a scientific open access quarterly

EBER

Entrepreneurial Business and Economics Review

eISSN 2353-8821

2024, Vol. 12, No. 3

KRAKOW UNIVERSITY OF ECONOMICS
Department of International Trade
Centre for Strategic and International Entrepreneurship

a scientific open access quarterly

Entrepreneurial Business and Economics Review

eISSN 2353-8821 2024, Vol. 12, No. 3

KRAKOW UNIVERSITY OF ECONOMICS
Department of International Trade
Centre for Strategic and International Entrepreneurship

Publisher

Krakow University of Economics
Centre for Strategic and International Entrepreneurship
Department of International Trade
ul. Rakowicka 27, 31-510 Kraków, Poland
phone +48 12 293 5929, -5376, -5307, -5381
e-mail: eber@uek.krakow.pl
www.eber.uek.krakow.pl

Secretariat and Editorial Office

Mrs. Anna Marcinek-Markowska
Building U, Room 300, phone +48 12 293 5929

Executive Team for this Issue

Copyediting: Mikołaj Golubiewski, Jan Burzyński
Proofreading: Anna Marcinek-Markowska
Cover and DTP: Marek Sieja

Reviewers

All articles are double-blinded peer-reviewed at least by two independent reviewers.
The detailed list of reviewers is published at our website once a year.

Original Version

The online journal is the primary and reference version.
Both printed and online versions of the journal are original and identical.

ISSN 2353-883X (printed version, in the years 2013-2019)
eISSN 2353-8821 (online version, since 2013)

Abstracting/Indexing

The journal, and all its articles, is abstracting and/or indexing
in international databases, including:

ESCI Web of Science ™ Core Collection (USA)
Scopus by Elsevier (the Netherlands)
SJR – Scimago Journal Ranking (Spain)
Clarivate Analytics (Beijing, China)
EconLit – American Economic Association (USA)
ABI/INFORM Global (USA)
ProQuest Entrepreneurship (USA)
EBSCO Business Source Ultimate (USA)
EBSCO Business Source Corporate Plus (USA)
Cabell's International (USA)
Sherpa Romeo (UK)
Publons (Beijing, China)
ERIH Plus (Norway)
DOAJ (England, UK)
Google Scholar (USA)
NSD Nordi – Norwegian Register for Scientific Journals, Series and Publishers (Norway)
Julkaisufoorumi – Finish Classification of Publications (Finland)
BazEkon (Poland)
BazHum (Poland)

Identification and Originality

All articles published in EBER are tagged with an identification number
employing the Digital Object Identifier (DOI) System.
EBER uses the Crossref Similarity Check service powered by iThenticate to verify the originality of articles
submitted to the journal.

Table of Contents

Entrepreneurial Business and Economics Review

2024, Vol. 12, No. 3

10.15678/EBER.2024.120301

Acquisitions of private-equity-backed private companies: Insights from acquirer's choice of target and the implications on deal value through the subprime crisis

Josephine Gemson

ABSTRACT

Objective: This study explores the characteristics of worldwide acquisitions of private-equity-backed (PE) private companies. It examines the impact of the subprime crisis, the acquirer's choice of target, and the implications on deal value.

Research Design & Methods: This study uses deal-level data on worldwide PE-backed private company acquisitions that were completed between 2000 and 2017. Research methods to test the hypotheses include data visualization, comparative analysis, and regression analysis.

Findings: Data visualization indicates that North America was the most popular region for PE-backed private company acquisitions, followed by Europe and Asia. Industry sectors such as the services sector, the technology sector, the manufacturing sector, and the healthcare, and biotechnology sectors were popular. Comparative analysis indicates that financial acquirers preferred targets with larger revenues, larger core profits and operational profitability. Regression analysis indicates that acquirer characteristics such as acquirer type and experience levels, and deal characteristics such as deal location and percentage of stake acquired influence deal size. However, target company information and performance supersede acquirer characteristics. The subprime crisis in 2008 was a minor deterrent in the acquisition activity for both financial buyers and strategic buyers resulting in larger value deals with targets with smaller revenues.

Implications & Recommendations: This study provides insights into the importance and relevance of signals in PE-backed private company acquisitions by examining the characteristics of such acquisitions, the acquirer preferences, and the determinants of deal value. Private companies are less visible and less transparent as compared to public companies, making them obscure and difficult to value. Therefore, strategic acquirers and financial acquirers rely on signals to assess the viability of the potential target, with PE backing serving as a notable certification. This study indicates that PE-backing influences deal value and acquirer's preferences. Despite the 2008 financial crisis influencing acquisition activity, both sets of acquirers were able to leverage their experiences into their respective acquisitions. Higher total and relevant experience seemed to work favourably for acquirers, who profited from increased bargaining power.

Contribution & Value Added: Firstly, this study enriches and adds to the knowledge of the literature on acquisitions, particularly private company acquisitions and the role played by PE in the same. Next, this study adds to the literature on the subprime crisis and the impact of the crisis on acquisition activity. Further, this article provides insights into strategic decision-making by the two dominant acquirers- strategic acquirers, and financial acquirers- when they are limited by a target pool and the interpretation of signals by the target. Finally, the examination of PE-backed private company acquisitions adds to the study and practice of entrepreneurial finance by examining the role of PE as a signal to deal with quality to encourage acquisitions of privately held targets.

Article type: research article

Keywords: Private company acquisitions; private equity; deal value; financial buyers; strategic buyers

JEL codes: G34, G24

Received: 10 July 2023 Revised: 23 September 2023 Accepted: 7 May 2024

Suggested citation:

Gemson, J. (2024). Acquisitions of private-equity-backed private companies: Insights from acquirer's choice of target and the implications on deal value through the subprime crisis. *Entrepreneurial Business and Economics Review,* 12(3), 7-24. https://doi.org/10.15678/EBER.2024.120301

INTRODUCTION

Mergers and acquisitions (M&A) are a characteristic feature of the modern economy with global M&A volumes amounting to USD3.4 trillion worldwide in 2022 (Statista, 2023). Extant literature has examined motivations, trends, determinants, and performance of the process to include efficiency-related reasons (Gompers & Xuan, 2008), to help firms gain access to new resources in business sectors (Pazarskis *et al*., 2018), to cluster by industry and driven by deregulation (Andrade *et al*., 2001; Mitchell & Mulherin,1996), and due to managerial behaviour and promotion of self-interest (Heaton, 2002; Shleifer & Vishy, 1989; Jensen, 1986; Roll, 1986; Jensen & Meckling, 1976). A further theory based on inefficient markets and rational managers (Shleifer & Vishy, 1989) examined mergers as an arbitrage opportunity through which managers took advantage of the stock market's misvaluation of the acquiring firm's stock and its perception of resulting synergies.

The views above heighten the distinguishing features of public companies and the rationales that led to mergers and acquisitions in them. Greater visibility, regulatory disclosure requirements, greater ties with investment banks, and enhanced analysts' coverage cause public companies to be more well-known (Capron & Shen, 2007) and have more liquidity allowing for value by the market and feedback through the role of professional arbitrageurs, which helps lessen uncertainty with respect to their value. The visibility, liquidity, and disclosure requirements of public companies are juxtaposed with the opaqueness of private companies, which boast significantly larger volumes of acquisitions as compared to their public counterparts (Capron & Shen, 2007; Draper & Paudyal, 2006). This makes private company acquisitions worthy of examination.

Although private companies may be difficult to locate and value (Deeds *et al*., 1999) and more illiquid (Fuller *et al*., 2002), less information on private targets leads to more value-creating opportunities for exploiting private information (Capron & Shen, 2007). Therefore, acquirers have to rely on signals in the form of information transmitted by the company itself (Spence, 1974), and/or other participants, such as the PE seller. Private companies can tailor and customize the information they want to communicate (Arikan, 2005; Ragozzino & Reuer, 2007), and PE firms are known to provide certification for the quality of the target due to an alleged superior governance mechanism (the Jensen Hypothesis) (Jensen, 1986; 1989). Thus, deal values contain a combination of information presented by the target company, deal characteristics, and the acquirer's skill and experience, as well as the signals provided by the PE-backing. While the acquirer is an important player in the transaction, they constitute one of two buyers – a strategic buyer (corporate firm) seeking long-term synergies, or a financial buyer (PE firm) seeking a profit within a set time frame. Both these acquirers are active participants in the market for corporate control (Manne, 1965) seeking suitable opportunities.

In this study, I examined one particular type of acquisition – the private-equity-backed (PE) private company acquisition, and the role PE plays in the acquisition and among the private company target pool.

As part of this study, I analysed global PE-backed private company acquisitions that took place between 2000 and 2017. This timeframe also allows for the examination of the impact of the subprime crisis. This strategy study (Capron & Shen, 2007; Shen & Reuer, 2005) focuses on the acquirer's choice of target and the implications on deal value, without dealing with performance implications.

The rest of the article is organized as follows. The next section will provide a review of the private company acquisitions and the subprime crisis, the PE-backed target, and the importance of the acquirer while stating the hypotheses. Next, I will present the data used for the study followed by the analysis. Next, I will move to the results of the analysis and discuss them. The implications of the study are presented. Finally, I will present conclusions and future research directions.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Private Company Acquisitions and the Subprime Crisis

Literature on public and private company acquisitions yields inconsistent results. Fuller *et al*. (2002) conclude that private companies may be less valuable than similar, more liquid investments and Bargeron *et al.* (2008) conclude that public target shareholders received 63% higher premium from public acquirer firms rather than PE firms. Lys and Yehuda (2016) developed a valuation model, in which they demonstrate that relative to public targets, private targets commanded higher premiums over their stand-alone values and generated higher synergies in their acquisitions. Thus, the competition for acquisition and the subsequent procurement of rights limit divergence from shareholder wealth maximization by managers. This provides a mechanism through which economies of scale or other synergies available from combining or reorganizing control and management of corporate resources are realized (Jensen & Ruback, 1983).

Distinguishing features of the private company acquisition market sets them apart from public company acquisitions (Capron & Shen, 2007; Vinas *et al*., 2013; Brander & Egan, 2017; Gemson, 2021), making them relevant and worthy of discussion and research. Firstly, there are significant differences in deal structures, performance parameters, and patterns of returns between public acquisitions and private ones (Brander & Egan, 2017; Capron & Shen, 2007). Next, the analysis of private acquisitions enhances the study and practice of entrepreneurship and entrepreneurial finance (Brander & Egan, 2017) in that successful companies be acquired as privately-held targets. Finally, the nature and characteristics of private companies and the market for private acquisitions provide rich insights into the effects of information asymmetry (Brander & Egan, 2017; Gemson, 2021). Since private companies neither have a medium to automatically transmit information, nor have the onus to do so, they can tailor and customise the information they want to communicate (Arikan, 2005; Ragozzino & Reuer, 2007). Such information in the form of signals that may be transmitted may be valuable and can reduce adverse selection problems (Spence, 1974).

The market for private acquisitions is large and important, and such acquisitions form a significant part of the financial market and the market for corporate control (Brander & Egan, 2017; Gemson, 2021). Crises events can introduce shocks into the economy causing a disruption in financial systems (Bernake, 1983) including acquisition activity and can cause acquirers to become more cautious. Pazarskis *et al*. (2018) examined the impact of the economic crisis in Greece and concluded that mergers were not successful as a business strategy during the crisis period. Literature on the impact of the subprime crisis indicates that the subprime crisis negatively affected the likelihood of diversifying and cross-border acquisitions (Cerrato *et al*., 2016) and acquisition activity levels reduced during the years preceding the financial crisis (Andriuskevicius, 2015). Despite prevailing financial and market turmoil, the global mergers and acquisitions market was resilient and witnessed unseen growth (Andriuskevicius, 2015). Limited studies have examined the private acquisition market and the effect of the global financial crisis on the determinants of acquisitions, and this study aims to fill the gap. Thus, I hypothesized:

H1: There is a changing nature of acquisitions post subprime crisis.

The PE-backed Target

Private entities deals are heterogeneous (Cressy *et al.,* 2007) in terms of opportunities for performance improvements (Wright *et al.,* 2008) and PE firms have subsequently been known to seek appropriate methods to drive improvements in operational performance and improve efficiencies.

On average, academic research has found improvements in operations and performance because of PE involvement, leading to superior returns and increased value (Wright *et al*., 2009), and the PE industry has often been hailed as a new and efficient form of organization that generates economic efficiencies through a superior governance framework (Jensen, 1986; 1989). Academic literature has examined operational and performance parameters both at a deal level (Acharya *et al.,* 2011; Achleitner *et al.,* 2011) and at the portfolio company level (Kaplan, 1989). Substantial average improvements have been noted in profitability and cash flow measures (Bull, 1989; Kaplan, 1989; Malone, 1989; Singh, 1990; Opler, 1992; Muscarella & Vetsuypens, 1990; Wright *et al*., 1992), in sales growth, margin

expansion, streamlining of capital expenditures, and working capital (Kaplan, 1989), in increases in return of assets of PE firms (Wright *et al*., 1992), in better financial ratios related to cash flows, sales, and return on investment (Bruining, 1992), leading to conclusions that PE-backed companies outperform peers in terms of operating performance (Kaplan, 1989; Muscarella & Vetsuypens, 1990).

Such improvements could be thought of as the result of appropriate approaches employed by PE firms (Wright *et al.,* 2008). Such approaches include active monitoring (Cotter & Peck, 2001; Guo *et al.,* 2007; Cornelli & Karakas, 2008) and resource provision (Gemson, 2015), improved incentive alignment, and governance engineering (Achleitner & Figge, 2014), and through the provision of smart capital and operational engineering (Kaplan & Stromberg, 2009). While active monitoring through involvement by PE constitutes an important contributor to improved performance (Cotter & Peck, 2001; Guo *et al*., 2007; Cornelli & Karakas, 2008), experience and specialization add to their effectiveness. More experienced PE firms are known to enhance their learnings (Gemson, 2021) and build better businesses, while industry specialization of PE firms (Gemson, 2021) adds significantly to increases in operating profitability of PE-backed buyouts (Cressy *et al*., 2007) and create long and lasting value through their involvement (Gottschalg & Wright, 2008). Moreover, PE firms that lack suitable resources are known to form alliances or syndicates (Lerner, 1994) for sharing information and resources. Incentive alignment can be achieved through increased managerial ownership (Leslie & Oyer, 2009; Muscarella & Vetsuypens, 1990) and the use of leverage to use the firm's free cash flows effectively (Jensen, 1989), while governance engineering results in improved reporting procedures, and the active monitoring of operations by PE firms (Acharya *et al.,* 2011; Metrick & Yasuda, 2011). Operational engineering is achieved through specific operational expertise and industry-specific capabilities to actively support portfolio companies (Kaplan & Stromberg, 2009; Sousa, 2010). Wright *et al.* (2008) argue that although enhanced incentives contribute substantially to operational performance improvements, their equity stake in PE may be directly related to the price paid for the deal or to the selection of attractive deals. Wright *et al.* (2008) found evidence suggesting that the size of the management's equity stake is an important influence on performance, and it also influences the amount of external funding that needs to be raised.

Therefore, PE presence is one of the key value-creating drivers (Guo *et al.,* 2011) and has often been akin to providing a certification effect (Wu *et al.,* 2014; Sahlman, 1990; Barry *et al.,* 1990) to signal deal quality (Jensen, 1989). Gompers and Xuan (2006) examine the characteristics of the acquisition of venture capital (VC) backed by private firms by public companies. They argue that VC-backed start-ups are composed primarily of future growth opportunities, and therefore acquirers have considerable growth capabilities so that they can fully take advantage of the real options acquired once the opportunities arise in the future. Hammer *et al*. (2022) conclude that PE-backing induces a sizable but short-lived boost to acquisition activity. Brander and Egan (2017) argue that typical patterns for successful entrepreneurial companies were to have an initial public offering (IPO) or be acquired as a privately-held target, with the latter happening more frequently. It would be interesting to examine the effect of PE-backing on private company acquisitions. Thus, I hypothesized that the PE presence and backing would signal the quality of the private target:

H2: The PE-backing of a private target can increase the deal value in an acquisition.

The Importance of the Acquirer

The two dominant acquirers in the market for corporate control, *i.e.* strategic acquirers (corporate buyers) and financial acquirers (PE buyers), have different purposes of existence, business models, acquisition approach, and processes (Teerikangas, 2015), and therefore differ in their objectives for said acquisitions. The acquisition process is known to realise synergies (Zaks *et al*., 2018; Kalsie & Singh, 2022) including realizing and enhancing growth potentials, cost-based synergies, revenue-based synergies, or organizational learning (Austin & Leonard, 2008). While strategic acquirers seek long-term synergies, financial buyers intend short to medium-time horizon exits harnessing profitable returns. Such acquirers will also differ on various dimensions including affinity for specific assets such as performance parameters (Gemson, 2021), engagement in exporting and timeframes of association with

targets, organizational skills to improve profitability and productivity (Baziki *et al.,* 2017), and varying target appeals (Gorbenko & Malenko, 2014; Gemson, 2021).

Adverse selection (Akerlof, 1970) is an inherent feature of the M&A market, heightened by the lacuna of the private target. Subsequently, the type of search is of prime importance (Capron & Shen, 2007) and acquirers will need to resort to interpreting signals the target company sends. The PE-backing of such a target aims at providing some comfort in terms of increased operational efficiency and performance parameters. However, PE firms are known to be skilled in negotiating deal values, sometimes at the expense of the acquiring firm.

The deal value is of paramount importance in the acquisition process because a favourable value will assist acquirers engage with targets to fulfil their goals. Bargeron *et al*. (2008) opine that target firms which harness operating synergies from their acquisitions would be acquired by operating firms and correspondingly have a higher premium. Gorbenko and Malenko (2014) conclude that the valuation of a strategic buyer is 16.7% above the stand-alone market value of the target while that of a financial buyer is 11.7% above the stand-alone market value of the target. While strategic acquirers may be limited by their ability to value targets, financial acquirers have well-honed insights (Bottazzi *et al*., 2008). They also have well-developed professional judgments and social networks to identify target firms with potential investment value in the market (Tang & Lei, 2018). Holloway *et al.* (2016) argue that the determinants of acquisitions can be mapped to characteristic features that form the underlying heterogeneity of PE firms. Gemson (2021) concludes that financial acquirers had significantly larger-sized deals as compared to strategic buyers in private markets. Thus, I hypothesized:

H3: Strategic acquirers and financial acquirers have differing preferences in PE-backed private acquisition targets.

RESEARCH METHODOLOGY

The Sample

I obtained data for this study from the PrivCo database which provides details on privately held companies, including private market M&A, VC, and PE deals. A deal, for this study, represents a completed acquisition of a private target on a specific date made by a buyer(s) purchased from a PE seller(s) for a specific value. Deal information available in the PrivCo database includes the date of the acquisition, target name, sector, deal value, buyer, and seller information. In the analysis, I used completed acquisition deals between 2000 and 2017. There were fewer deals in the earlier years as compared to the later periods. I sourced other variables from Bloomberg and the World Bank database.

The dataset for this study consisted of 2392 PE-backed completed acquisitions of private companies between 2000 and 2017. Out of the 2392 acquisitions, 1852 acquisitions were in the United States (77.4% of the sample) while 540 acquisitions corresponded to the rest of the world (22.5% of the sample). Such trends have been noted by Capron and Shen (2007). In total, 665 (27.80%) acquisitions were by financial acquirers (PE), and 1727 (72.19%) acquisitions were by strategic acquirers (corporations). The total value of these acquisitions was approximately USD1322.5 billion and was spread over 45 countries.

Summary Statistics

Table 1 presents a summary table of the sample of PE-backed acquisitions.

An examination of Table 1 reveals an increase in the number of PE-backed acquisitions as well as the total deal value of acquisitions during the time periods in question. In Period 1 (2000-2004) there were fewer acquisitions, which could also be due to the non-recording or unavailability of deals in the database. The Period II (2005-2008) showed a steep increase in the number of deals. This was the period just prior to the subprime crisis. Period III (2009-2012) and Period IV (2013-2017) after the subprime crisis showed an increase in a number of deals, albeit at a lower growth rate.

