356)	0.526	3.252	-0.577 (0.364)	0.562	2.507		
Family and/or friends funds availability	0.885** (0.352)	2.422	6.303	0.893** (0.361)	2.443	6.114		

Logistic Model Estimation Results

Inzinerine Ekonomika-Engineering Economics, 2022, 33(1), 86–102

Model	Model 1	Model 2						
Dependent variables	Entrepreneurial intentions	Entrepreneurial intentions						
Control variables								
Gender		-0.514 (0.375)	0.598	1.876				
University		-0.342 (0.357)	0.711	0.913				
Locality		-0.756** (0.362)	0.470	4.372				
Chi-square	20.100**	26.426***						
R square	0.138	0.188						

Note: *, ** and *** represents statistically significant at 10 %, 5 % respectively 1 %. Source: processed by the authors

For Model 1, we run the logistic model with only the independent and dependent variables considered. For Model 2, we also included the control variables in the logistic regression to test the mediating role of gender, university and locality of origin. Through this way of running the models, we wanted to identify if the introduction of control variables changes the relationships between variables.

The results of Model 1 revealed that knowledge, entrepreneurial education and the availability of leasing and funds coming from family and/or friends are significant students' intentions to become determinants of entrepreneurs in the near future. Thus, as shown in Table 7, entrepreneurial intentions were positively related to the scores obtained for the variable measuring business knowledge. When the score for business knowledge increases with one unit determines an increase of students' entrepreneurial intentions. The odds ratio for an auxiliary unit in the score of the variables measuring knowledge was 2.402, considering that the other variables included in the analysis had a constant variation. This result shows that their knowledge about the business requirements strongly influences the entrepreneurial intentions of the interviewed young people. Creating a new business is encouraged when the young potential entrepreneurs have sufficient knowledge about the number of procedures required, costs, time, financial resources needed and available for this stage of the firm's life.

The variable measuring *education* resulted in being negatively related to students' intentions to become entrepreneurs in the near future. This result shows that when the score for the variable education registered an increase of one unit, the probability of students creating a new business decreased. The odds ratio for an auxiliary unit in the score of the variable measuring education was 0.611. The negative impact of education on young people's intention to enter into entrepreneurship might be explained through the fact that benefiting from an education focused on entrepreneurship young people can form a realistic opinion on the conditions of entry but also of carrying out an entrepreneurial activity. They become familiar with the possible risks and failures that may occur, thus reducing their optimism and may want to be more cautious about investing money and about their future and financial stability. Our results are related with the results obtained by other studies (Oosterbeek *et al.*, 2010).

When focusing on the financial resources' availability, we observe that the availability of funds from leasing and from family and/or friends had a statistically significant influence on the intentions to become entrepreneurs of those interviewed, although with different signs. Leasing availability is negatively related to entrepreneurial intentions. The financial resources received from family and/or friends had a positive effect on youth entrepreneurial intentions.

The regression model results indicate that increasing the availability of funds from leasing determines a decrease in entrepreneurial intentions. Students prefer to create businesses that are not dependent on suppliers. Leasing providers in Romania charge rents/leasing rates that compete with the average cost of borrowed capital. During the study period (October 2019 - February 2020), the average interest rate on new loans to non-financial corporations decreased from 5.88 % to 5.60 % (NBR, 2021a). In contrast, under the multi-annual national program "SME Leasing", the cost of leasing (which does not include the management fee, the risk fee, and the fees related to the operations related to the financing activity) is 3.5 % higher than the reference interest rate. During the mentioned period, the reference rate of the National Bank of Romania decreased from 2.5 % to 2 % (NBR, 2021b).