The average deal value fell between 37.70% in Period II just prior to the subprime crisis, indicating a cautious deal activity during the subprime crisis. Period III clocked a revival of average deal sizes, with increases of 23.14%. Period IV showed robust growth with a 42.54% increase in average

deal value globally. The total deal value throughout the four periods showed increasing trends. Although the subprime crisis resulted in caution with smaller average deal sizes, there were increased total deal values indicating that appetites were by no means destroyed. Global total deal values were USD394.34 billion in Period III and USD708.107 billion in Period IV indicating growths of 90.66% and 79.57% from prior periods respectively.

Table 1. Summary snapshot of the sample of PE-backed acquisitions used in the study

Period	Time Period	Number of acquisitions	Growth Rate	The average deal value of acquisitions (USD, millions)	Growth Rate	Total deal value of acquisitions (USD, billions)	Growth Rate
I	2000-2004	21		629.964		13.229	
II	2005-2008	527	2409.52%	392.461	-37.70%	206.827	1463.44%
III	2009-2012	816	54.84%	483.26	23.14%	394.34	90.66%
IV	2013-2017	1028	25.98%	688.82	42.54%	708.107	79.57%

Source: own study of data sourced from PrivCo.

Table 2 presents a summary snapshot of the acquirers of the PE-backed private company acquisitions in the sample.

Table 2. Summary snapshot of the two dominant acquirers of PE-backed private company acquisitions

Acquirer type	Number of acquisitions	Average deal value (USD, millions)	Total deal value (USD, billions)
Strategic acquirer (corporate firm)	1727	509.1542	879.309
Financial acquirer (PE firm)	665	666.4585	443.195

Source: own study of data sourced from PrivCo.

From Table 2, we see that strategic acquirers or corporate firms were more popular than financial acquirers or PE firms. Strategic acquirers comprised 1727 deals or 72.19% of the sample while financial acquirers or PE firms accounted for only 665 deals or 27.8% of the sample. The total deal value of these strategic acquirers was USD879.309 billion while the total deal value of financial acquirers was only 54.2% of the same, amounting to USD443.195 billion. However, when I considered the average deal value, the financial acquirer had a greater average deal value of USD0.666 billion as compared to USD0.509 billion for strategic buyers.

Figure 1 shows the distributions of acquisitions geographically.

The large number of acquisitions translated into the fact that North America had the largest total deal value comprising USD966.97 billion, followed by Europe with USD302.76 billion which has been captured in Panel B in Figure 1. The total deal value in Asia was USD39.74 billion with the Oceania regions clocking a total deal value of USD7 billion.

However, when I considered the average deal value, Panel C in Figure 1 showed a different scenario. The average PE-backed acquisition was the largest in Europe clocking USD0.7 billion, followed by South America, with an average PE-backed acquisition being valued at USD0.65 billion. Acquisitions in Asia, North America, and Oceania followed with average deal values of USD0.55 billion, USD0.51 billion, and USD0.46 billion respectively. This indicates that while North America had robust acquisition activity, the average deal value was smaller compared to acquisitions in the other regions. More specifically, deals in Africa valued at an average of USD 0.198 billion were lower in value.

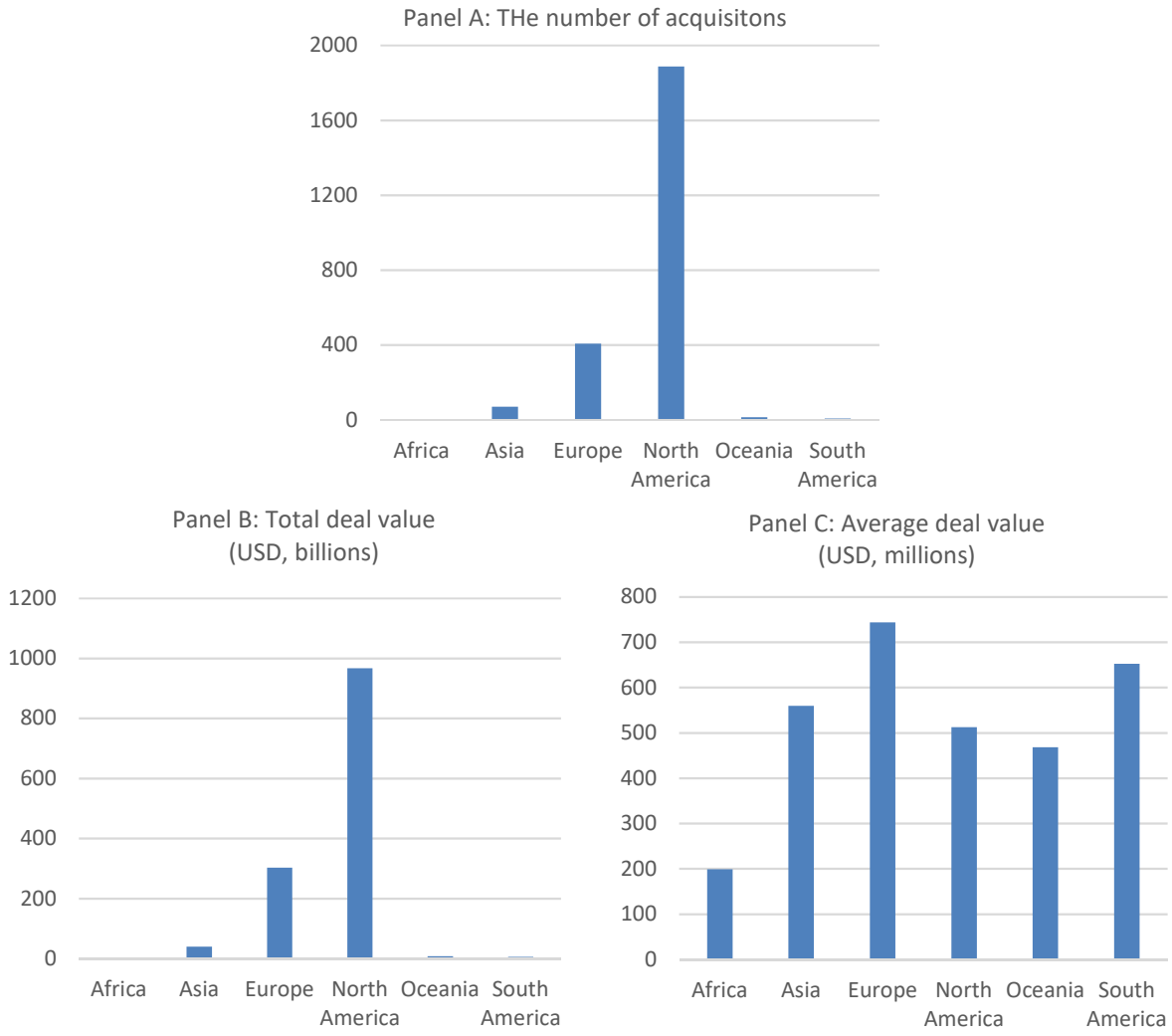

Figure 1. Distribution of PE-backed acquisitions of private companies geographically, 2000-2017
Note: Panel A: The number of acquisitions. Panel B: Total deal value (USD, billions).
Panel C: Average deal value (USD, millions).
Source: own elaboration of data sourced from PrivCo.

Figure 2 shows the distributions of acquisitions as per industry sector. There are nine industry sectors – agriculture (including agriculture and forestry), construction (including construction and real estate), consumer products (including consumer products, e-commerce, retail, and hospitality), finances (including financial, banking, commercial financial services, insurance, lending, and trading and brokerage), healthcare & biotechnology (including healthcare, biotechnology, and pharmaceuticals), infrastructure (including clean energy, energy & utilities, and transport), manufacturing (including manufacturing and industrial), services (including media, services, administrative services, consulting, broadcasting), and technology (including technology, Internet services, Internet content, and software).

Panel A in Figure 2 shows the distribution of a number of PE-backed private company acquisitions in the nine industry sectors. The services sector (20.74%) and the technology sector (19.90%) had the greatest number of acquisitions followed by the manufacturing sector (17.94%) and the healthcare & biotechnology sector (16.18%). The infrastructure sector accounted for 9.91% of the number of acquisitions in the sample, followed by the consumer products (7.40%) and the financial sector (5.39%). The construction and agriculture sector had a smaller number of deals. An examination of Panel A indicated that the companies that were acquired were not confined to any specific sector but were from diverse

industry sectors. There were no dominant industry sectors when it came to PE-backed private company acquisitions reinstating that acquisitions were heterogeneous.

Panel B in Figure 2 shows the average deal value in PE-backed private company acquisitions in the sample. The average acquisition for this sample was valued at USD552 million. The largest averages belonged to the agriculture sector which also had the fewest number of deals in the sample. The financial sector followed with an average acquisition valued at USD756.77 million, while the healthcare & biotechnology sector had average acquisitions valued at USD726.81 million dollars. The technology sector, services sector, and manufacturing sector, while clocking the greatest number of acquisitions had average deal sizes of USD0.44 billion, USD0.478 billion and USD0.46 billion respectively.

Panel C in Figure 2 shows the total deal value of all PE-backed private company acquisitions in the sample. The healthcare & biotechnology sector accounted for the largest value with USD281.27 billion with 387 acquisitions, accounting f or 21.27% of the total deal value in the sample. The services sector came in second with a total deal value of USD237.136 billion in the 496 acquisitions, accounting for 17.93% of the total deal value in the sample. The technology sector and the manufacturing sector clocked total deal values of USD217.267 billion and USD197.350 billion respectively, while the infrastructure sector saw a total deal value of USD151.027 billion. The consumer products sector and financial sector each account for 7.8% of the total deal value in the sample, while the construction and agriculture sectors together accounted for 2.5% of the total deal value.

An examination of the sample depicts the diversity in industry sectors of PE-backed acquisitions and wide variations in average and total deal values. No specific industry-dominated private company acquisitions.

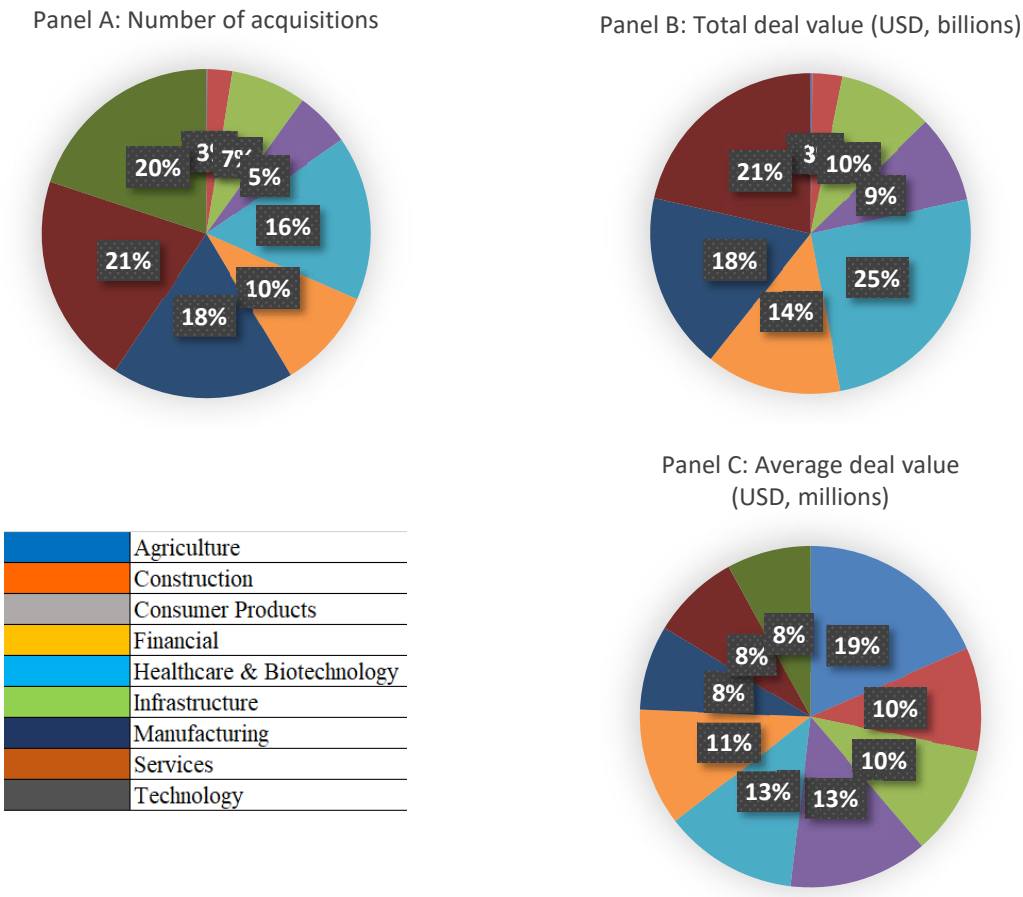

Figure 2. Distribution of PE-backed acquisitions of private companies sector-wise, 2000-2017

Note: Panel A: The number of acquisitions. Panel B: Total deal value (USD, billions).
Panel C: Average deal value (USD, billions).
Source: own elaboration of data sourced from PrivCo.

Methods

This study is similar to strategy studies (Capron & Shen, 2007) where the research question focuses on the acquirer's choice of target (Shen & Reuer, 2005) without dealing with performance implications.

I used comparative analysis to identify significant differences in PE-backed private company acquisitions in the sample. I performed two sets of comparative analyses. Firstly, I did a comparative analysis for two periods, 2000-2008, and 2009-2017 to identify changes, if any, in acquisitions after the subprime crisis. I analysed the key parameters such as deal value, acquirer type, acquirer experience, target's revenues, and target's EBITDA. Secondly, I conducted comparative analysis to identify differences, if any, in acquirer preferences on target companies on performance measures such as total assets, total equity, revenues, net income, cash flow, EBITDA, and operating income. I used the independent sample t-test to perform the two sets of comparative analyses.

Next, I used a 2-stage regression model to identify the determinants of deal value of PE-backed private company acquisitions. In the first stage, I regressed the acquirer variable – BUYER (a dummy variable indicated either a financial buyer or a strategic buyer) – on a set of exogenous variables. In the second-stage regressions, I used the fitted variable as an explanatory variable for the dependent variable. The dependent variable was the deal value – DEALVALUE (2010 billion USD). I used the natural log form of this variable for the analysis. Independent variables represented deal level characteristics, acquirer characteristics, and target parameters.

Table 3 presents the variables that I used in the analysis.

Table 3. Variables used in the analysis

Particulars	Description
Dependant variables	
BUYER	The acquirer in the completed acquisition. This variable is represented by a binary variable, 1 representing a financial acquirer firm, 0 representing a strategic firm. This value has been controlled for endogeneity with the age of the target, whether the deal was a local deal and the presence of a buyer syndicate.
BUYERSYN	The presence of a syndicate buyer. This variable is represented by a binary variable, 1 representing a syndicate, and 0 otherwise.
BUYEREXP	The cumulative experience of the buyer(s) in the deal, in years.
BUYERRELEXP	Relevant experience of the buyer in the deal. This variable is represented by a binary variable, 1 representing experience in the industry of the target, 0 representing no industry experience.
LOCAL	Indicating if the completed acquisition was completed in the same country as the buyer. This variable is represented by a binary variable, 1 representing a local deal, 0 otherwise.
STAKE	The percentage stake acquired in the target firm expressed as a percentage.
TARGETAGE	Age of the target, in years, at the time of acquisition.
TARGETREV	Revenue (million USD) of the target in the year of acquisition, expressed as a natural log.
Control variables	
NORTHAMER / EUROPE / ASIA / OCEANIA / SOUTHAMER	Region variables representing North America, Europe, Asia, Oceania, and South America. This variable is used to capture region effects.
CONSTRU / CONSUMER / FINANCIAL / HEALTHCARE / INFRA / MANU / SERVICES / TECH	Sector variables representing the construction sector, consumer sector, financial sector, healthcare & biotechnology sector, infrastructure sector, manufacturing sector, services sector, and technology sector. I used this control variable to capture industry effects.

Source: own study.

An examination of Table 4 provides interesting insights between the two periods in question. Targets that were older and had lower revenues were preferred post-subprime crisis. Brander and Egan (2017) note that private targets are often younger firms typically emerging from entrepreneurial sta-

tus, and less information about them is publicly available. However, after the subprime crisis, target firms that are older and have relatively lower revenues were acquired. This indicates a shift in the preference of both acquirers, despite PE-backing. Deal values are also significantly larger post-2008.

Table 4. The results of the comparative analysis indicating any changes in the periods in question

Particulars		2000-2008	2009-2017
Deal Value	N	548	1844
	μ	401.563	597.856
	t	3.693***	
Buyer Type	N	548	1844
	μ	0.30	0.27
	t	-1.482	
Buyer Experience	N	548	1844
	μ	36.33	43.08
	t	2.345**	
Target Age	N	548	1844
	μ	22.39	25.29
	t	2.075**	
Revenue during the acquisition year	N	133	278
	μ	767.60	709.19
	t	-0.433	
Revenue one year prior to the acquisition	N	40	443
	μ	1130.11	593.153
	t	2.075**	

Note: ***99% CI, **95%CI, *90%CI; I divided the sample into two time-periods, i.e. 2000-2008, and 2009-2017.
Source: own study.

Table 5 presents the results of the comparative analysis indicating acquirer preferences on targets. Target parameters including total assets, equity, revenue, net income, cash flow, EBITDA, and operating income are compared during the year of acquisition and one year prior to the year of acquisition to identify if company performance measures influence preferences of the two types of acquirers.

Table 5. Comparative analysis indicating differences in acquirer preferences on target companies

Particulars		Year of acquisition	One year prior to the acquisition
TOTAL ASSETS			
Strategic acquirer	N	30	101
	μ	1708.86	1097.92
Financial acquirer	N	40	98
	μ	1459.03	1146.36
	t	-0.22	0.110
TOTAL EQUITY			
Strategic acquirer	N	27	81
	μ	454.33	565.75
Financial acquirer	N	40	74
	μ	433.33	253.89
	t	-0.074	-1.283
REVENUE			
Strategic acquirer	N	267	305
	μ	596.59	592.13
Financial acquirer	N	144	178
	μ	971.93	715.57
	t	2.868**	1.061

Particulars		Year of acquisition	One year prior to the acquisition
NET INCOME			
Strategic acquirer	N	20	76
	μ	181.38	109.09
Financial acquirer	N	32	82
	μ	222.06	69.71
	t	0.224	-0.799
CASH FLOW			
Strategic acquirer	N	5	23
	μ	17.48	365.37
Financial acquirer	N	9	35
	μ	68.68	132.71
	t	1.298	-1.051
EBITDA			
Strategic acquirer	N	25	50
	μ	164.07	103.44
Financial acquirer	N	31	29
	μ	135.55	287.28
	t	0.077	2.434**
OPERATING INCOME			
Strategic acquirer	N	19	66
	μ	584.38	45.5
Financial acquirer	N	29	87
	μ	69.22	50.87
	t	0.02	0.350

Note: ***99%CI, **95%CI, *90%CI.
Source: own study.

Strategic acquirers and financial acquirers did not differ in asset and equity values, incomes, and cash flows of the targets. Only variables indicating revenues (in the year of acquisition) and EBITDA (one year prior to the year of acquisition) emerged as significant, both at 95% confidence interval. This suggests that financial acquirers preferred targets with larger revenues and EBITDA indicating that they preferred targets with larger core profits and operational profitability.

Factors Influencing Deal Value

I conducted a regression analysis to examine the factors that affect deal value in private company acquisitions. I also attempted to verify if the acquirer influences the value of the deal. Hence, I used the dummy variable *BUYER* indicating 1 for a financial buyer and 0 for a strategic buyer to see if it is fit for acquirer choice following the procedure discussed by Boone and Mulherin (2007). Next, I used this fitted value as an independent variable to identify if it influenced deal value. Similarly, the variables *BUYEREX* and *BUYERRELEXP* were fitted with relevant experience and presence of a syndicate, and total buyer experience and presence of a syndicate respectively.

An examination of Table 6 provides insights into the various factors that affect deal value for PE-backed private company acquisitions. I observed that the variable *BUYER* emerged as positively significant in all regressions 1, 2, 3, 4. This indicates that financial buyers acquired deals at significantly higher deal values as compared to strategic buyers. Prior research on buyer influence on deal value on public targets suggested that strategic buyers tended to pay a larger premium on deals. Gorbenko and Malenko (2014) concluded that, on average, the valuation of a strategic buyer is 16.7% above the stand-alone market value of the target while that of a financial buyer is 11.7% above the stand-alone market value of the target. However, when private targets are considered, financial buyers have significantly larger deal values (Gemson, 2021). In this study, the PE-backed target seems to garner a larger deal value with financial buyers too.

Table 6. The results of the OLS regression used the examined factors affecting deal value

Regression	1	2	3	4	5	6
Number of Observations	2,392	2392	2280	2392	448	448
Prob > F	0.0000	0.0000	0.000	0.000	0.000	0.000
R-squared	0.0465	0.0633	0.0878	0.0651	0.4163	0.4431
Adj R-squared	0.0409	0.0570	0.0806	0.0591	0.3988	0.4198
Root MSE	1.4972	1.4846	1.4641	1.4829	1.057	1.0322
BUYERPE#	0.8642***	3.2884***	5.6353***	0.6160***	0.3445	4.0166
BUYEREXP*	–	-0.0994***	-0.1343***	–	–	-0.0545
BUYERRELEXP$	–	-22.0346***	-17.8325***	–	–	8.0485
LOCALDEAL	–	–	-0.5347***	–	–	-0.4246**
STAKE	–	–	0.0084***	–	–	0.0128***
TARGETAGE	–	–	–	0.0077***	0.0023	-0.0025
TARGETREV	–	–	–	–	0.5662***	0.5562***
NORTHAMER	0.5213	1.5789*	0.7390	0.5223	0.7404	-0.3111
EUROPE	1.0518	2.1496**	1.1583	1.0068	0.6446	-0.4667
ASIA	0.4305	1.5580*	0.8169	0.4355	1.4566	0.4144
OCEANIA	1.0018	2.1077**	1.1336	0.9482	1.2195	–
SOUTHAMER	1.0878	2.2255**	1.4636	1.0512	–	-0.9465
CONSTRU	-1.6865	-1.6478	-1.4910	-1.4826	–	–
CONSUMER	-1.3975	-1.3342	-1.1860	-1.1975	0.3953	0.6276
FINANCIAL	-1.2152	-1.1401	-1.0202	-0.9981	0.2372	0.4888
HEALTHCARE	-1.3821	-1.3728	-1.2781	-1.1361	0.4172	0.4959
INFRA	-1.4289	-1.4039	-1.2679	-1.2291	0.2279	0.2982
MANU	-1.6184	-1.6136	-1.5645	-1.5132	0.0787	0.1978
SERVICES	-1.6150	-1.5502	-1.4468	-1.3989	0.1406	0.1628
TECH	-1.8684*	-1.7436*	-1.5955	-1.5980	0.5579	0.6505

Note: # value fitted by obtaining a predicted variable with a logit regression, in which the buyer choice was regressed against the age of the target, whether the deal was a local deal, and the presence of a buyer syndicate; * value fitted by obtaining a predicted variable with multiple regression, in which the buyer experience was regressed against relevant experience and the presence of a buyer syndicate; $ value fitted by obtaining a predicted variable with a logit regression where the relevant experience was regressed against total experience and the presence of a buyer syndicate; *** 99% CI, **95% CI, *90% CI. Source: own study.

When I examined acquirer characteristics, variables *BUYEREXP* and *BUYERRELEXP* emerged negatively significant in regressions 2 and 3, indicating that both total experience and relevant experience of the buyer affected deal values. The negative significance of total experience and relevant industry experience could be translated into the fact that more experienced buyers (both with overall experience and with relevant experience) are able to use their bargaining power while picking good deals and bargain for lower prices. However, these variables lose their significance when the target parameters are considered, indicating that company information and availability supersede experience levels.

The examined deal characteristics included variables representing *LOCAL* and *STAKE* – which represented a local deal and the percentage of stake acquired. The variable *LOCAL* emerged as negatively significant indicating that the physical proximity between the buyer and the target reduced deal values. Location often played a major role in deal value with cross-border deals being more expensive. Reuer and Ragozzino (2007) opine that lack of information on private firms limits the breadth of the acquirer's search and increases the risk of not evaluating properly the assets of private targets. Therefore, acquirers may prefer to buy private targets for local search. The positive significance of STAKE indicates that acquisitions which involved larger stakes had significantly larger deal values, which is on expected lines.

Target characteristics included variables *TARGETAGE* and *TARGETREV*, both of which appeared positively significant (regressions 4 and 5). *TARGETAGE* represented the age of the target which has been often used in academic literature to recognise the information asymmetry surrounding companies. Younger firms had more information asymmetry surrounding them translating into increased risk, indicating that

these targets are valued less (despite being PE-backed), while older targets had larger deal values. However, in private acquisitions, private targets are oft younger companies just emerging from entrepreneurial status (Brander & Egan, 2017) and less information about them is publicly available, translating into little objective data to disclose to prospective investors (Sanders & Boivie, 2004) while long-standing firms produce more objective data about their operations (Henderson, 1999). The variable *TARGETREV* represented the revenues of the target in the year of acquisition and the positive significance of the same indicates that targets with larger revenues had larger deal values. When both *TARGETAGE* and *TARGETREV* were taken together (regression 5), *TARGETAGE* lost significance indicating the revenues of the target are more significant and appear to lend an element of comfort to the deal to increase its value.

Finally, when I considered all variables together in Regression 6, the variable *TARGETREV* appeared significant. This indicates that the target's revenue was the most important regarding deal values. Company parameters superseded all other factors affecting deal value including PE-certification effects and buyer experience.

The regressions were controlled for location and industry sectors. When the experience levels of the buyer were considered, most regions emerged significant. This indicated that the levels of experience (both total and relevant) pertain to the region where the deals took place. However, industry sectors did not emerge significantly.

RESULTS AND DISCUSSION

This study explored the characteristics of worldwide acquisitions of PE-backed private companies and examined the impact of the subprime crisis, the differences in acquirer preferences and determinants of deal value. Private companies are known to suffer from a lack of visibility and transparency making them little known, difficult to locate and value. Thus, potential acquirers may be bereft of an automatic transmission mechanism whereby information is easily obtainable, and inefficiencies identifiable, and therefore may need to rely on signals provided by the potential target and/or third parties, such as PE firms backing such companies. The presence of PE backing is known for providing a certification for the quality of the target due to alleged superior governance mechanism (Jensen, 1986; 1989). Therefore, it was interesting to examine the characteristics of such acquisitions.

The examined sample of worldwide completed acquisitions from 2000-2017 provided rich insights into the same. The was a steady increase in the number and volume of acquisitions during the sample period. The subprime crisis in 2008 was a minor deterrent in acquisition activity, with smaller-sized acquisitions immediately following the years after the subprime crisis. However, there was a significant change in the nature of deals following the crisis. Independent sample t-tests indicated significant differences in revenues of targets, with targets with smaller revenues after the subprime crisis. An increase in target age along with lower revenues indicated that acquisitions after the subprime crisis were less risky companies. However, there was no significant difference in target performance characteristics, indicating that acquirers sought similarly placed companies. This indicated that although there was comfort in the presence of the PE, the market was more risk-averse and preferred deals with lower risk levels.

The results of the comparative analysis indicated that financial acquirers preferred targets with larger revenues and operational profitability. Parameters such as asset sizes, income, or cash flows did not influence acquirer choice. This indicated that financial buyers utilized the certifications effects of PE firms, and sought companies which they could divest from in a suitable period, which still gave them adequate returns.

The 2-stage regression conducted to examine the determinants of the deal value indicated that the choice of the acquirer and target characteristics influenced the deal value. The positive significance of the acquirer type indicated that financial acquirers sought larger deal values. While the literature on public companies concluded that strategic acquirers had larger premiums, private company acquisitions concluded that financial acquirers had significantly larger deal values. The experience levels of the buyer – both total and relevant – emerged negatively significant indicating that they contributed actively to deal values, by using their bargaining power to negotiate lower deal values. When only buyer experience was considered (Regression 2), region variables also emerged

significant, indicating that experience was region-specific too. However, experience levels were superseded by target-level parameters.

Deal characteristics examined included local deals and the percentage of stake acquired. The negative significance of the variable *LOCALDEAL* and the positive significance of the variable *STAKE* was on expected terms. The existing academic literature indicates that cross-border acquisitions are usually valued more because of proximity challenges due to differences in law, customs, business procedures, and dealings, causing increased risk and information asymmetry. Further, Reuer and Ragozzino (2007) opine that lack of information on private firms limits the breadth of the acquirer's search and increases the risk of not evaluating properly the assets of private targets, therefore, acquirers may prefer to buy private targets for local search.

When target characteristics were examined, the age of the target, a variable indicating the level of information asymmetry surrounding the deal appeared positively significant. This indicated that older targets had larger deal sizes. Younger targets are often prone to information asymmetry, especially in private companies, and have little objective data to disclose to prospective investors (Sanders & Boivie, 2004) while long-standing firms produce more objective data about their operations (Henderson, 1999). The significance of target revenues indicates that targets with larger revenues have significantly larger deal values. Other performance measures such as assets, equity, net income, cash flow, and EBITDA did not appear significant and were excluded from the analysis. The two acquirers, while having clear preferences over revenue measures, were not swayed by other performance measures. The non-significance of such performance measures reinstates the certification effects of PE-backing. The target revenue was the only company performance parameter which superseded the acquirer choice and their experience levels.

Implications

This study explored worldwide acquisitions of PE-backed private companies and examined the impact of the subprime crisis, the differences in acquirer preferences, and the determinants of deal value. Private companies face many challenges such as lack of visibility and transparency making it difficult for potential acquirers to obtain information and identify inefficiencies. The presence of PE backing is viewed as a certification of the quality of the target due to alleged superior governance mechanism (Jensen, 1986; 1989). Therefore, acquirers may rely on signals provided by the potential target and/or third parties, such as PE firms backing, as a signal and to mitigate the lack of information transmission. Therefore, it was interesting to examine the characteristics of such acquisitions.

While the timeline of this study included the subprime crisis of 2008, the results indicate that this crisis impacted acquisition activities with a minor deterrent immediately following the crisis. The years immediately following the crisis were marked with more caution – targets had greater age and significantly lower revenues. Although PE-backing provides a sense of comfort, acquirers indicated a preference for less risky companies.

The analysis of determinants of deal value indicates that acquirer and target characteristics play a significant role. Financial acquirers and strategic acquirers had varying target preferences; financial acquirers picked targets with larger revenues and operational profitability, and companies they could divest from in a suitable period, which still gave them adequate returns. Experience levels of the buyers, both total and relevant, contributed negatively to deal values. This implies that experienced buyers actively used their bargaining power to negotiate lower deal values. Moreover, target characteristics such as age and revenue also emerged as significant, with older targets and targets with larger revenues associated with larger deal sizes.

CONCLUSIONS

This study examined PE-backed private company acquisitions while analysing acquirer preferences and determinants of deal value during the subprime crisis. I observed and analysed the trends in global private company acquisitions, the determinants of acquisitions of the two dominant acquirers – strategic acquirers and financial acquirers, and PE-backing which provides a certification effect.

While there was a steady increase in private company acquisitions throughout the period in question, the time periods post the subprime crisis saw smaller-sized targets in terms of revenue. Crisis situations are known to throw financial systems off gear, so a move towards smaller-sized targets indicates the cautious nature of the acquirers.

While PE-backing provided the certification effects making performance variable non-significant, financial acquirers preferred targets with larger revenues and larger EBITDA. The PE-backing made other performance variables non-significant, their mere presence signalling target quality. However, the target revenue emerged strongly and positively significant, nullifying the significance levels of the acquirers as well as their experience levels. The deal value was influenced by the target characteristics and deal characteristics. Targets that were older and had larger revenues were more sought after, as with deals with larger stakes.

While this study examined trends of private company acquisitions, it was not free from challenges. Private companies, due to the private nature of their existence are difficult to locate and value, and hence this study was limited with respect to the level of publicly available information. While I used global data obtained from the PrivCo database and took care to verify the correctness of deals, this database may not capture all private company acquisitions. Further, this study is limited to the extent of the variables publicly available. The availability of additional performance measures and variables could certainly increase the insights that could be derived.

While this study provided insights into the preferences of acquirers and determinants of deal value, it would be interesting to examine if the results of such acquisitions are indeed favourable given the limitations of target choice. Future studies could examine the performance of such acquisitions to analyse if subsequent synergies and returns were indeed created in the course of such strategic decision-making. While adding to the literature on the impact of crises in financial markets, this study opens up avenues to contrast and compare the impact of the subprime crisis and the impact of the COVID-19 crisis on acquisition activity. Both crises sent financial systems off gear, and it would be interesting to examine the trends and nature of private company acquisitions through the two crises. The study also provides a setting to expand the impact and implications of the strategic decision-making of both the strategic acquirers and the financial acquirers in acquiring private targets. While entrepreneurship through acquisitions is a popular and fast-growing method, a deeper examination of the nature of PE-backing will shed insights into successful, private, entrepreneurial targets.

REFERENCES

Acharya, V.V., Gottschalg, O., Hahn, M., & Kehoe, C. (2011). Corporate governance and value creation: evidence from private equity', Working Paper (New York University-Leonard N. Stern School of Business, 2011). https://doi.org/10.2139/ssrn.1324016

Achleitner, A., & Figge, C. (2014). Private equity lemons: Evidence on value creation in secondary buyouts. *European Financial Management*, *20*, 2, 406-433. https://doi.org/10.1111/j.1468-036X.2012.00644.x

Achleitner, A.K., Braun, R., & Engel, N. (2011). Value creation and pricing in buyouts: empirical evidence from Europe and North America. *Review of Financial Economics*, *20*(4), 146-161. https://doi.org/10.1016/j.rfe.2011.09.001

Akerlof, G.A. (1970). The market for "lemons": Quality uncertainty and the market mechanism. *Quarterly Journal of Economics*, *84*(3), 488-500. https://doi.org/10.2307/1879431

Andrade, G., Mitchell, M., & Stafford, E. (2001). New evidence and perspective on mergers. *Journal of Economic Perspectives*, *15*, 103-120. https://doi.org/1257/jep.15.2.103

Andriuskevicius, K. (2015). Opportunities and challenges of value creation through merger and acquisitions in cyclical economies. *Procedia, Social and Behavioral Sciences*, *213*, 764-769. https://doi.org/j.sbspro.2015.11.471

Arikan, I. (2005). In the market for firms, how should a firm be sold?. In G.L. Cooper, & S. Finkelstein (Eds.), *Advances in mergers and acquisitions* (vol. 4, pp. 181-208). Greenwich, CT: JAI Press.

Austin, J.E., & Leonard, H.B. (2008). Can the virtuous mouse and the wealthy elephant live happily ever after?. *California Management Review, 51*, 77-102. https://doi.org/10.2307/4116646

Bargeron, L.L., Schlingemann, F.P., Stulz, R.M., & Zutter, C.J. (2008). Why do private acquirers pay so little compared to public acquirers?. *Journal of Financial Economics*, *89*, 375-390. https://doi.org/10.1016/j.jfineco.2007.11.005

Baziki, S.B., Norback, P.J., Persson, L., & Tag, J. (2017). Cross-border acquisitions and restructuring: Multinational enterprises and private equity firms. *European Economic Review*, *94*, 166-184. https://doi.org/10.1016/j.euroecorev.2017.02.012

Barry, C.B., Muscarella, C.J., Peavy, J., & Vetsuypens, M.R. (1990). The role of venture capital in the creation of public companies. *Journal of Financial Economics*, *27*(2), 447-471. https://doi.org/10.1016/0304-405X(90)90064-7

Bernanke, B.S. (1983). Non-Monetary Effects of the Financial Crisis in the Propagation of the Great Depression. *The American Economic Review*, *73*, 3, 257-276.

Boone, A.L., & Mulherin, J.H. (2007). How are firms sold?. *The Journal of Finance*, LXII(2), 847-874. April 2007. https://doi.org/10.2139/ssrn.642306

Brander, J.A., & Egan, E.J. (2017). The winner's curse in acquisitions of privately held firms. *The Quarterly Review of Economics and Finance*, *65*, 249-262. https://doi.org/10.1016/j.qref.2017.01.010 1062-9769

Bruining, H. (1992). Performance improvement post-management buyout. PhD diss., Erasmus University Rotterdam, Haveka.

Bull, I. (1989). Management performance in leveraged buyouts: An empirical analysis*. Journal of Business Venturing*, *3,* 263-78.

Capron, L., & Shen, J.C. (2007). Acquisitions of public vs private firms: Private information, target selection, and acquirer returns. *Strategic Management Journal*, *28*, 891-911. https://doi.org/10.1002/smj.612

Cerrato, D., Alessandri, T., & Depperu, D. (2016). Economic crisis, acquisitions, and firm performance. *Long Range Planning*, *49*(2), 171-185. https://doi.org/10.1016/j.lrp.2015.12.018

Cornelli, F., & Karakas, O. (2008). Private equity and corporate governance: Do LBOs have more effective boards?. In J. Lerner and A. Gurung (Eds.). *The global impact of private equity report 2008, globalization of alternative investments*, Working Papers (vol. 1, pp. 65-84). New York: World Economic Forum.

Cotter, J.F., & Peck, S.W. (2001). The structure of debt and active equity investors: The case of the buyout specialist. *Journal of Financial Economics*, *59*, 101-47. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=251890 on July 1, 2023.

Cressy, R., Malipiero, A., & Munari. F. (2007). Playing to their strengths? Evidence that specialization in the private equity industry confers competitive advantage. *Journal of Corporate Finance, 13*, 647-69. https://doi.org/10.2139/ssrn.964367

Deeds, D., DeCarolis, D., & Coombs, J.E. (1999). Dynamic capabilities and new product development in high technology ventures: An empirical analysis of new biotechnology firms. *Journal of Business Venturing*, *15*(3), 211-229. https://doi.org/10.1016/S0883-9026(98)00013-5

Draper, P., & Paudyal, K. (2006). Acquisitions: Private versus public. *European Financial Management*, *12*(1), 57-80. https://doi.org/10.1111/j.1354-7798.2006.00310.x

Faccio, M., McConnell, J., & Stolin, D. (2006). Returns to acquirers of listed and unlisted targets. *Journal of Financial and Quantitative Analysis*, *41*(1), 197-220. https://doi.org/10.1017/S0022109000002477

Farinós Viñas, J.E., Herrero, B., & Latorre Guillem, M. (2013). Value Creation When Acquiring Public vs Private Firms. Spanish Evidence (September 2, 2013). https://doi.org/10.2139/ssrn.2343558

Fuller, K., Netter, J., & Stegemoller, M. (2002). What do returns to acquiring firms tell us? Evidence from firms that make many acquisitions. *The Journal of Finance*, *57*(4), 1763-1793. https://doi.org/10.1111/1540-6261.00477

Gemson, J. (2021). Private company acquisitions in the market for corporate control: A comparison between private equity and corporate acquirers. *The Quarterly Review of Economics and Finance*, *81*, 342-357. https://doi.org/10.1016/j.qref.2021.06.014

Gompers, P.A., & Xuan, Y. (2006). The role of venture capitalists in the acquisition of private companies*. Harvard Business School and NBER, Harvard Business School*. Retrieved from http://ssrn.com/abstract=563822. on July 1, 2023.