Table 8

Models	Model	3 (Female	le) Mod		Model 4 (Male)		Model 4 (Male)		Model 5 (UAIC))
Dependent variable	Entreprene	neurial intentions		Entrepreneurial intentions Entrepreneu		Entrepreneurial intentions		Entreprene	urial inter	ntions	
In dan an dant yaniah lag	Coefficient B	Exp	Wald	Coefficient B	Exp	Wald	Coefficient B	Exp	Wald		
independent variables	(S.E.)	(B)	w alu	(S.E.)	(B)	walu	(S.E.)	(B)	waiu		
Constant	0.611	1 0 1 2	2 000	1.828**	1 (10	0.075	1.057**	2 976	4 9 4 7		
Constant	(0.431)	1.042	2.009	(1.742)	1.742)	1.010 0.075 (0.480)		2.0/0	4.04/		
Knowladge	1.122	2 072	0.086	0.476	1 6 1 0	0.075	1.083	2.052	0.622		
Kilowicuge	(1.130)	5.072	0.980	(1.742)	1.010	0.075	(1.372)	2.935	0.025		

Logistic Model Estimation Results by Groups

Models	Model 3 (Female)			Mod	el 4 (Male	.)	Model 5 (UAIC)			
Dependent variable	Entreprene	urial inter	ntions	Entrepren	eurial inte	entions	Entreprene	Entrepreneurial intentions		
Education	0.452 (0.611)	1.571	0.548	-1.917** (0.929)	0.798	4.260	-1.111* (0.628)	0.038	3.133	
Bank loans availability	0.604* (0.333)	2.547	3.299	0.046 (0.510)	1.047	0.008	-0.475 (0.368)	0.622	1.669	
EU fund availability	0.580 (0.493)	1.786	1.386	-0.193 (0.748)	0.825	0.066	0.114 (0.521)	1.121	0.048	
Non-reimbursable funds availability	-0.256 (0.586)	0.774	0.192	-1.313 (0.922)	0.269	2.026	-0.445 (0.621)	0.641	0.514	
Personal savings availability	1.016** (0.450)	2.761	5.093	-0.169 (0.747)	0.845	0.051	0.278 (0.453)	1.320	0.375	
Leasing availability	-0.455 (0.512)	0.374	0.790	0.350 (0.726)	1.419	0.233	-0.520 (0.593)	0.594	0.769	
Family and/or friends funds availability	-0.297 (0.441)	0.743	0.452	1.709** (0.762)	4.181	5.029	-0.506 (0.507)	0.603	0.999	
Chi-square	14	.359**	16.025** 12.860		16.025** 12.86		•			
R square	0).147		0.351		0.163				
Models	Model	6 (UTGA)	Mode	l 7 (Urba	n)	Model 8 (Rural)			
Dependents variable	Entreprene	urial inter	ntions	Entrepren	eurial inte	entions	Entreprene	urial inter	ntions	
Independent variables	Coefficient B (S.E.)	Exp (B)	Wald	Coefficient B (S.E.)	Exp (B)	Wald	Coefficient B (S.E.)	Exp (B)	Wald	
Intercept	0.740 (1.342)	2.096	0.304	0.844 (1.122)	2.325	0.566	1.858 (1.991)	6.413	0.871	
Knowledge	0.701 (0.791)	2.015	0.785	0.726 (0.601)	2.142	1.609	0.614* (0.945)	1.847	0.422	
Education	-0.483 (0.409)	0.617	1.396	-0.347 (0.315)	0.707	0.213	-1.111 (0.619)	0.329	3.225	
Bank loans availability	0.771 (0.656)	2.161	1.379	-0.023 (0.491)	0.977	0.002	1.214 (0.721)	3.368	2.834	
EU fund availability	-0.389 (0.753)	0.678	0.268	0.032 (0.543)	1.033	0.004	-1.114 (1.209)	0.328	0.849	
Non-reimbursable funds availability	0.969 (0.042)	2.635	2.405	0.378 (0.460)	1.460	0.676	1.125 (0.666)	3.079	2.854	
Personal savings availability	0.042 (0.585)	1.043	0.005	-0.083 (0.474)	0.920	0.031	-0.504 (0.804)	0.604	0.393	
Leasing availability	-0.729 (0.537)	0.482	1.842	-0.617 (0.458)	0.540	1.811	-0.788 (0.636)	0.455	1.536	
Family and/or friends funds availability	0.551 (0.583)	1.735	0.894	0.968** (0.437)	2.633	4.902	0.880* (0.697)	2.411	1.592	
Chi-square	8	3.389		10).720**		13.430*			
R square	0	0.139			0.118		0	.276		

Note: *, ** and *** represents statistically significant at 10 %, 5 % respectively 1 %. Source: processed by the authors

An increase in the *availability of the funds coming from family and/or friends* encourages the students' entrepreneurial intentions because this financing process is highly informal and may not involve the restrictions and requirements that other funders have (Grunhagen, 2008). Thus, the odds ratio for an auxiliary unit of the variable expressing the availability of funds from family and/or friends was 2.422. Previous studies have also found that monetary support from family and/or friends might positively influence the decision of people to become entrepreneurs (Turker & Sonmez Selcuk, 2009; Echecopar *et al.*, 2011; Denanyoh *et al.*, 2015).

Thus, with a risk of 10 %, we can say that the availability of leasing and financial resources from family or friends together with knowledge and education explained the intentions to enter into entrepreneurship of students.

When including in the analysis the control variables (Model 2) we observe partially similar results. Therefore, the results of Model 2 (see Table 7) revealed that knowledge, entrepreneurial education and the availability of non-reimbursable funds and funds coming from family and/or friends influenced students' entrepreneurial intentions significantly. Also, from the control variables included, only locality of origin significantly influenced students' entrepreneutrial intentions. The differences that appear compared to Model 1 consist in the fact that the availability of funds from leasing no longer has a statistically significant effect. Instead it appears the positive effect of the availability of non-reimbursable funds on the entrepreneurial intentions.

The availability of *non-reimbursable funds* has positive effects and stimulates entrepreneurial intentions because receiving these financial aids does not imply a repayment in the future. Because, potential entrepreneurs do not know how the company will evolve if it will generate enough funds to repay a loan, the fact that they are not obliged to return the funds does not impose restrictions on their activity and encourages them. The *locality of origin* negatively influences the intentions of students to become entrepreneurs, in the sense that young people from rural areas are less interested in becoming entrepreneurs in the future because they are discouraged by the economic characteristics of rural areas.

For a more in-depth analysis, we applied least-square logistic regressions on the respondents grouped according to the control variables: gender, university and locality of origin. The results thus obtained are presented in detail in Table 8.

Therefore, models 3 and 4 analyse the effects of the considered independent variables on the entrepreneurial intentions of young people grouped by gender. Our results point out that the entrepreneurial intentions of female students are influenced by the availability of bank loans and personal savings. Both sources of financing have a positive coefficient and show that when it increases the availability of the funds coming from bank loans and personal savings, the young women will be encouraged to open their own business. On the other hand, male's entrepreneurial intentions are significantly influenced by education and the availability of funds coming from family and / or friends. Increasing the availability of funds from family and friends will encourage youth males to enter into entrepreneurship. But entrepreneurial education has a negative relation with young male entrepreneurial intentions because, as we described earlier, it gives them more knowledge about the realities of entrepreneurial life, the risks and challenges that may arise and consequently, they are discouraged from entering entrepreneurship.

These results are consistent with prior studies, pointing out that gender differences are significant when analyzing the relation between entrepreneurial intentions and access to finance (Westhead & Solesvik, 2016; GEM, 2018; Urban & Ratsimanetrimanana, 2019; Meyer & Hamilton, 2020).

When grouping the respondents according to the university they study at (Models 5 and 6), we obtain limited and different results. Thus, Model 5 shows that the entrepreneurial intentions of students studying at UAIC are significantly and negatively influenced by entrepreneurial education. At the same time, Model 6 does not show any variables significantly related to students' entrepreneurial intentions from UTGA. However, we should keep in mind that the findings of models 5 and 6 are not statistically significant as Sig value associated with Chi-square is higher than 0.05. The last two models, models 7 and 8, show the variables that influence entrepreneurial intentions depending on the locality of origin of the respondents (see Table 8). Thus, we notice that, the availability of the funds coming from family and / or friends impacts their entrepreneurial intentions for the respondents coming from urban localities only. In contrast, for those coming from rural localities, business knowledge is a determining factor for entrepreneurial intentions. Thus, if the funds from family and friends are available for young people, they can be stimulated to start a business regardless of the locality of origin.