Gorbenko, A.S., & Malenko, A. (2014). Strategic and financial bidders in takeover auctions. *The Journal of Finance*, LXIX(6), 2513-2555. https://doi.org/10.2139/ssrn.1559481

Gottschalg, O., & Wright, M. (2008). Understanding the buyers' role in private equity returns – the influence of skills, strategy and experience*. CMBOR Occasional Paper.*

Guo, S., Hotchkiss, E., & Song, W. (2007). Do buyouts (still) create value?. *SSRN Working Paper.*

Hammer, B., Hinrichs, H., & Schweizer, D. (2022). What is Different About Private Equity-Backed Acquirers?. *Review of Financial Economics*, *40*(2), 117-149, https://doi.org/10.2139/ssrn.2832444 on 17 November 2023.

Heaton, J.B. (2002). Managerial optimism and corporate finance. *Financial Management*, *31*, 33-46.

Henderson, A.D. (1999). Firm strategy and age dependence: a contingency view of the liabilities of newness, adolescence, and obsolescence. *Administrative Science Quarterly*, 44, 281-314. Retrieved from https://www.statista.com/statistics/267369/volume-of-mergers-and-acquisitions-worldwide/ on 17 November 2023. https://doi.org/10.2307/2666997

Jensen, M.C. (1986). The agency cost of free cash flow, corporate finance and takeovers. *American Economic Review*, *76*, 323-329. https://doi.org/10.2139/ssrn.99580

Jensen, M.C. (1989). The eclipse of the public corporation. *Harvard Business Review, 5*, 61-74.

Jensen, M.C., & Meckling, M.H. (1976). Theory of the firm: Managerial behavior, agency costs and the ownership structure. *Journal of Financial Economics*, *3*, 305-360. https://doi.org/10.1016/0304-405X(76)90026-X

Jensen, M.C., & Ruback, R.S. (1983). The market for corporate control: The scientific evidence. *Journal of Financial Economics*, 11, 5-50. https://doi.org/10.1016/0304-405X(83)90004-1

Kalsie, A., & Singh, N. (2022). Measurement of synergy in merger & acquisitions: A panel data approach using composite variable (principal component analysis). *Journal of Corporate Accounting & Finance, 33*, 36-51. https://doi.org/10.1002/jcaf.22523

Kaplan, S.N. (1989). Management buyouts: evidence on taxes as a source of value. *Journal of Finance*, *3*, 611-32. https://doi.org/10.1111/j.1540-6261.1989.tb04381.x

Kaplan, S.N., & Stromberg, P. (2009). Leveraged buyouts and private equity. *Journal of Economic Perspectives*, *23*(1), 121-46. https://doi.org/10.1257/jep.23.1.121

Leslie, P., & Oyer, P. (2009). Managerial incentives and value creation: evidence from private equity. *Working Paper (Rock Center for Corporate Governance – Stanford University, 2009).* https://doi.org/10.2139/ssrn.1341889

Luypaert, M., & Van Caneghem, T. (2017). Exploring the double-sided effect of information asymmetry and uncertainty in mergers and acquisitions. *Financial Management*, Winter, *2017*, 873-917. https://doi.org/10.1111/fima.12170

Lys, T.Z., & Yehuda, N. (2016). Do Acquisitions of Private Targets Create Higher Value? (November 30, 2016). Available at SSRN: https://ssrn.com/abstract=2877589 or https://doi.org/10.2139/ssrn.2877589 on July 2, 2023.

Malone, S. (1989). Characteristics of smaller company leveraged buyouts. *Journal of Business Venturing*, *4*, 345-59. https://doi.org/10.1016/0883-9026(89)90006-2

Manne, H.G. (1965). Mergers and the market for corporate control. *The Journal of Political Economy*, *73*(2), 110-120. https://doi.org/10.1086/259000

Mitchell, M.L., & Mulherin, J.H. (1996). The impact of industry shocks on take-over and restructuring activity. *Journal of Financial Economics*, *41*, 193-229. https://doi.org/10.1016/0304-405X(95)00860-H

Moeller, S.B., Schlingemann, F.P., & Stulz, R.M. (2004). Do shareholders of acquiring firms gain from acquisitions?. *Journal of Financial Economics*, *73*(2), 201-228. https://doi.org/10.2139/ssrn.383560

Muscarella, C., & Vetsuypens, M. (1990). Efficiency and organizational structure: A study of reverse LBOs. *Journal of Finance*, *65*, 1389-413. https://doi.org/10.1111/j.1540-6261.1990.tb03720.x

Opler, T.C. (1992). Operating performance in leveraged buyouts. *Financial Management*, *21*, 27-34. https://doi.org/10.2307/3665678

Pazarskis, M., Drogalas, G., & Koutoupis, A. (2018). Mergers and accounting performance: Some evidence from Greece during the economic crisis. *Accounting and Management Information Systems, 17*, 1, 31-45. https://doi.org/10.24818/jamis.2018.01002

Ragozzino, R., & Reuer, J.J. (2007). Initial public offerings and the acquisition of entrepreneurial firms. *Strategic Organization*, *5*(2), 155-176. https://doi.org/10.1177/1476127007079139

Roll, R. (1986). The hubris hypothesis of corporate takeovers. *Journal of Business*, *59*, 197-216. https://doi.org/10.1086/296325

Sahlman, W.A. (1990). The structure and governance of venture capital organizations. *Journal of Financial Economics*, *27*(2), 473-521. https://doi.org/10.1016/0304-405X(90)90065-8

Sanders, W.M.G, & Boivie, S. (2004). Sorting things out: valuation of new firms in uncertain markets. *Strategic Management Journal*, *25*, 2, 167-186. https://doi.org/10.1002/smj.370

Singh, H. (1990). Management buyouts: Distinguishing characteristics and operating changes prior to public offering. *Strategic Management Journal*, *11*, 111-29.

Sousa, M. (2010). Why do private equity firms sell to each others?. *Working Paper (University of Oxford – Said Business School, 2010.*

Spence, A.M. (1974). Market signaling: Informational transfer in hiring and related screening processes. *Cambridge, MA: Harvard University Press.*

Stromberg, P. (2007). The new demography of private equity. *Swedish Institute for Financial Research. Stockholm School of Economics Working paper.*

Shleifer, A., & Vishny, R.W. (1989). Management entrenchment: The case of manager-specific investments. *Journal of Financial Economics*, *25*, 123-139. https://doi.org/10.1016/0304-405X(89)90099-8

Sułkowski, Ł., Seliga, R., & Woźniak, A. (2019). Strategic Challenges of Mergers and Acquisitions in Higher Education Sector. *Entrepreneurial Business and Economics Review, 7*(2), 199-215. https://doi.org/10.15678/EBER.2019.070211

Tang, Q., & Lei, W. (2018). Identifying M&A targets and the information content of VC/PEs. *China Journal of Accounting Research*, *11*, 33-50. https://doi.org/10.1016/j.cjar.2016.08.002

Author

Josephine Gemson

Associate Professor of Finance at the School of Management, Economics, and Mathematics at King's University College at Western University. Her research interests include private equity, decision-making under uncertainty, infrastructure finance, and ethics.

Correspondence to: Dr. Josephine Gemson, School of Management, Economics, and Mathematics, King's University College at Western University, 266 Epworth Avenue, London N6A2M3, Canada, e-mail: jgemson@uwo.ca

ORCID http://orcid.org/0000-0001-5833-4204

Acknowledgements and Financial Disclosure

The author would like to thank PrivCo (www.privco.com) for providing data for this research. The extended support from Dan Gingert of PrivCo throughout the period of the study is also noted and acknowledged. The author also acknowledges financial assistance provided by the Kings Research Grants and the research assistance from the two research associates – Ismail El Sayed and Benjamin Buechler.

Conflict of Interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright and License

Published by Krakow University of Economics – Krakow, Poland

Ministry of Education and Science
Republic of Poland

The journal is co-financed in the years 2022-2024 by the Ministry of Education and Science of the Republic of Poland in the framework of the ministerial programme "Development of Scientific Journals" (RCN) on the basis of contract no. RCN/SP/0583/2021/1 concluded on 13 October 2022 and being in force until 13 October 2024.

Entrepreneurial Business and Economics Review

2024, Vol. 12, No. 3

10.15678/EBER.2024.120302

Much ado about refugee entrepreneurship? Refugee vs economic migrants' entrepreneurial intention in Poland

Alexandra David, Jolanta Maj, Maciej Filipowicz, Judith Terstriep, Sabina Kubiciel-Lodzińska

ABSTRACT

Objective: The objective of the article is to assess whether in Poland, Ukrainian war refugees exhibit more entrepreneurial intention than Ukrainian pre-war economic migrants.

Research Design & Methods: This article uses data from a panel study conducted in 2022 and 2023, encompassing 357 (1st wave) and 481 Ukrainian war refugees and pre-war economic migrants (2nd wave). The study employed decision tree analysis with the CRT (classification and regression) method on the 2023 sample data for data analysis.

Findings: Research findings indicate that regarding Ukrainians' entrepreneurial intention, their gender rather than the specific nature of their migration status holds significance – whether as an economic migrant or a refugee.

Implications & Recommendations: We suggest that intersectionality and the associated gender gap require close examination rather than setting the sole focus on the migrant or refugee status. An increased emphasis should lie on providing entrepreneurship guidance that is human-centred and, in so doing, female- and family-centred.

Contribution & Value Added: Prior research has not thoroughly explored the differences between pre-war economic migrants and refugees regarding their engagement in entrepreneurship and their achievements within this domain. This article taps into this research gap by conducting a comparative analysis of two distinct cohorts of migrants from Ukraine in Poland.

Article type: research article

Keywords: refugee entrepreneurship; migrant entrepreneurship; entrepreneurial intention; Ukrainian refugees vs economic migrants

JEL codes: L26, O15, F22

Received: 22 August 2023 Revised: 19 April 2024 Accepted: 22 April 2024

Suggested citation:
David, A., Maj, J., Filipowicz, M., Terstriep, J., & Kubiciel-Lodzińska, S. (2024). Much ado about refugee entrepreneurship? Refugees vs. economic migrants' entrepreneurial intention in Poland. *Entrepreneurial Business and Economics Review,* 12(3), 25-40. https://doi.org/10.15678/EBER.2024.120302

INTRODUCTION

We undertook a comprehensive comparative analysis of entrepreneurial intention within the Ukrainian refugee and pre-war economic migrant communities in Poland – a topic that has received limited attention in existing research. According to McMullen *et al.* (2021), we define entrepreneurial intention as a key predictor of entrepreneurial activity (Obschonka *et al.,* 2010). It refers to the conscious state of mind guiding behaviour towards planned entrepreneurial action in the future, which may be imminent, indeterminate, or never realised (Thompson, 2009). Beliefs and perceptions regarding starting a new venture shape entrepreneurial intention, converting into behaviour unless hindered by environmental or context conditions or conflicting intentions (David & Terstriep, 2023; McMullen & Shepherd, 2006). This is commonly achieved by recognising and capitalising on fresh opportunities. Such activities span a spectrum that includes but is not restricted to, pinpointing opportunities, acquiring resources, embracing risk, and fostering innovation (Wei & Duan, 2023; Burger-Helmchen, 2008). The

focus on Poland, a primary destination for both groups alongside Germany, adds significant relevance to the study (Borkowski *et al.,* 2021; Andrejuk, 2019).

The main motivation of our research was to discern variations in entrepreneurial initiation tendencies between two cohorts, challenging the traditional classification that differentiates migrant (mainly referring to economically driven migration) and refugee entrepreneurship in the existing literature. In alignment with recent studies on refugee entrepreneurship, as exemplified by Newman *et al.* (2023), our investigation emphasised the limited exploration of differences in entrepreneurial tendencies and success between refugees and economic migrants. A critical knowledge gap exists concerning whether refugees demonstrate higher levels of entrepreneurial intention compared to economic migrants and the investigation of underlying determinants (Newman *et al.,* 2023).

Insights from the scarce literature on Ukrainian refugees contribute to a compelling narrative. On the one hand, literature on Ukrainian business activity in Poland before the full-scale Russian invasion (Andrejuk, 2019) suggests a surprisingly low entrepreneurial intention among those individuals. On the other hand, Ukrainians relocating to Poland after February 24, 2022, exhibited substantial entrepreneurial experience before their relocation, as evidenced by studies like Kohlenberger *et al.* (2023), resulting in an 'entrepreneurial boom' post-2022 attributed to the transformative impact of the special Polish law on assistance to Ukrainians enacted in 2022 (Act of March 12, 2022, on Assistance to Citizens of Ukraine in Connection with the Armed Conflict on the Territory of that State). This legislation significantly enhanced the legal framework for both Ukrainian pre-war economic migrants and refugees. Notably, Ukrainians can now establish self-employment from 2022 onwards, providing a unique context for many individuals previously hindered by legal barriers to embark on entrepreneurial ventures. However, the question of whether there are differences in entrepreneurial intention between these two groups largely remains unanswered.

Therefore, and against this background, we posed the following research question:

RQ1: Do Ukrainian refugees show higher entrepreneurial intentions in Poland than Ukrainian pre-war economic migrants?

In recent years, research on refugees' engagement in entrepreneurial activities has become a more prominent topic in academic discourse, mainly referred to as 'refugee entrepreneurship' (Newman *et al*., 2023; Abebe, 2023; David & Zaghow, forthcoming; Freiling *et al*., 2019). The European refugee crisis (which in the general understanding refers to the Syrian war and the movement from the Middle East), now colliding with the refugee movement from Ukraine, explains the increased interest. A scoping review conducted using Google Scholar with the terms 'refugee entrepreneurship' for 2015 to 2023 resulted in 62 reviewed articles. Of these, only three were issued before the refugee crisis of 2015-17, while 58 were published from 2018 to 2023. These findings align with the observations of Heilbrunn and Iannone (2020) and Abebe (2023), who highlight the escalating academic interest and a notable expansion of scholarly research on refugee entrepreneurship.

Alongside this phenomenon, migration movements that were previously concentrated in Western Europe are progressively expanding to Eastern Europe (OECD, 2023). Consequently, Poland is witnessing significant changes in its immigration landscape and has emerged as a newly developed country of residence (CoR). Notably, in 2021, Poland issued over 790 000 first residence permits, constituting 27% of all permits granted within the EU during that period (Statista, 2023). By February 2022, approximately 2 million foreigners were estimated to reside in Poland, with the majority – around 1.35 million – of Ukrainians (Duszczyk & Kaczmarczyk, 2022; Statista, 2023). We may categorise them into two groups: the first comprises pre-war migrants who arrived in Poland before February 24, 2022, mainly for employment purposes (hereafter referred to as *pre-war economic migrants*). The second group comprises forced migrants who sought refuge in Poland to escape the warfare in Ukraine (hereafter referred to as *refugees*). We refer to the group of Ukrainians before February 24, 2022, as pre-war economic migrants, but we are aware that the conflict, started in 2014 with the annexation of Crimea and the rebellion in Donbas. Consequently, some of the respondents who arrived as 'economic' migrants to Poland had been internally displaced due to the military conflict in Ukraine. However, since they were not yet considered refugees at that time, we will continue to use the same designation as pre-war economic migrants.

Both economic migrants and refugees seeking to integrate into the labour market find initiating a business a viable option (Abebe, 2023). In 2022, Ukrainians established nearly 16 thousand one-person companies in Poland, which accounted for 6% of all established businesses last year. In the first six months of 2023, nearly 14 thousand of them arrived, which is almost as many as in the whole of last year. As a result, almost every tenth company established in Poland was Ukrainian. From the outbreak of war in Ukraine until the end of June 2023, 29.4 thousand Ukrainian sole proprietorships were registered in the CEIDG database (PIE, 2023). Despite these facts, it remains unclear whether scholars' interest in refugee entrepreneurship is triggered and results from the growing public discussion on refugee integration or whether it originates from observations that refugees display particular entrepreneurial behaviour (Betts *et al.,* 2017).

In what follows, we will depart from the theoretical discourse on refugee entrepreneurship, aiming to refine the concept and raise queries about its legitimacy as a distinct research area (section 2). Following this, we will outline our chosen research methodology (section 3). To gain a more comprehensive understanding, we will present the decision tree analysis using the CRT method, which enabled us to scrutinise variables pertinent to the phenomenon (section 4). In section 5, we will present and discuss the study's findings. Finally, we will conclude by acknowledging specific limitations and delving into the implications (section 5).

LITERATURE REVIEW

Reviews by Heilbrunn and Iannone (2020), Abebe (2023), and Newman *et al.* (2023) contribute to the rapidly evolving field of refugee entrepreneurship. As indicated by Newman *et al.* (2023), the literature suggests that as self-employed individuals displaced from their country of origin (CoO), refugee entrepreneurs differ from other minority entrepreneurs, such as economic migrants (Abebe, 2023). Various factors, including individual and business characteristics, underpin this distinction (cf. Kunz, 1973). Scholars like Hartmann and Philipp (2022) and Hugo (2013) argue that the migration process distinguishes refugee and migrant entrepreneurs, emphasising the potentially traumatic, alienating, and isolating aspects of refugee migration (Wauters & Lambrecht, 2006). Bakker and McMullen (2023) explore cultural diversity factors through inclusive entrepreneurship, while Yeshi *et al.* (2022) and Desai *et al.* (2021) highlight challenges faced by refugee entrepreneurs in countries of resettlement including identifying opportunities, acquiring resources, and overcoming structural barriers like discrimination and segregation in local entrepreneurial ecosystems. Ranabahu *et al. (*2022) and Heilbrunn (2019) have identified structural advantages and disadvantages specific to refugee entrepreneurship compared to other migrant groups.

However, despite these studies, there is still a need for a more nuanced understanding of this phenomenon (David & Zaghow, forthcoming). Before the surge in research after 2018, refugee entrepreneurs were typically grouped into publications on migrant entrepreneurship based on shared characteristics, such as nationality or common CoR (*e.g.* Haghighi & Lynch, 2012; Ram *et al.,* 2008), or included in broader groups of migrants, such as new migrants in the UK (Jones *et al.,* 2010) or in the Netherlands (Kloosterman *et al.,* 2016). Such studies assumed that refugees were part of the study population, leading to implicit rather than explicit inclusion of refugee entrepreneurs in migrant entrepreneurship research over the years.

To better differentiate refugee entrepreneurs, we will delve into the distinctions between migrant and refugee entrepreneurs.

Structural Advantages and Disadvantages of Refugee vs Economic Migrant Entrepreneurs

Forced and disruptive separation from family and community life, strenuous mobility journeys, and unplanned country resettlement are some identified challenges refugees face (Yeshi *et al.,* 2022; Sossou *et al., 2*008). These experiences often lead to forced resource scarcity, including losing financial and physical assets during flight and limited finances before leaving the CoO (David & Terstriep, 2023; Bizri, 2017; Gold, 1992). Psychological trauma resulting from war exposure, threats to physical safety, violence, prolonged family separation, and the destruction of homes and properties can also

limit refugees' cognitive capacity thus impacting their ability to engage in self-employment or other economic activities (Gold, 1992). Consequently, when they participate in entrepreneurial endeavours, they recognise a potential short-term or enduring decline in material assets and social capital, along with a devaluation of resources tied to their CoO contexts.

Like economic migrants, refugees face discrimination, segregation, loss of identity and legitimacy, and power (Yeshi *et al.*, 2022; Desai *et al.*, 2021). Strict regulatory regimes and institutional voids – incredibly shortly after refugees' arrival – can further hinder their economic participation (Heilbrunn, 2019). Often there exists a structural mismatch between refugees' skills and the CoRs' labour markets in forced migration contexts. The percentage of employees with culture/country-specific skills, who would not have left their CoO under normal circumstances, tends to be higher among refugees than among economic migrants (Gold, 1992). Moreover, blocked labour market mobility due to the limited transferability of professional degrees, especially when moving from less to more regulated CoRs, presents another barrier (Gold & Kibria, 1993). As mentioned, refugees also experience a loss of connection to their resource base in the CoO, as social links to their home country cannot be easily activated (Wauters & Lambrecht, 2006). Moreover, compared to economic migrants, scholars argue that refugees often have smaller social capital in the CoR (Gold, 1992; Wauters & Lambrecht, 2006).

On the contrary, some scholars identified the advantages of refugee entrepreneurs. They identified resilience, encompassing individual, relational, and institutional aspects as a critical factor in refugee entrepreneurship (Heilbrunn, 2019; Shepherd *et al*., 2020; Shepherd *et al.,* 2022). Alongside resilience, the bricolage attitude, which involves utilising limited resources creatively to engage in entrepreneurial activities, has also been recognised as a crucial skill for refugee entrepreneurs (Heilbrunn, 2019; Kwong *et al.,* 2018). Interestingly, trauma and psychological impacts resulting from the refugee experience may potentially foster entrepreneurial thinking, as evidenced by the emergence of 'venture ideal novelty' and 'entrepreneurial rigour' (David & Terstriep, 2023; Wauters & Lambrecht, 2006). Moreover, refugee entrepreneurs often create blended value, complementing economic value with social and cultural outcomes in ethnic/co-ethnic and local host communities (Ranabahu *et al.,* 2022). A further characteristic of refugee entrepreneurs which they share with migrant entrepreneurs lies in their potential for transnationality. Transnationality involves establishing social and economic connections within CoR and CoO, as well as tapping into diaspora networks around the world as valuable resources (Ram *et al.,* 2022; Halilovich & Efendić, 2019; Sandberg *et al.,* 2019; Williams & Krasniqi, 2018). These factors highlight the multifaceted aspects that shape refugees' entrepreneurial endeavours.

When comparing refugees to migrant entrepreneurs, there are differences. Refugees are individuals who have been forced to flee their home countries due to persecution, war, or violence and did not decide actively to change the CoR. They typically have a specific legal status as refugees (at least at the beginning of their refugee journey) granted by the CoR or international organisations, based on the recognition of their need for protection. This can also affect refugee resources, which seem to be limited and may initiate entrepreneurial activities as a means of survival and integration into their new communities. However, the comparison shows that refugee entrepreneurs share more rather than less similarities with migrant businesspeople. Thus, to gain more insights into the entrepreneurial endeavours of both groups we hypothesised in the study's context:

H1: There is a difference between Ukrainian refugees and Ukrainian pre-war economic migrants regarding their entrepreneurial intention in Poland.

H2: The status of being a refugee has an impact on individuals' entrepreneurial intention.

Aligned with the findings of Newman *et al.* (2023), employing a quantitative methodology to examine refugee entrepreneurship may reveal heightened entrepreneurial intention. This approach has the potential to elucidate and substantiate the rationale behind considering refugee entrepreneurship as a distinct and independent research field.

RESEARCH METHODOLOGY

Research Design and Sampling

This study adopted a quantitative research design for two reasons. Firstly, we aimed to present structured quantitative evidence that identifies differences in migrants' and refugees' entrepreneurial intentions. For this purpose, we divided respondents into two groups based on their declared date of arrival in Poland. We designated individuals present in Poland before February 24, 2022, as pre-war economic migrants, while those arriving after this date – as refugees based on their official status according to the United Nations High Commissioner for Refugees (UNHCR). As defined by the UNHCR, a refugee is someone forced to flee their country due to a well-founded fear of persecution for reasons such as race, religion, nationality, membership in a particular social group, or political opinion. Refugees typically seek safety and protection in another country, meeting criteria that make the term appropriate for describing individuals compelled to leave their home country due to conflict, persecution, or other hardships. However, it is crucial to approach this terminology with sensitivity, considering the experiences of those affected and ensuring language that upholds their dignity and humanity. In cases of uncertainty about legal status or individual preferences, using more general terms like 'displaced persons' or 'individuals who have fled conflict' is advisable. Moreover, we are aware that in the Polish context, Ukrainian forced migrants who entered Poland after the Russian invasion are not officially referred to as refugees but as forced migrants. Nonetheless, we decided that the priority here was on the term 'refugees' to make both groups more distinctive, while also acknowledging the importance of using language that is respectful and considerate of the experiences of the individuals being referred to.

The survey inquired about the type of employment in Poland with none of the respondents in the surveyed group indicating business ownership at the time of the survey. Consequently, we queried participants regarding their entrepreneurial intentions in Poland. This question aimed to capture the future aspirations of both refugees and economic migrants. Identifying factors underlying possible differences necessitates thorough quantitative examination. Secondly, the decision to employ a quantitative approach stems from the specific research inquiries being addressed, as they inherently pertain to matters of change. As Bono and McNamara (2011) put forward, a quantitative approach, including panel data or experimental designs, is vital for queries involving changes. As migration flows a subject to change, measurement over an extended timeframe – challenging to gather through qualitative methods – is necessary. Hence, we consider a quantitative approach more appropriate for our study.

We conducted the panel study in 2022 and 2023 on the same population cohorts: Ukrainian (voluntary) pre-war economic migrants and Ukrainian refugees (who came to Poland after the war began). In 2022, the research sample (n=357) included 162 pre-war economic migrants and 195 refugees. In 2023, the research sample (n=481) included 214 pre-war economic migrants and 267 refugees. Respondents lived all over Poland. Table 1 presents the sample's structure.

Most of the sample consisted of women, constituting over 90% of the respondents, particularly among refugees. In a specific study in Kraków (Cracow), the proportion of women among Ukrainian refugees reached 97%, with an average respondent age of 39 (Kohlenberger *et al.,* 2023). Another Polish survey, conducted through social media, reported an approximate 80% representation of female respondents among refugees (Górny & Kaczmarczyk, 2023). In a broader context, according to Statistics Poland (SP), about 65% of protected migrants from Ukraine are women, with approximately 52% falling within the working-age bracket (SP, 2023). We selected the participants in both waves through a purposeful sampling method using a research panel. This panel invites registered respondents to participate, and upon completion, they receive points that can be exchanged for monetary rewards. The sample consisted of registered users who found the offered rewards satisfactory for their participation. We chose this approach because of the challenges in recruiting participants for research purposes (migrants are considered a hard-to-survey group). The research is challenging in terms of sampling, identifying people to survey, reaching respondents, and implementing the survey (convincing them to take part in the survey and carrying it out (Tourangeau, 2014). While the results cannot be statistically generalised, we believe they still provide valuable insights for the population under study.

Table 1. Economic migrants vs refugees in Poland between 2022 and 2023

Variables			1st wave (2022)		2nd wave (2023)	
			Economic migrants	Refugees	Economic migrants	Refugees
Gender	Female	Number	125	189	159	252
		%	77.2	96.9	74.3	94.4
	Male	Number	37	6	55	15
		%	22.8	3.1	25.7	5.6
Age	18-29	Number	46	35	71	72
		%	28.4	17.9	33.2	27.0
	30-44	Number	70	111	111	161
		%	43.2	56.9	51.9	60.3
	45-59	Number	44	38	28	32
		%	27.2	19.5	13.1	12.0
	< 60	Number	2	11	4	2
		%	1.2	5.6	1.9	0.9

Source: own study.

Data Analysis

We conducted the statistical analysis using IBM SPSS, employing decision trees with the CRT method on the 2023 sample data. Decision tree analysis proves helpful in identifying groups' characteristics. The dataset used had explicit comebacks from respondents regarding their willingness or unwillingness to initiate a business. Unfortunately, we could not perform a similar analysis for the 2022 sample due to many ambiguous answers, making it unsuitable for decision tree analysis. Instead, we used descriptive statistics for the 2022 sample. Consequently, the dataset used for the decision tree analysis was relatively small, with 307 respondents, resulting in a relatively low-risk level of 0.235. The created model achieved a 76.5% accuracy in correctly predicting responses. However, it was notably more effective in predicting declarations of reluctance to initiate a business (93.5%) than readiness to create one (35.6%). Consequently, the model was better at diagnosing barriers rather than facilitators for initiating a business.

Table 2. Classification matrix (tree construction algorithm: CRT; dependent variable: REC_FIRMA)

Observed	Predicting		
	Yes	No	% of correct
Yes	32	5	35.6%
No	14	203	93.5%
Total percentage	15.0%	85.0%	76.5%

Source: own study.

The model incorporates several variables, including:

1. *Gender:* Categorised as male or female.
2. *Language competencies:* A quantitative variable rated on a scale of 0 to 6, indicating self-assessed language proficiency in Polish (speaking, writing, and reading).
3. *Early parenthood:* A binary variable indicating whether respondents have children younger than three years (yes/no).
4. *Age:* The age of respondents at the time of the study.
5. *Residence:* A dichotomous variable representing the desire for permanent settlement in Poland or other situations, such as return to Ukraine, further migration, or unspecified plans.
6. *Societal climate (Poles' opinions about Ukrainians):* An ordinal variable with three categories reflecting the generalised attitude of Poles toward Ukrainian citizens, *i.e.* positive, neutral, or negative.
7. *Education:* An ordinal variable with three categories, indicating respondents' educational level – higher, secondary, or vocational/lower education.
8. *Migrant type:* A dichotomous variable distinguishing voluntary economic pre-war migrants (who arrived before February 24, 2022) from displaced people (refugees who arrived after February 24, 2022).

The graphical representation of the decision tree (Figure 1) does not include the education level due to the CRT algorithm's selective approach, which prioritises variables that provide the most significant benefits in constructing the tree structure. However, education remains relevant and interacts with other variables in the model.

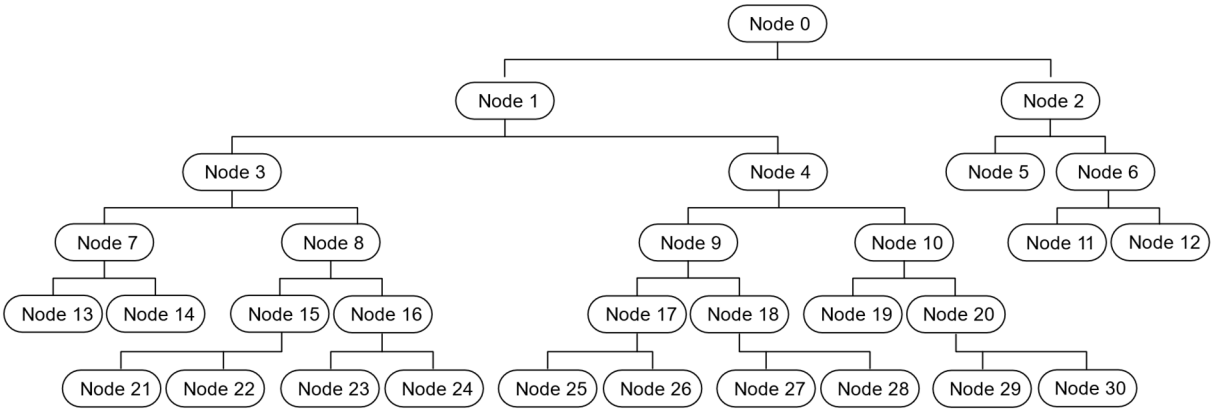

Figure 1. Exemplary decision tree structure
Source: own elaboration.

RESULTS AND DISCUSSION

As illustrated in the literature review, few studies examine whether refugee entrepreneurship warrants being considered a distinct research field due to refugees exhibiting a higher intention to entrepreneurship leading to business creation. Hence, we tapped into this research gap by investigating the potential differences between Ukrainian pre-war economic migrants and Ukrainian refugees regarding their entrepreneurial intentions.

Our results show that in 2022, approximately 60% of the surveyed refugees and 33% of pre-war economic migrants had no intention to initiate a business. Among pre-war economic migrants, more than 47% were undecided about starting a business in the future, and nearly 36% of refugees shared a similar view. A small group of respondents expressed their desire to initiate their own business. Notably, the response 'no' was more prevalent among pre-war economic migrants (19.1%) than refugees (7.2%).

Table 3. Ukrainian migrant and refugees' desire to initiate a business: The comparison of 2022 and 2023 results

Answers		1st wave (2022)		2nd wave (2023)	
		Economic migrants	Refugees	Economic migrants	Refugees
Yes	Number	31	14	52	38
	%	19.1	7.2	24.3	14.2
No	Number	54	111	77	140
	%	33.3	59.9	36.0	52.4
I don't know	Number	77	70	85	89
	%	47.5	35.9	39.7	33.3
Total	Number	162	195	214	267
	%	100.0	100.0	100.0	100.0

Source: own study.

The 2023 survey revealed significant changes in the entrepreneurial intention among pre-war economic migrants and refugees. The percentage of pre-war economic migrants expressing a positive response increased slightly more than 24%, while among refugees, 14.2% indicated a willingness to start their own business. However, it is essential to note that the proportion of pre-war economic migrants not intending to start a business also slightly increased. On the other hand, the percentage of refugees with 'no' answers decreased slightly to 52.4%. A considerable portion of undecided respondents accounted for

around 40% of pre-war economic migrants and over 33% of refugees. Having a social network in terms of social capital (Bourdieu, 1986) seems also an important factor that may influence the decision to set up a business. In the surveyed group in 2023, more than 73% of the pre-war economic migrants and slightly more than 65% of the refugees had close family, distant relatives, or friends in Poland. The research methodology employed decision trees and included all relevant variables, but the graphical representation in Figure 1 omitted the education level. Despite its correlation with the willingness to stay in Poland, education had little impact on entrepreneurial intention. Instead, gender, language competence, and having young children were more influential in explaining the results. Furthermore, the model considered the categorisation of migrants as either pre-war economic migrants or refugees. However, it was determined to be the least impactful factor among the variables analysed.

Table 4. Weights of variables included in the analysis

Independent variable	Validity	Standardised validity
Gender	0.034	100.0%
Language	0.032	94.4%
Early parenthood	0.021	62.6%
Age	0.019	55.4%
Residence plans	0.019	55.3%
Societal climate	0.007	21.4%
Education	0.004	10.8%
Type of migrant	0.003	9.6%

Source: own study.

We analysed factors influencing entrepreneurial intention among Ukrainian citizens considering the independent variables outlined in Table 4. We divided the decision tree outlined in the methodology section into three smaller parts for clarity of presentation. However, it is essential to note that these sections are interconnected and collectively form a unified analysis rather than three separate and distinct analyses.

The study revealed that gender significantly impacted the groups' entrepreneurial intention (Figure 2 and Figure 4). Men showed a significantly higher interest in becoming entrepreneurs than women (nodes 1 and 2). Moreover, the model supported the feminist perspective, showing that having children reduced the likelihood of women wanting to start a business (nodes 17, 18). This finding is particularly noteworthy in the context of the influx of refugee women from Ukraine, who are often accompanied by their children and in the context of intersectionality studies (Carastathis, 2016). The highest proportion of individuals interested in initiating a business consists of men with children under three (node 2) – Figure 2. These individuals seem to experience pressures related to household responsibilities. However, the research does not definitively answer whether this is connected to their current occupational position. It is possible that some of them might be unemployed or dissatisfied with their earnings. Due to the limited number of cases and the lack of detailed exploration of their employment quality, this remains a matter of speculation.

Noteworthy, we observed a relatively high interest in entrepreneurship among men without offspring, particularly those in their prime working years, typically before age 50. We could attribute this to their higher intention for risk-taking, which tends to be more prominent among younger individuals. Unexpectedly, language competence emerged as another crucial variable for entrepreneurial declarations. The age of migrants and their plans for permanent settlement in Poland also played a significant role in the entrepreneurial intention. However, we found the division between pre-war migrants and refugees showing a relatively strong relationship in entrepreneurial intention to be linked not only to the nature of residence but also to language competence. Refugees with better language skills were likelier to engage in entrepreneurship (node 21, 22).

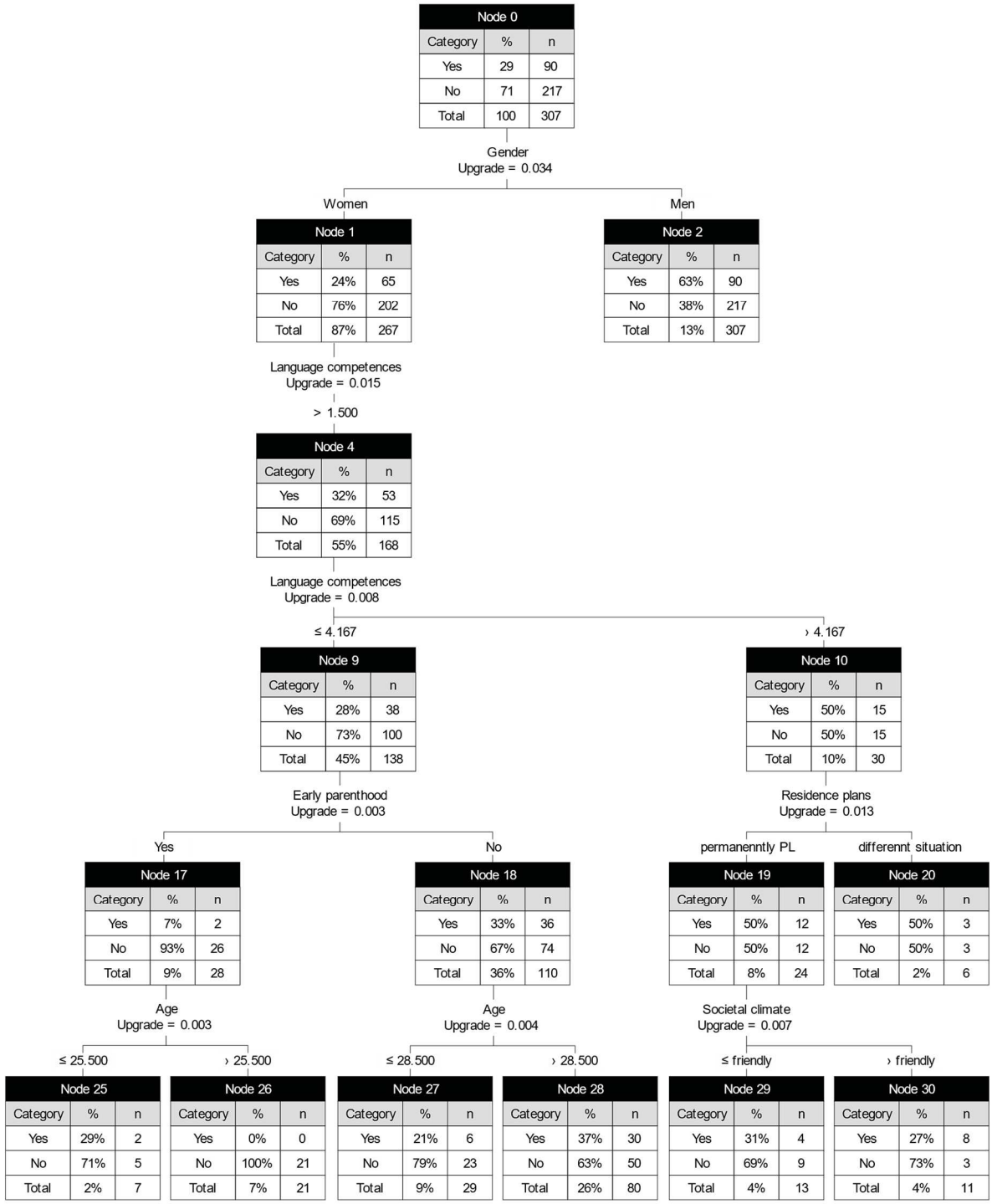

Figure 2. Decision tree structure: Section 1
Source: own elaboration.

At the same time, pre-war economic migrants with lower language competence were also inclined to do so (node 23, 24), possibly due to established social connections – Figure 3. Furthermore, the study indicates that migrants' perception of a positive societal climate reflected in Poles' positive attitudes towards them was influential. Positive emotions related to the openness of the host society were particularly significant, especially for women with excellent language skills who aimed to stay permanently in Poland (node 30), possibly including students or graduates of Polish universities. Overall, the findings highlight the importance of how foreigners perceive the attitudes of Poles in their decision-making process.