Conclusions

The main purpose of our paper was to analyse the role of access to finance in determining the intentions to become entrepreneurs of the students from Romania. To achieve this purpose, we used econometric methods like the descriptive statistics and the logit regression. After running the descriptive statistics, the results showed that gender, university and the locality of origin significantly explain the students' entrepreneurial intentions. Thus, our findings show that female students are more interested in becoming entrepreneurs in the future than male students. These findings are in line with those of Anggadwita *et al.* (2017). However, the results were also influenced by the sample composition, which had a higher percentage of women.

Also, the empirical findings of our study show that the entrepreneurial intentions were slightly higher for the students at the Technical University Gheorghe Asachi, and also higher for the students coming from urban areas. This confirms the results obtained by other studies (Bosma and Stenberg, 2014; Katekhaye *et al.*, 2019) highlighting the significant differences between the environment of origin and entrepreneurial activity.

The econometric models tested revealed that entrepreneurial intentions of youth are significantly determined by business knowledge, education and the availability of financial resources. First, when the business knowledge is higher, it encourages the young people to be interested in starting their own business. These findings are similar to those of Malebana (2014) and Blesia *et al.* (2021).

Second, education resulted to negatively influence the entrepreneurial intentions. This result is similar to the findings of Oosterbeek *et al.* (2010) and shows that knowing the difficulties that may occur when running a business and the possible risks, determines the potential entrepreneurs to be more cautious about investing money but also about their future and financial stability.

The availability of financial resources had different influences depending on the models analysed. The availability of funds from family or friends positively influences the entrepreneurial intentions in most of the models analysed. In addition, women potential entrepreneurs have stated that their decisions to start a new business in the future could be positively determined by the increased availability of loans coming from banks and also from personal savings. Non-reimbursable funds availability also positively influenced the entrepreneurial intentions, while the leasing funds' availability resulted in having a negative effect. These results are new; no detailed analysis has been made in the literature on the effects of the availability of different sources of financing on the entrepreneurial intentions of young people. Thus, our results provide detailed information on the main sources of financing of a business and the role played by the availability of each of them for different types of potential entrepreneurs (grouped by gender, place of origin, university), which has not been done before in the literature.

Table 9

Independent variables	Prediction (hypothesis)	Model 1		Model 2
Access to financial resources	+	Partially confi	rmed	Partially confirmed
Business knowledge	+	Confirmed	1	Confirmed
Entrepreneurial education	+	Infirmed		Infirmed
Areas of entrepreneurs	Higher for urban areas	-		Confirmed
Gender of entrepreneurs	Higher for man	-		Infirmed
Independent variables	Prediction (hypothesis)	Confirmed	Infirme	d Irrelevant results
Bank loans availability	+	Model 2		Model 1,3,4,5,6,7,8
EU fund availability	+	-	-	Model 1,2,3,4,5,6,7,8
Non-reimbursable funds availability	+	-	-	Model 1,2,3,4,5,6,7,8
Personal savings availability	+	Model 2	-	Model 1,3,4,5,6,7,8
Leasing availability	+	-	Model	Model 2,3,4,5,6,7,8
Family and/or friends funds availability	+	Model 1,2,4,7,8	-	Model 3,5,6

Determinants of Entrepreneurial Intention – Results of Research

Overall, the findings of our empirical analysis (summarized in Table 9) come to complete the literature that analyses the determinants of entrepreneurial intentions, with aspects that focus on the role played by access to finance, knowledge and education. Moreover, the questionnaire used is a new tool that focuses on testing the role of access to finance for stimulating potential entrepreneurs.

The limits of our study derives from the reduced number of respondents. However, this was influenced by the number of final-year students at the two universities. In our future research we intend to extend the sample by applying the questionnaire to a larger number of students including other universities from Romania, grouped by region. Also, we intend to apply the questionnaire to students from universities from other CEE countries to compare the results obtained by country.

The results of our research could be of interest to policymakers assisting them in making decisions that support and encourage potential entrepreneurs through measures that increase and facilitate access to finance for start-ups. The results obtained could also be important for financial resources providers because they offer information about how easy access to finance stimulates the entrepreneurial intentions of youth. They could also benefit education providers, helping them adapt their training programs and extracurricular activities to strengthen students' entrepreneurial intentions.

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The article has been reviewed. Received in March 2021; accepted in February 2022.



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