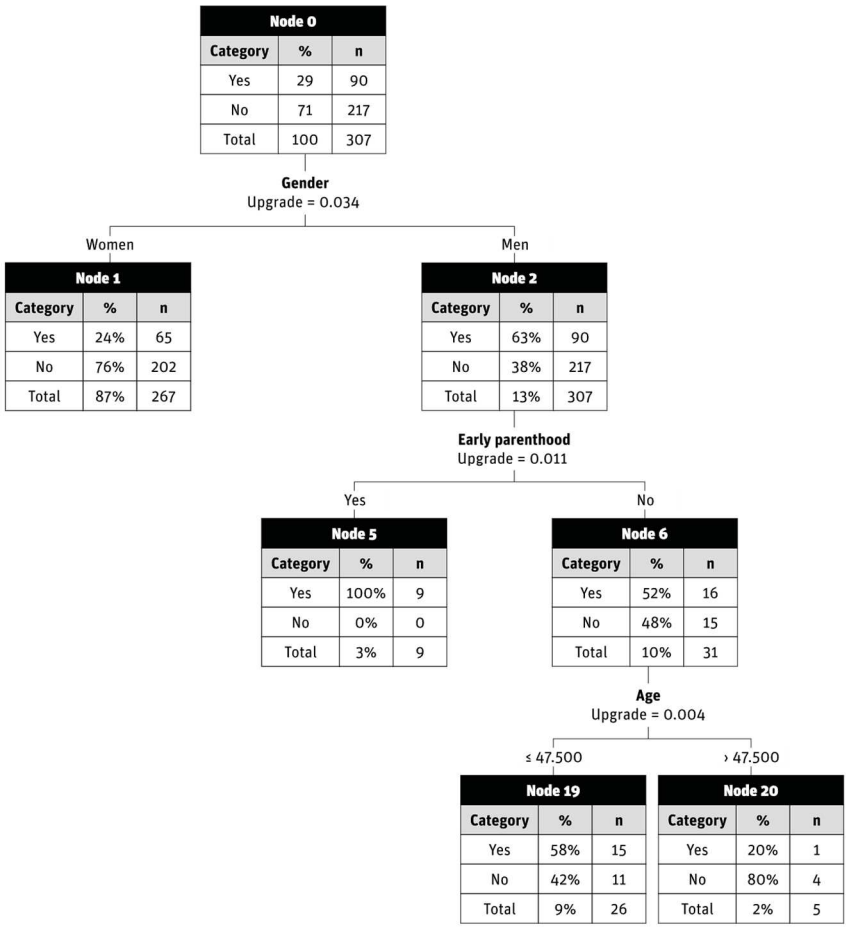

Figure 3. Decision tree structure: Section 2
Source: own elaboration.

Our results suggest the type of migrant status – pre-war economic migrant vs refugee – is subordinate when it comes to the entrepreneurial intention. Thus, we rejected **H1:** There is a difference between Ukrainian refugees and Ukrainian pre-war economic migrants regarding their entrepreneurial activities in Poland. This is because no significant differences became evident. Instead, surprisingly, we found a significant positive relationship between linguistic competence and entrepreneurial intention. These competencies tend to be higher among economic migrants. Economic migrants often have a shuttle migration pattern connected to legal regulations, and they gradually become familiar with the language during their subsequent visits to Poland. In contrast, refugees never had to deal with the Polish language, and their relatively short period of stay does not allow for a thorough acquaintance with it. The language barrier prevents them from fully capitalising on their resources, making them dependent on diaspora communities, intermediaries, and support institutions.

Finally, we also rejected **H2**: The status of being a refugee has an impact on the entrepreneurial activities of individuals to initiate a business. The status of a migrant, whether it be an economic migrant or a refugee, seems not to play a role in entrepreneurial intention. Instead, our study unintendedly exposed that the family status quo and the connection to intersectionality are more influential factors. In detail, the study revealed that individuals in the phase of early parenthood, *i.e.* those with children under the age of three, exhibited a favourable inclination towards entrepreneurial intention among men. Conversely, among analysed women, those without children displayed a higher tendency to venture into entrepreneurship. In line with earlier studies (Naldi *et al.*, 2021), we can attribute this to the care work obligations of women in early parenthood, which starkly contrasts with their male counterparts.

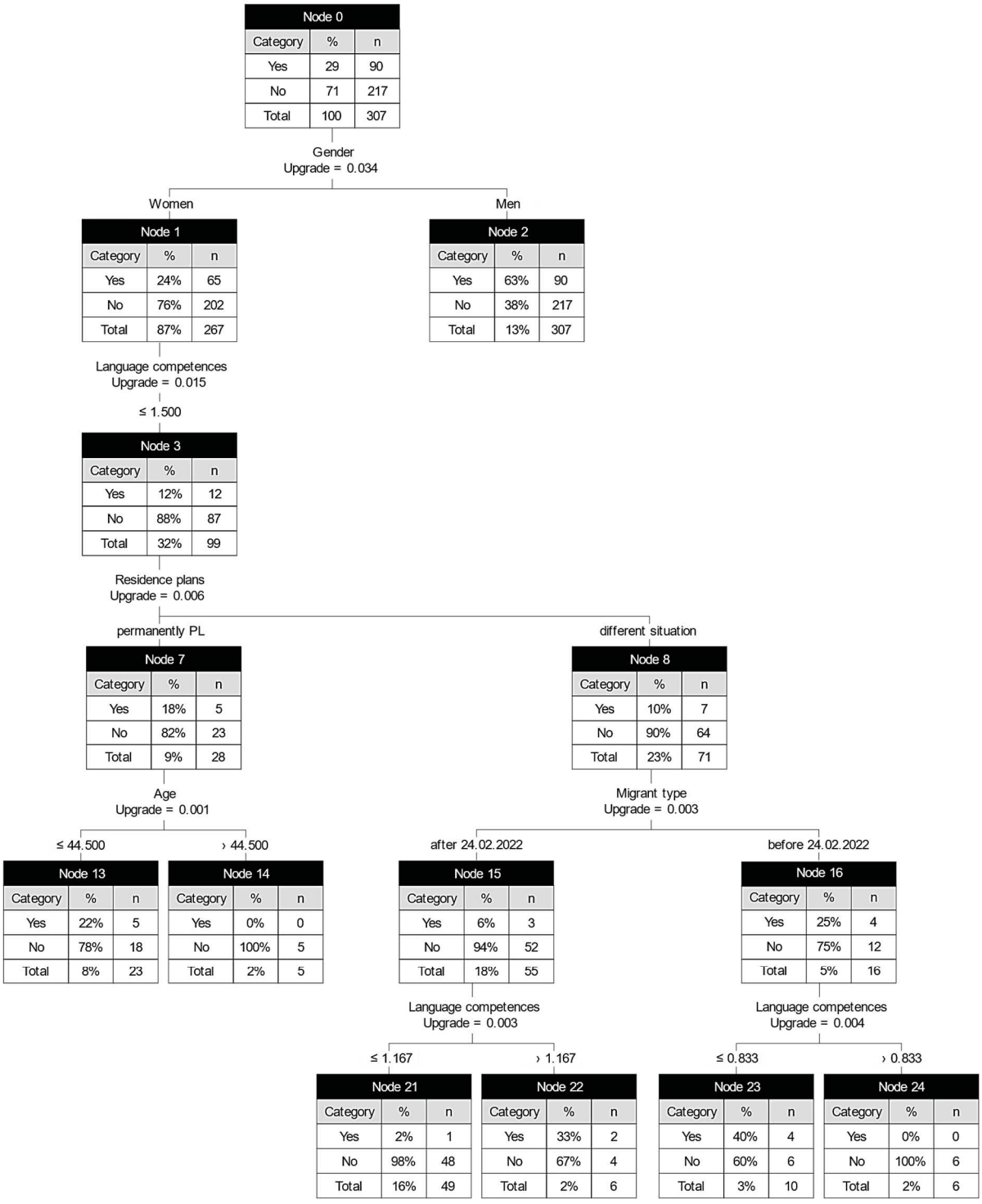

Figure 4. Decision tree structure: Section 3
Source: own elaboration.

Summing up, the study identified three main factors for the entrepreneurial intention among the analysed groups, which are gender, societal climate, and migrants' age. The legal framework is also important when deciding to set up a business. We examined only entrepreneurial intention. Therefore, we could not determine whether the intention has resulted in the actual establishment of businesses. However, further studies have demonstrated that, due to the new law, Ukrainians, in general, have established more ventures after 2022 in Poland (Kohlenberger *et al.,* 2023). A special law (introduced in 2022, after

the war in Ukraine) gives Ukrainians the possibility to pursue self-employment without any constraints (Act of March 12, 2022, on Assistance to Citizens of Ukraine in Connection with the Armed Conflict on the Territory of that State). This legal evolution represents a notable departure from past limitations and also provides opportunities for numerous pre-war economic migrants previously impeded by regulations.

CONCLUSIONS

The study's initial question was: Do Ukrainian refugees show higher entrepreneurial activities in Poland than Ukrainian pre-war economic migrants?

In general, our finding reveals no substantial differences between the two groups. Instead, the results reveal that it is rather a gender that impacts entrepreneurial intention. Distinct entrepreneurial inclinations emerge between pre-war economic male migrants, who often gravitate towards sectors like construction, and female migrants, particularly refugees, displaying a heightened propensity for personal service domains such as beauty care and catering. Customisation of advice and support is imperative for effective assistance. It is crucial to note that this disparity does not imply equal market access for refugees compared to other entrepreneurs, emphasising the need for tailored, context-specific assistance when warranted. Consequently, in formulating programmes aimed at supporting migrant and refugee entrepreneurs, policymakers should prioritise considerations of gender dynamics and adopt an intersectional perspective, avoiding an exclusive focus on migration status. In detail, the findings suggest the following policy implications:

(1) **Gender-tailored programmes:** Policymakers should create targeted programmes for male and female migrant and refugee entrepreneurs, addressing distinct preferences, challenges, and opportunities based on gender. (2) **Intersectional policies:** Policymakers are advised to adopt an intersectional policy approach that considers both gender and migration status, recognising diverse experiences among migrants. (3) **On-demand advice and assistance:** An on-demand, tailored advice and assistance considering the diversity in entrepreneurial preferences might be offered. This may involve customising support services, training programmes, and funding opportunities for different migrant groups. (4) **Empowering female migrants:** Future initiatives should prioritise promoting female migrant and refugee entrepreneurship, addressing gender imbalances. Efforts should focus on overcoming intersectionality challenges and fostering an inclusive entrepreneurial ecosystem empowering migrant and refugee women and families with children. (4) **Digitalisation:** Policymakers should promote digital literacy and create an environment conducive to online business growth, enabling refugees and female entrepreneurs to access broader audiences and expand market reach through cost-effective digital platforms and social media.

Our study was limited to entrepreneurial intent rather than actual business establishment. Furthermore, there is a gender imbalance in the study, and we are aware that some of the pre-war economic migrants arrived in Poland before 2022 also for political reasons. However, we found no evidence that Ukrainian refugees exhibit a higher entrepreneurial intention than the Ukrainian pre-war migrant group. – on the contrary. Therefore, scholars need to conduct more research in the future in this area to gain further insight into the phenomenon of refugee and migrant entrepreneurship, their similarities and differences as business initiators and business leaders. Therefore, future research should gather comprehensive data on migrants, including social capital, for deeper analysis. The observed gender imbalance, with a higher representation of women, warrants further investigation. Future studies might explore reasons for the underrepresentation of men in entrepreneurship and examine intersectionality within male-dominated markets. This research agenda would enhance our understanding and support female refugee entrepreneurship. Moreover, a comparison between different ethnicities in entrepreneurship might be of interest – for instance, Ukrainian refugees and Syrian refugees. Moreover, technological advancements and digitalisation are transformative for levelling the entrepreneurial playing field, especially for minorities and refugees. Leveraging these advances can empower refugees and female entrepreneurs to operate businesses efficiently, even remotely.

REFERENCES

Abebe, S.A. (2023). Refugee entrepreneurship: systematic and thematic analyses and a research agenda. *Small Business and Economics, 60*, 315-350. https://doi.org/10.1007/s11187-022-00636-3

Act of March 12, 2022, on Assistance to Citizens of Ukraine in Connection with the Armed Conflict on the Territory of that State [Ustawa z dnia 12 marca 2022 r. o pomocy obywatelom Ukrainy w związku z konfliktem zbrojnym na terytorium tego państwa (Dz.U. 2022 poz. 583). Retrieved from https://isap.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU20220000583 on January 9 2024.

Andrejuk, K. (2019). Ukrainian Immigrants and Entrepreneurship Drain: Towards a Concept of Governance-Induced Migration. *East European Politics and Societies*, *33*(4), 899-916. https://doi.org/10.1177/0888325419835018

Bakker, R.M., & McMullen, J.S. (2023). Inclusive entrepreneurship: A call for a shared theoretical conversation about unconventional entrepreneurs. *Journal of Business Venturing, 38*(1). https://doi.org/10.1016/j.jbusvent.2022.106268

Betts, A., Bloom, L., Kaplan, J.D., & Omata, N. (2017). *Refugee economies: Forced displacement and development* (First edition ed.). Oxford, United Kingdom: Oxford University Press.

Bizri, R.M. (2017). Refugee-entrepreneurship: a social capital perspective. *Entrepreneurship & Regional Development*, *29*(9), 847-868. https://doi.org/10.1080/08985626.2017.1364787

Bono, J.E., & McNamara, G. (2011). From the editors: Publishing in AMJ—Part 2: Research design [Editorial]. *Academy of Management Journal*, *54*(4), 657-660. https://doi.org/10.5465/AMJ.2011.64869103

Borkowski, M., Brzozowski, J., Vershinina, N., & Rodgers, P. (2021). Networks and Migrant Entrepreneurship: Ukrainian Entrepreneurs in Poland. In N. Vershinina, P. Rodgers, M. Xheneti, J. Brzozowski, & P. Lassalle (Eds.), *Global Migration, Entrepreneurship and Society* (Contemporary Issues in Entrepreneurship Research, Vol. 13) (pp. 161-176). Emerald Publishing Limited. https://doi.org/10.1108/S2040-724620210000013012

Bourdieu, P. (1986). The Forms of Capital. Handbook of Theory and Research for the Sociology of Capital. J.G. Richardson. New York: Greenwood Press.

Burger-Helmchen, T. (2008). Plural-entrepreneurial activity for a single start-up: A case study,

The Journal of High Technology Management Research, *19*(2), 94-102, https://doi.org/10.1016/j.hitech.2008.10.002

Carastathis A. (2016). *Intersectionality. Origins, Contestations, Horizons.* Lincoln: University of Nebraska Press.

CSO (2023). Mieszkańcy Ukrainy objęci ochroną czasową. Retrieved from file:///C:/Users/Sabina/Downloads/mieszkancy_ukrainy_objeci_ochrona_czasowa%20(2).pdf on January 9, 2024.

David, A., & Terstriep, J. (2023). Transformational Hubs for Recognised Refugees – Policy Recommendations by the Enter to Transform Project. Gelsenkirchen: Institute for Work and Technology, 6. Gelsenkirchen: Institut Arbeit und Technik. https://doi.org/10.53190

David, A., & Zaghow, L.R. (forthcoming). What is refugee entrepreneurship? – Reflections for a growing field. In N. Ranabahu, H.P. de Vries & R.T. Hamilton (Eds.), *Refugee Entrepreneurship: A Research Companion*. Routledge: Abingdon.

Desai, S., Naudé, W., & Stel, N. (2021). Refugee entrepreneurship: context and directions for future research. *Small Business Economics*, *56*(3), 933-945. https://doi.org/10.1007/s11187-019-00310-1

Duszczyk, M., & Kaczmarczyk, P. (2022). War and migration: the recent influx from Ukraine into Poland and possible scenarios for the future. *CMR Spotlight, 4*, 39.

Freiling, J., Harima, A., & Heilbrunn, S. (2019). *Refugee entrepreneurship: a case-based topography*. Macmillan.

Gold, S.J. (1992). The employment potential of refugee entrepreneurship: Soviet Jews and Vietnamese in California. *Review of Policy Research*, *11*(2), 176-186. https://doi/10.1111/j.1541-1338.1992.tb00400.x

Gold, S., & Kibria, N. (1993). Vietnamese refugees and blocked mobility. *Asian and Pacific Migration Journal, 2*(1), 27-56. https://doi.org/10.1177/011719689300200102

Górny A., & Kaczmarczyk P. (2023). Between Ukraine and Poland. Ukrainian migrants in Poland during the war. *CMR Spotlight, 2*(48).

Haghighi, A.M., & Lynch, P. (2012). Entrepreneurship and the social integration of new minorities: Iranian hospitality entrepreneurs in Scotland. *Tourism Review, 67*(1), 4-10. https://doi.org/10.1108/16605371211216323

Halilovich, H., & Efendić, N. (2019). From refugees to trans-local entrepreneurs: Crossing the borders between formal institutions and informal practices in Bosnia and Herzegovina. *Journal of Refugee Studies, 23*(4), 663-680. http://doi.org/10.1093/jrs/fey066

Hartmann, C., & Philipp, R. (2022). Lost in space? Refugee entrepreneurship and cultural diversity in spatial contexts. *ZFW-Advances in Economic Geography*, *66*(3), 151-171. https://doi.org/10.1515/zfw-2021-0017

Heilbrunn, S., & Iannone, R.L. (2020). From Center to Periphery and Back Again: A Systematic Literature Review of Refugee Entrepreneurship. *Sustainability*, *12*(18), 7658. https://doi.org/ 10.3390/su12187658.

Heilbrunn, S. (2019). Against all odds: Refugees bricoleuring in the void. *International Journal of Entrepreneurial Behavior & Research, 1*(3), 85-104. https://doi.org/10.1108/ijebr-10-2017-0393

Hugo, G. (2013). The economic contribution of humanitarian settlers in Australia. *International Migration, 52*(2), 31-52. https://doi.org/10.1111/imig.12092

Jones, T., Ram, M., & Theodorakopoulos, N. (2010). Transnationalism as a force for ethnic minority enterprise? The case of Somalis in Leicester. *International Journal of Urban and Regional Research, 34*(3), 565-585. https://doi:10.1111/j.1468-2427.2010.00913.x.

Kloosterman, R.C., Rusinovic, K., & Yeboah, D. (2016). Super-diverse migrants - similar trajectories? Ghanaian entrepreneurship in the Netherlands seen from a mixed embeddedness perspective. *Journal of Ethnic and Migration Studies, 42*(6), 913-932. https://doi:10.1080/1369183x.2015.1126091

Kohlenberger, J., Buber-Ennser, I., Pędziwiatr, K., Rengs, B., Setz, I., Brzozowski, J., Riederer B.,Tarasiuk O., & Pronizius, E. (2023). High self-selection of Ukrainian refugees into Europe: Evidence from Kraków and Vienna. *PloS one, 18*(12). https://doi.org/10.1371/journal.pone.0279783

Kunz, E.F. (1973). The refugee in flight: Kinetic models and forms of displacement. *International Migration Review, 7*(2), 125-146.

Kwong, C.C.Y., Cheung, C.W.M., Manzoor, H., & Rashid, M.U. (2018). Entrepreneurship through bricolage: A study of displaced entrepreneurs at times of war and conflict. *Entrepreneurship & Regional Development*, *7*, 1-21. https://doi.org/10.1080/08985626.2018.1541592

McMullen, J.S., Brownell, K.M., & Adams, J. (2021). What Makes an Entrepreneurship Study Entrepreneurial? Toward A Unified Theory of Entrepreneurial Agency. *Entrepreneurship Theory and Practice, 45*(5), 1197-1238. https://doi.org/10.1177/1042258720922460

McMullen, J.S., & Shepherd, D.A. (2006). Entrepreneurial action and the role of uncertainty in the theory of the entrepreneur. *Academy of Management Review*, *31*(1), 132-152. https://doi.org/10.5465/amr.2006.19379628

Naldi, L., Baù, M., Ahl, H., & Markowska, M. (2021). Gender (in)equality within the household and business start-up among mothers. *Small Business Economics, 56*, 903-918. https://doi.org/10.1007/s11187-019-00275-1

Newman, A., Macaulay, L., & Dunwoodie, K. (2023). Refugee Entrepreneurship: A Systematic Review of Prior Research and Agenda for Future Research. *International Migration Review*, *0*(0). https://doi.org/10.1177/01979183231182669

Obschonka, M., Silbereisen, R.K., & Schmitt-Rodermund, E. (2010). Entrepreneurial intention as developmental outcome. *Journal of Vocational Behavior*, *77*(1), 63-72. https://doi.org/10.1016/j.jvb.2010.02.008

OECD (2023). *International Migration Outlook 2023, OECD Publishing.* Paris, https://doi.org/10.1787/b0f40584-en

Polski Instytut Ekonomiczny (PIE) (2023). Od 2022 r. w Polsce powstało już blisko 30 tys. ukraińskich działalności gospodarczych. Retrieved from www.pie.net.pl on July 19, 2023.

Ram, M., Jones, T., Doldor, S., Villares-Varela, M., & Li, H. (2022). What happens to refugee-origin entrepreneurs? Combining mixed embeddedness and strategy perspectives in a longitudinal study. *Ethnic and Racial Studies*, *45*(16), 1-27.

Ram, M., Theodorakopoulos, N., & Jones, T. (2008). Forms of capital, mixed embeddedness and Somali enterprise. *Work, Employment and Society, 22*(3), 427-446. https://doi.org/10.1177/0950017008093479

Ranabahu, N., De Vries, H.P., & Basharati, Z. (2022). Refugee-owned small businesses: A typology for blended value creation. *International Migration*, *IOM UN Migration.* https://doi.org/10.1111/imig.13072

Sandberg, S., Immonen, R., & Kok, S. (2019). Refugee entrepreneurship: Taking a social network view on immigrants with refugee backgrounds starting transnational businesses in Sweden. *International Journal of Entrepreneurship and Small Business, 36*(1/2), 216-241. https://doi.org/10.1504/ijesb.2019.096967

Shepherd, D.A., Parida, V., & Wincent, J. (2022). Refugee Entrepreneurs Building and Displaying Resilience (pp. 55-89). In: *Entrepreneurial Responses to Chronic Adversity: The Bright, the Dark, and the in Between. Palgrave Macmillan*. https://doi.org/10.1007/978-3-031-04884-5_3

Shepherd, D.A., Saade, F.P., & Wincent, J. (2020). How to circumvent adversity? Refugee-entrepreneurs' resilience in the face of substantial and persistent adversity. *Journal of Business Venturing, 35*(4). https://doi:10.1016/j.jbusvent.2019.06.001

Sossou, M.A., Craig, C.D., Ogren, H., & Schnak, M. (2008). A qualitative study of resilience factors of Bosnian refugee women resettled in the southern United States. *Journal of Ethnic & Cultural Diversity in Social Work*, *17*(4), 365-385. https://doi.org/10.1080/15313200802467908

Statista (2023). Retrieved from https://www.statista.com/statistics/1312584/ukrainian-refugees-by-country/ on July 19, 2023.

Thompson, E.R. (2009). Individual entrepreneurial intent: Construct clarification and development of an internationally reliable metric. *Entrepreneurship Theory and Practice*, *33*(3), 669-694. https://doi.org/10.1111/j.1540-6520.2009.00321.x

Tourangeau, R. (2014). Defining Hard-to-Survey Populations. In Hard-to-Survey Populations, edited by Roger Tourangeau, Brad Edwards, Timothy P. Johnson, Kirk M. Wolter, and Nancy Bates (pp. 3-20). Cambridge: Cambridge University Press.

UNHCR. (2023). Persons who are forcibly displaced, stateless and others of concern to UNHCR. Retrieved from https://www.unhcr.org/refugee-statistics/methodology/definition/ on January 26, 2024.

Wei, W., & Duan, J. (2023). How do entrepreneurial activities at different levels promote business growth: a review and research agenda. *Chinese Management Studies*, Vol. ahead-of-print No. ahead-of-print. https://doi.org/10.1108/CMS-06-2022-0226

Wauters, B., & Lambrecht, J. (2006). Barriers to refugee entrepreneurship in Belgium: Towards an explanatory model. *Journal of Ethnic and Migration Studies*, *34*(6), 895-915. https://doi.org/10.1080/13691830802211190

Williams, N., & Krasniqi, B.A. (2018). Coming out of conflict: How migrant entrepreneurs utilise human and social capital. *Journal of International Entrepreneurship*, *16*(2), 301-323. https://doi.org/10.1007/s10843-017-0221-4

Yeshi, T., Harima, A., & Freiling, J. (2022). Resilience on an emotional rollercoaster: Refugee entrepreneurship under adversity. *European Management Journal*. In Press. https://doi.org/10.1016/j.emj.2022.12.009

Authors

The contribution share of authors is as follows: Alexandra David (25%) – Concept and design, Jolanta Maj (20%) – Analysis, interpretation of data, Maciej Filipowicz – (15%) – Analysis, Judith Terstriep (15%) – Methodology, Sabina Kubiciel-Lodzińska (25%) – Interpretation of data, concept.

Alexandra David

PhD in sociology (2015, University of Twente in Enschede, the Netherlands). Senior Researcher at the Westphalian University Gelsenkirchen, Institute for Work and Technology (IAT) and lecturer at the Ruhr-University Bochum (Germany). Her research interests include the topics of diversity, migration, innovation, and integration with a special focus on migrant and refugee entrepreneurship.

Correspondence to: Alexandra David, PhD, Westphalian University Gelsenkirchen, Institute for Work and Technology, Munscheidstr. 14, 45886 Gelsenkirchen, Germany, e-mail: David@iat.eu

ORCID http://orcid.org/0000-0002-6393-8624

Jolanta Maj

PhD in political science (2014, Willy Brandt Center for German and European Studies University of Wrocław). Assistant professor at the Wrocław University of Science and Technology (Poland). Her research interests include diversity management and inclusion and their impact on business innovation and efficiency.

Correspondence to: Jolanta Maj, PhD, Wrocław University of Science and Technology, 27 Wybrzeże Wyspiańskiego, 50-370 Wrocław, Poland, e-mail: jolanta.maj@pwr.edu.pl

ORCID http://orcid.org/0000-0001-5542-0713

Maciej Filipowicz
PhD in social sciences (2015, University of Silesia in Katowice). An employee of the Opolskie Labour Office, and an associate of Opole University. His research interests include socio-cultural determinants of labour market participation (unemployment and employment), migration and social exclusion.
Correspondence to: Maciej Filipowicz, PhD, Opole University, ul. Katowicka 89, 45-061 Opole, e-mail: maciej.filipowicz@uni.opole.pl
ORCID http://orcid.org/0009-0000-8796-0896

Judith Terstriep
PhD in economics (2018, University Hamburg). Head of the Research Department »Innovation, Space & Culture« and lecturer at the Westphalian University Gelsenkirchen, Institute for Work and Technology (IAT) and lecturer at the Ruhr-University Bochum (Germany). Her research interest include the interplay of innovation, (social) relations, knowledge, and society from the perspective of innovation, management, and spatial theory contributing to just transitions and societal change.
Correspondence to: Judith Terstriep, PhD, Westphalian University Gelsenkirchen, Institute for Work and Technology, Munscheidstr. 14, 45886 Gelsenkirchen, Germany, e-mail: terstriep@iat.eu
ORCID http://orcid.org/0000-0002-1579-0469

Sabina Kubiciel-Lodzińska
PhD in economics (2010, Wrocław University of Economics and Business). Assistant professor at the Opole University of Technology (Poland). Her research interests include economic migrations, migrant entrepreneurship and the inclusion of refugees in the labour market.
Correspondence to: Sabina Kubiciel–Lodzińska, PhD, Opole University of Technology, ul. Prószkowska 76, 45-758 Opole, Poland, e-mail: s.kubiciel-lodzinska@po.edu.pl
ORCID http://orcid.org/0000-0002-5465-6967

Acknowledgements and Financial Disclosure

We thank all Ukrainians who participated in our study. We understand that, under these conditions, they have greater concerns and still took the time for this study. Without them, this article would not have been possible. The authors received no financial support for this article's research, authorship, or publication.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright and License

Published by Krakow University of Economics – Krakow, Poland

Ministry of Education and Science
Republic of Poland

The journal is co-financed in the years 2022-2024 by the Ministry of Education and Science of the Republic of Poland in the framework of the ministerial programme "Development of Scientific Journals" (RCN) on the basis of contract no. RCN/SP/0583/2021/1 concluded on 13 October 2022 and being in force until 13 October 2024.

Entrepreneurial Business and Economics Review

2024, Vol. 12, No. 3

10.15678/EBER.2024.120303

Small and medium-sized enterprises dynamic capabilities and competitive advantage: The mediating effect of digitalization

Murry Harmawan Saputra, Mohamad Nur Utomo, Kasmad Ariansyah, Yanuar Farida Wismayanti, Rahmat Husein Andri Ansyah, Koeswinarno, Suradi

ABSTRACT

Objective: The aim of the article is to examine the interplay among dynamic capabilities, digitalization, and competitive advantage, with a specific focus on exploring the mediating influence of digitalization in the relationship between dynamic capabilities and competitive advantage among small and medium-sized enterprises (SMEs) in the Indonesian context.

Research Design & Methods: We utilized a survey method for the collection of primary data. The respondents were SME founders in the provinces of Central Java and North Kalimantan, Indonesia, with a minimum of one year of business engagement. Moreover, we utilized Partial Least Squares Structural Equation Modelling (PLS-SEM) analysis on 230 collected responses to examine the proposed hypotheses on the relationships among dynamic capabilities, digitalization, and competitive advantage.

Findings: We found that dynamic capabilities, except for coordinating capability, positively influence the implementation of digitalization. This highlights the role of these capabilities in utilizing digital technologies effectively. The study also revealed a positive relationship between digitalization and SME competitive advantage. Furthermore, the study showed the significant role of digitalization in mediating the associations between sensing capability, learning capability, integrating capability, and competitive advantage. These findings underscore the importance of developing dynamic capabilities to facilitate digitalization for enhancing competitive advantage in the digital era.

Implications & Recommendations: The study's implications for SMEs seeking to enhance competitive advantage through digitalization include the importance of improving sensing capability for market understanding, cultivating a learning culture for employee tech updates, and strengthening integrating capability by seamlessly incorporating digital technology into existing processes and functions.

Contribution & Value Added: While many studies have concentrated on evaluating the direct impact of dynamic capabilities on firm competitive advantage or exploring different mediating factors, this research explored the indirect effects of SME's dynamic capabilities on competitive advantage, delving into digitalization's mediating role.

Article type: research article

Keywords: dynamic capability; competitive advantage; digitalization; SME; Indonesia

JEL codes: M21, M31, O12

Received: 26 September 2023 Revised: 19 December 2023 Accepted: 6 March 2024

Suggested citation:

Saputra M.H., Utomo, M.N., Ariansyah, K., Wismayanti, Y.F., Ansyah, R.H.A., Koeswinarno, & Suradi (2024). Small and medium-sized enterprises dynamic capabilities and competitive advantage: The mediating effect of digitalization. *Entrepreneurial Business and Economics Review,* 12(3), 41-67. https://doi.org/10.15678/EBER.2024.120303

INTRODUCTION

Small and medium-sized enterprises (SMEs) play a crucial influence in driving economic development around the world (Lin *et al*., 2022), not to mention the emerging economies. This is particularly notable in Indonesia, where SMEs represent nearly 99% of business units, contribute approximately 60.5% to

the Gross Domestic Product (GDP), and employ approximately 96.9% of the national labour force (Limanseto, 2022). However, the rapidly changing business environment has led to increased market volatility, posing challenges to the resilience of these SMEs (Onngam & Charoensukmongkol, 2023). The challenges are often more pronounced in emerging markets, especially among those operating within traditional industries (Chen *et al*., 2016). Limited financial resources further exacerbate these hurdles, particularly in comparison to their larger counterparts (Ratanavanich & Charoensukmongkol, 2023). This phenomenon underscores the need for SMEs to concentrate on developing appropriate strategies to endure in an increasingly competitive environment (Nyamrunda & Freeman, 2021).

Globalization is one of major challenges encountered by SMEs. While globalization presents new opportunities, it is important to acknowledge that without appropriate strategies, the benefits of globalization might not be uniformly accessible to all nations and organizations (Skare & Riberio Soriano, 2021). The challenges of globalization evolve over time, propelled by the rapid advancement of digital technology, and continues to reshape the competitive landscape. While in the past, enterprises competed only within their geographic boundaries, in the digital era, these geographical limitations have been eroded, allowing competitors of an enterprise to emerge from locations around the world (Ariansyah & Nuryakin, 2019). In the current globalized economy, enterprises encounter multiple competitive challenges, including the sustainability challenge, the global challenge, and the technological challenge (Noe *et al*., 2017). Such a situation brings tougher consequences for enterprises in developing economies (Jean *et al*., 2010).

Furthermore, the emergence of COVID-19 at the begining of 2020 has worsened the business landscape. Various responses undertaken by governments to this unforeseen condition, including lockdowns, social distancing protocols, and the cessation of physical business operations, lead to a significant contraction of global business activities (Soto-Acosta, 2020). In particular, SMEs have faced significant challenges and adverse impacts compared to larger enterprises due to their relatively limited financial resources, asset ownership, and productivity levels (OECD, 2020). Kalemli-Ozcan *et al*. (2020) found that a significant number of SMEs worldwide, ranging from 45% to 53%, experience financial debt due to the pandemic. In Indonesia, a survey by Katadata Insight Center (KIC) unveiled that the Covid-19 pandemic had detrimental effects on 82.9% of SMEs (Setyowati, 2020). Subsequently, a more recent survey by Bank Indonesia showed that 87.5% of the surveyed SMEs encountered unfavourable consequences of the COVID-19 pandemic (Bank Indonesia, 2022). In such a situation, resilience extends beyond the entrepreneur personally and encompasses the adaptability of their business model, strategy, and value creation efforts (Elo *et al*., 2022).

These constantly dynamic and challenging circumstances necessitate organizations, including SMEs, to enhance their adaptability and proactively adjust their business processes (Kuuluvainen, 2012) to sustain their competitive advantage and ensure their survival. This adaptive measure is commonly referred to as dynamic capabilities, which involves the utilization and management of resources to create value in a rapidly changing business environment (Teece *et al*., 1997). Dynamic capabilities enable enterprises to analyse the reasons behind technological changes and reconfigure their resources to integrate competent and less competent elements, ultimately generating significant value. In essence, SMEs need to adjust their resources to stay competitive in the evolving business environment, necessitating dynamic capabilities (Papadopoulos *et al*., 2020). This notion finds support in numerous empirical studies that have demonstrated the favourable impact of dynamic capabilities on the performance and competitive advantage of SMEs (Ahmad *et al*., 2022; Anggadwita *et al*., 2023; Dejardin *et al.*, 2023; Heredia-Portillo & Armas-Arévalos, 2023; Hernández-Linares *et al*., 2021; Martins, 2023).

Diverging from the above literature who asserted a direct connection between dynamic capabilities and competitive advantage, Cepeda and Vera (2007), Eisenhardt and Martin (2000), Helfat and Peteraf (2003), Pavlou and El Sawy (2011), Pundziene *et al*. (2021), and Prange and Verdier (2011) collectively contribute deeper conceptual and empirical insights into the dynamic capabilities and firms' competitive advantage relationship. Their findings suggest that these capabilities commonly exert an indirect influence on a firm's performance and competitive advantage. Cepeda and Vera (2007), Eisenhardt and Martin (2000), Protogerou *et al*. (2012), and Wilden *et al.* (2013) further suggest that the relationship between a firm's dynamic capabilities and its overall performance and competitive

advantage is mediated by the firm's operational capabilities, defined as a firm's capacity to conduct its daily activities effectively (Pavlou & El Sawy, 2011). Analysing the variable's mediating function – in this case operational capability – is essential for understanding the mechanisms or processes by which dynamic capabilities impact SME's competitive advantage. Recent research has delved into several factors that mediate the correlation between dynamic capabilities and competitive advantage as well as performance. These include organizational ambidexterity (Jurksiene & Pundziene, 2016), marketing and management capability (Ferreira & Coelho, 2017), innovation capability (Ferreira *et al*., 2020), and open innovation (Pundziene *et al*., 2021). While operational capabilities can take various forms, this current study posits digitalization as one of these capabilities as it enhances daily activities in a more effective and efficient manner. Digitalization refers to the capacity to utilize digital technologies to reshape a business model, thereby opening up new avenues for generating revenue and creating value (Bloomberg, 2018), reflecting the innovative integration of digital tools and strategies into the core business' operations. While existing literature acknowledges the connection between dynamic capabilities and firm digitalization, as suggested by Ellström *et al.* (2021), and recognizes the positive impact of digitalization on firm performance (Cheng *et al*., 2023; Masoud & Basahel, 2023; Vial, 2019), existing empirical research has not thoroughly expounded on the role of digitalization in mediating the relationship between dynamic capabilities and competitive advantage, especially within the context of SMEs. While a study by Vo Thai *et al*. (2024) does explore the mediating role of digitalization, the focus is primarily on the relationship between dynamic capabilities and business model innovation, as well as sustained performance.

Against the background, we aimed to address the identified research gap by proposing and examining a model that elucidates the connections among dynamic capabilities, digitalization, and competitive advantage. It specifically investigates the mediating role of digitalization in the relationship between SMEs' dynamic capabilities and competitive advantage. This focused investigation represents a significant contribution and offers additional insights into optimizing SME strategy development and business adaptation amidst rapid market changes to ensure sustained competitiveness. Firstly, we addressed a previously overlooked theoretical gap by empirically examining the connection between dynamic capabilities and a firm's competitive advantage with a specific emphasis on digitalization's mediating role. Secondly, the findings contribute to research on SME digitalization and competitive advantage, presenting evidence of the positive impact of digitalization on SMEs' competitive positioning. Thirdly, the research results enhance the understanding of SME owners, particularly those in developing countries grappling with the challenges of an evolving business environment, by offering insights into achieving competitiveness through the enhancement of their dynamic capabilities and processes of digital transformation. To fulfil these objectives, we utilised a survey method to gather primary data from SME founders located in Central Java and North Kalimantan provinces, Indonesia, each having at least one year of business involvement. Furthermore, the study employed Partial Least Squares Structural Equation Modeling (PLS-SEM) analysis on a dataset comprising 230 responses to evaluate the proposed hypotheses concerning the interplay among dynamic capabilities, digitalization, and competitive advantage.

The subsequent sections are organized as follows: The second section will delineate the literature review and the hypotheses development, offering a synthesis of relevant theories and previous research findings. The third section will provide the research method utilized in this study. The fourth section will present results and discussion. Finally, the fifth section will provide a conclusive summary of the paper.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Dynamic Capability

The concept of dynamic capabilities is based on Schumpeter's (1934) idea of innovation-driven competition, where competitive advantage is achieved through the creative destruction and novel recombination of existing resources. These ideas were further refined in various academic works, such as configuration competence (Henderson & Cockburn, 1994), and combinative capabilities (Kogut & Zander, 1992). Building on preceding research, Teece *et al*. (1997) provided a comprehensive exploration of dynamic capabilities, with their seminal paper recognized as a highly influential source in the field.

Teece's (2007) recent framework on dynamic capabilities further contributes to shaping the discourse in this area. According to Teece and colleagues (Teece, 2007; Teece *et al*., 1997), competitive advantage in dynamic and unpredictable environments is contingent on a firm's dynamic capabilities rather than its competitive positioning or industry conflict.

Dynamic capability refers to a firm's proficiency in seamlessly incorporating, constructing, and adapting both internal and external capabilities to address rapidly changing environments (Teece *et al*., 1997). Dynamic capabilities align with Barney's (1991) resource-based view (RBV), a framework that has garnered significant attention in management, operations, and innovation studies. The RBV explains how organizations use their internal resources and capabilities to attain a competitive advantage and achieve exceptional performance in a constantly evolving business environment (Akenroye *et al*., 2020; Sousa-Zomer *et al*., 2020). While the RBV focuses on resource picking, which involves selecting and assembling specific combinations of resources, dynamic capabilities highlight resource renewal. These capabilities enable enterprises to sense environmental changes, seize emerging opportunities, and transform their business strategies and operations (Eisenhardt & Martin, 2000). In the context of SMEs, dynamic capabilities are particularly relevant due to their resource constraints and inherent flexibility. Often, SMEs face limited resources, which can be a challenge in the face of dynamic markets. However, dynamic capabilities enable SMEs to leverage their existing resources and build new capabilities, allowing them to compete effectively with larger competitors (Eisenhardt & Martin, 2000; Teece, 2014).

According to Pavlou and El Sawy (2011) and Matarazzo *et al*. (2021), dynamic capabilities encompass four dimensions, including sensing, learning, integrating, and coordinating capabilities. Sensing capability involves the organization's ability to detect changes in the business environment, including market trends and customer needs, enabling proactive responses to changes. Learning capability includes the ability to learn from experiences and new information, allowing organizations to develop deep knowledge and sustainable adaptation. Integrating capability involves the integration of internal and external resources to create value and innovation. Meanwhile, coordinating capability focuses on the organization's ability to manage and coordinate various internal elements to work synergistically. Overall, these four dimensions of dynamic capabilities unite to create organizations that are responsive, capable of learning, adapting, and innovating in the face of business environmental dynamics (Mikalef & Pateli, 2017; Teece, 2020).

Digitalization

As articulated by Bukht and Heeks (2017), digitalization refers to the utilization of digital technology to reconfigure the societal, economic, and cultural dimensions of existence. Furthermore, within the realm of enterprises, digitalization, as expounded by Bloomberg (2018), involves leveraging digital technologies to transform a business model, thereby introducing new channels for revenue generation and value creation. In contemporary business and leadership discourse, digitalization, alongside agility, resilience, and sustainability, is gaining traction, especially during turbulent times. Embracing strategically agile processes, enabled by digitalization, promotes proactive strategic resilience, facilitating the pursuit of opportunities amid change (Florek-Paszkowska *et al*., 2021). Digitalization, functioning not only within large enterprises but also as a pivotal business strategy, has gained escalating significance for SMEs aiming to uphold competitiveness within the contemporary digital age. Moreover, digitalization constitutes a vital strategy during crises. A survey by Bank Indonesia highlights that 12.5% of SMEs managed to sustain themselves throughout the pandemic, specifically those that successfully embraced digitalization (Victoria, 2021). By leveraging digital technologies, SMEs can explore new revenue streams, create disruptive business models, and develop innovative products and services. To execute the strategy, companies need a digital transforming capability (Warner & Wäger, 2019). SMEs need to integrate digital technologies and platforms into their value chain activities to drive business growth, innovation, and transformation. This enables SMEs to leverage digital tools and capabilities to enhance their operational efficiency, expand their market reach, and create new value propositions for customers (Westerman *et al*., 2014). Research has shown that the effective integration of digital technologies in areas such as production, marketing, sales, and customer service can lead to improved operational

performance and sustainable competitive advantage (Bharadwaj *et al*., 2013; Fonseka *et al*., 2022). However, the successful implementation of the digitalization requires SMEs to develop digital capabilities and cultivate a digital mindset within their organizations. SMEs with strong digital capabilities are better equipped to adapt to digital disruptions, seize emerging opportunities, and navigate the challenges of digital transformation (Bharadwaj *et al.*, 2013).

Competitive Advantage

Competitive advantage refers to the degree to which an organization can establish a strong and defendable position in relation to its competitors (Lo & Tian, 2020). Meanwhile, Farhikhteh, Kazemi, Shahin, and Shafiee (2020) define competitive advantage as the company's ability to create and sustain higher added value compared to its competitors over an extended period. It represents the unique qualities and strengths that enable a company to outperform others in the marketplace, allowing it to achieve superior performance and long-term success. Competitive advantage is a critical concept in strategic management and its significance for SMEs has garnered considerable attention in the literature. Various scholars have explored the sources and determinants of competitive advantage for SMEs, highlighting the unique characteristics and challenges faced by these organizations.

According to Porter's (1985) generic strategies framework, SMEs can achieve competitive advantage by either pursuing cost leadership or differentiation strategies. Cost leadership entails offering products or services at lower costs compared to competitors, while differentiation involves providing unique and valued offerings to customers. Both strategies can contribute to SMEs' competitive positioning in the market. In addition to Porter's framework, the resource-based view (RBV) offers insights into the sources of competitive advantage for SMEs. The RBV suggests that SMEs can gain a competitive edge by leveraging their unique resources and capabilities (Barney, 1991). These resources can include tangible assets like technology, equipment, or location, as well as intangible assets such as knowledge, reputation, and customer relationships. By effectively leveraging and deploying these resources, SMEs can differentiate themselves and create value for customers.

The Relationships of Dynamic Capability, Digitalization, and Competitive Advantage

Dynamic capabilities are a field of study that explores how businesses can gain temporary advantages over time by effectively responding to environmental shocks and changes (Barreto, 2010; Kump *et al*., 2019). The capabilities emphasize that companies need dynamic capacities to achieve technological and evolutionary fitness (Eisenhardt & Martin, 2000). Dynamic capabilities are expected to be able to transform resources (Eisenhardt & Martin, 2000), capabilities (Teece, 2007), operating procedures, or a combination thereof, depending on the context of change.

This study utilizes the dynamic capabilities typology introduced by Pavlou and El Sawy (2011), which emphasizes the four dimensions of sensing, learning, integrating, and coordinating capabilities. Pavlou and El Sawy (2011) assert that the dimensions they introduce represent a synthesis of existing literature, consolidated into a concise set to align with Teece *et al.*'s (1997) and Teece's (2007) framework. In a field that has faced criticism for its lack of precise measurements and being perceived as a black box, Pavlou and El Sawy's typology offers a parsimonious model that provides a limited yet specific and measurable set of dynamic capabilities (Hernández-Linares *et al*., 2021). Below are the descriptions and hypotheses of each capability in relation to digitalization.

Sensing Capability and Digitalization

In the fast-paced and highly competitive business environments of today (Teece, 2007), it is crucial to have a distinctive sensing capability (Zhang & Wu, 2013) to effectively leverage the potential benefits of resources and translate them into tangible outcomes. Sensing capability is the proficiency to recognize, interpret, and seize opportunities within the external environment (Pavlou & El Sawy, 2011). To develop this capability, organizations must actively search and explore both local and distant markets and technologies (Hodgkinson & Healey, 2011; Teece, 2014). Entrepreneurs with enhanced sensing capabilities can identify environmental changes and emerging opportunities, tailor products to meet market preferences, and address existing product weaknesses. This constant vigilance and adaptability

enable organizations to stay ahead of emerging trends and capitalize on new opportunities. Furthermore, sensing capability is crucial for SMEs in successfully adopting digital technologies (Alshanty & Emeagwali, 2019; Baden-Fuller & Teece, 2019). Matarazzo *et al*. (2021) also support the notion that sensing capabilities play a crucial role in SMEs' digital transformation. The capability to detect changes in the business environment, such as market trends, customer information, competitor insights, and technology, enables SMEs to enhance their digitalization prospects (Helfat & Raubitschek, 2018). Moreover, SMEs with robust sensing capabilities can swiftly adapt to digital technology advancements, improve operational efficiency, and respond more precisely to customer needs (Yeow *et al*., 2018). Sensing capabilities empower SMEs to comprehend shifts in consumer behaviour within the digital ecosystem, reinforcing the development of effective digital strategies.

H1a: Sensing capability (SC) positively influences the digitalization in SMEs.

Learning Capability and Digitalization

Learning capability is the ability of acquiring and assimilating knowledge (Kim, 1998) and using that knowledge to enhance a firm's capabilities and resource base (Zahra *et al*., 2006; Zollo & Winter, 2002). Through learning, organizations can identify new production opportunities and improve tasks' efficiency and effectiveness (Ambrosini & Bowman, 2009; Lin & Wu, 2014; Teece *et al*., 1997). Learning capability enables firms to adapt to changing circumstances and perform tasks more effectively and efficiently. This capability has also been identified as a significant factor influencing the success and effectiveness of digital technology adoption by SMEs (Shen *et al*., 2022). Provided strong learning capabilities, SMEs are able to adapt to technological changes and update their knowledge and skills to stay current with the latest trends (Gomes & Wojahn, 2017; Shen *et al*., 2022), to acquire new knowledge, and to adapt traditional business models in the digital era (Matarazzo *et al*., 2021). Moreover, SMEs with strong learning capabilities can identify opportunities for digital innovation, understand the implementation of new technologies, and enhance SME skills in facing digital challenges (Yeow *et al*., 2018). Furthermore, according to Helfat and Raubitschek (2018), learning capabilities also assist SME actors in responding to customer feedback, allowing them to improve and optimize their digital strategies over time.

H1b: Learning capability (LC) positively influences the digitalization in SMEs.

Integrating Capability and Digitalization

The integration and coordination of knowledge-related assets yield value that is irreplaceable within the marketplace (Teece, 2007). Although certain academics have regarded integration and coordination as singular capabilities (Teece *et al*., 1997), more recent literature considers them to be distinct (Ettlie & Pavlou, 2006; Pavlou & El Sawy, 2011). In our study, we align with Pavlou and El Sawy (2011) in conceptualizing the integrating capability as the ability to integrate new knowledge into operational capabilities through the promotion of shared understanding. The capability to effectively integrate knowledge within an organization is seen as a source of competitive advantage (Tsai, 2001), as the value of a firm's knowledge and learning can only be realized through effective integration into business processes (Hung *et al*., 2010). In the context of implementing digital technology-based businesses, the integrating capability has been found as the critical factor for the success and effectiveness of digital technology adoption by SMEs (Khurana *et al*., 2022). SMEs with integrating capabilities can connect their various activities into a strong linkage, anticipate the constantly changing business environment, and effectively integrate their systems and business processes with digital technology (Khurana *et al.,* 2022; Kolbe *et al*., 2021). Furthermore, the capability to integrate internal and external resources enables SMEs to develop more integrated and effective digital strategies (Matarazzo *et al.*, 2021). Integrating capabilities also play a role in fostering collaboration with external partners, including digital service providers, to expand reach and enhance competitiveness (Teece, 2020). Thus, the integrating capability becomes a key success factor in addressing challenges in adopting digital technologies.

H1c: Integrating capability (IC) positively influences the digitalization in SMEs.

Coordination Capability and Digitalization

Efficient utilization of dynamic capabilities necessitates the coordination of resource deployment, entailing the orchestration of tasks, resources, and activities within new operational capabilities (Pavlou & El Sawy, 2011). The coordination capability enables organizations to allocate resources efficiently, respond flexibly to changes, and achieve superior returns (Huang *et al*., 2012; Miller & Shamsie, 1996). This is particularly important for SMEs, which face resource limitations and rely on purposeful coordination for their learning efforts (Corredoira & McDermott, 2014; McDermott & Corredoira, 2010). In the relation to the digitalization, coordinating capability is essential for integrating digital technologies across organizational functions, promoting effective communication and collaboration, and maximizing the utilization of digital tools and platforms. It aligns processes, systems, and people to support the implementation of digitalization and drive organizational transformation. A robust coordinating capability empowers SMEs to overcome coordination challenges, streamline operations, and ensure efficient deployment of digital technologies throughout the organization. It enables seamless integration of digital tools, facilitates data sharing and collaboration among employees, and fosters a cohesive digital strategy. The ability to coordinate allows SME entrepreneurs to manage and implement digital technology efficiently, ensuring alignment among various elements in their businesses (Matarazzo *et al*., 2021). With strong coordinating capabilities, SMEs can optimize the use of digital resources, reduce the potential for misinformation, and enhance internal collaboration (Yeow *et al.*, 2018).

H1d: Coordination capability (CC) positively influences the digitalization in SMEs.

Digitalization and Competitive Advantage

Moreover, Porter's (1985) generic strategies framework shows that enterprises could attain competitive advantage through the pursuit of two distinct strategies: cost leadership and differentiation. These strategies represent two fundamental approaches that SMEs can adopt to position themselves effectively within their markets and outperform their competitors. In the contemporary digital age, both Porter's generic strategies, can be effectively pursued by integrating digital technology into the core business strategy of companies. Cuthbertson and Furseth (2022) express that SMEs digitalization plays a crucial role in enhancing the competitive advantage of SME entrepreneurs. Furthermore, Sousa-Zomer *et al.* (2020) highlight the significance of organizations having the ability to continuously transform their overall resource base to successfully implement digital strategies and hence sustain their competitiveness. Digital technology offers significant advantages to SMEs by reducing production and operational costs, enabling them to provide products or services at a lower price compared to their competitors. For instance, Ariansyah *et al.* (2021) underscore that entrepreneurs can leverage online sales platforms to efficiently find raw materials of their products at the most competitive price, resulting in more cost-effective production processes and ultimately leading to more competitive selling prices for their products. This cost reduction can attract price-conscious customers and contribute to gaining a competitive edge in the market. Moreover, Turban *et al.* (2009) highlight that in addition to reduced costs, online sales platforms also help entrepreneurs increase sales, enhance productivity, improve processing speed, reach broader market, and improve customer loyalty. Digital technology plays a pivotal role in enhancing the competitiveness of SMEs by facilitating the development of differentiated products through the innovation process. The mechanism through which digital technology can impact enterprise competitive advantage is by augmenting the potential for knowledge absorption. Digitalization also drives competitive improvement by streamlining the supply chain. It enables the implementation of digital accounting systems, providing accurate information to navigate uncertain and competitive markets, processing data swiftly, and enhancing customer service. Furthermore, digitalization contributes to the development of intellectual capital, a primary source of sustainable competitive advantage, by offering differentiation and creating customer value that is challenging to imitate. Moreover, digitalization is essential for SMEs to innovate and adapt to the business environment, thereby enhancing their competitive advantage. Several research findings indicate that digital technology and digital capabilities play a crucial role in improving corporate competitiveness

(Knudsen *et al*., 2021). Digital innovation, supported by digital technology, is also identified as a key factor in ensuring SME sustainability in the face of competition (Cuthbertson & Furseth, 2022). The success of digital technology transformation and adoption in SMEs significantly improves overall performance and competitiveness (Khurana *et al*., 2022). Florek-Paszkowska *et al*. (2021) also underscores the pivotal role of digital maturity in enhancing business resilience, stability, and competitive advantage amid the fourth industrial revolution, technological progress, and turbulent environments.

H2: The digitalization positively impacts SME competitive advantage (CA).

The Mediating Role of Digitalization

Dynamic capabilities are essential for companies to adjust to evolving environments and sustain a competitive edge (Harun *et al.*, 2023; Li, 2022), as the companies can perceive and capitalize on market opportunities over time, thus achieving enduring business performance (Teece, 2007). Cepeda and Vera (2007), Eisenhardt and Martin (2000), Helfat and Peteraf (2003), Pavlou and El Sawy (2011), Pundziene *et al*. (2021), and Prange and Verdier (2011) collectively provide enhanced conceptual and empirical insights into the interplay between dynamic capabilities and a firm's competitive advantage. Their findings indicate that these capabilities typically exert an indirect influence on a firm's competitive advantage and performance. Moreover, Cepeda and Vera (2007), Eisenhardt and Martin (2000), Protogerou *et al.* (2012), and Wilden *et al*. (2013) propose that the relationship between a firm's dynamic capabilities and its competitive advantage is mediated by the firm's operational capabilities. In a simpler term, operational capability refers to a firm's effectiveness in carrying out its daily activities (Pavlou & El Sawy, 2011).

In this research, we considered digitalization as one of the operational capabilities, as it enhances daily activities more effectively and efficiently. In today's increasingly digital world, companies that adapt to customer preferences and evolving market needs can mitigate the negative impacts of fluctuating demand on their economic performance (Harun *et al*., 2023). Ariansyah *et al*. (2023) also emphasize the significant role of digital technologies for sustainable economic development. Teece (2014) highlights the pivotal role of dynamic capabilities (DCs) in enabling companies to develop and deliver digitalized processes and products tailored to evolving customer needs, ultimately leading to increased profitability. Furthermore, Martins (2023) emphasizes the need to incorporate digitalization strategies into the framework of dynamic capabilities (DCs) to boost flexibility and agility in digital technologies. This integration enables organizations to swiftly adapt, innovate, customize, and implement products and services, thereby strengthening their competitive advantage (Vo Thai *et al*., 2024). As technological capabilities integrate into organizational practices, their significance increase, rendering them progressively challenging to replicate and indispensable, solidifying their role as a critical driver of innovation, profoundly influencing sustainable business performance (Martins, 2023).

Despite existing evidence on the correlation between digitalization and SME competitive advantage, there remains a need for additional research into how digitalization mediates the relationship between dynamic capabilities (DCs) and SME competitive advantage. Therefore, as dynamic capabilities can be represented by sensing, learning, integrating, and coordinating capabilities (Pavlou & El Sawy, 2011), we put forth a few hypotheses, as outlined below:

H3a: The digitalization mediates the relationship between sensing capability (SC) and competitive advantage (CA).

H3b: The digitalization mediates the relationship between learning capability (LC) and competitive advantage (CA).

H3c: The digitalization mediates the relationship between integrating capability (IC) and competitive advantage (CA).

H3d: The digitalization mediates the relationship between coordinating capability (CC) and competitive advantage (CA).

The hypotheses suggest that the dynamic capabilities, encompassing sensing, learning, integrating, and coordinating capabilities (Pavlou & El Sawy, 2011) will positively influence the adoption of

digital technology in the core of SME business strategy. In turn, this is expected to positively impact the SME competitive advantage.

RESEARCH METHODOLOGY

Research Design

This study refers to the Law Number 20 of 2008 on the micro, small, and medium enterprises in defining SME. According to the Law, the classification is based on their total assets and annual sales. Micro-enterprises are characterized by a net worth not surpassing IDR 50 million, excluding land and buildings, or annual sales not exceeding IDR 300 million. Small enterprises have a net worth ranging from over IDR 50 million to a maximum of IDR 500 million, excluding land and buildings, or annual sales surpassing IDR 300 million but not exceeding IDR 2.5 billion. Medium enterprises are distinguished by a net worth exceeding IDR 500 million but not surpassing IDR 10 billion, excluding land and buildings, or annual sales exceeding IDR 2.5 billion but not surpassing IDR 50 billion.

To validate the proposed hypotheses, we employed a quantitative research approach and utilized a cross-sectional research design. The data collection process spanned two months, specifically from September to October 2022, utilizing a face-to-face survey approach. Four enumerators distributed and assisted respondents in completing questionnaires, with each questionnaire taking no longer than 20 minutes to finish. As outlined in Table 1, the questionnaire adapted from previous research served as the primary research instrument. Furthermore, we utilized purposive sampling to select samples comprising SME founders with a minimum of one year of engagement in their businesses. Another criterion for sample selection was that the SME should have no direct or indirect affiliation with large companies.

We selected the locations for data collection based on the geographical classification of Indonesia, which can be roughly distinguished between Java and non-Java regions. Java is widely acknowledged for its advanced infrastructure, more densely population, concentration of business activities, and superior internet services, etc., in comparison to regions outside Java. To ensure a comprehensive understanding of the research topic, we deliberately chose representative locations in both Java and non-Java regions. Specifically, we focused on Central Java and North Kalimantan provinces due to their strategic significance. These provinces are centrally located within their respective classifications and serve as home for numerous SMEs. Moreover, North Kalimantan was selected to gain valuable insights into SMEs operating in border areas, where they encounter distinct challenges arising not only from domestic competitors but also from competitors in neighbouring countries such as Malaysia.

Our face-to-face data collection approach ensures a 100% response rate, resulting in the final sample size of 230. We may describe the profile of the samples can as follows: the business sectors of the respondents are classified into seven categories, namely, food and beverage processing (18%), handicrafts (11%), trade (23%), fashion products (20%), agriculture (13%), service sector (10%), and others 5%. Most SMEs fall into the small business sector, accounting for 158 (69%), while the medium-sized sector comprises 72 (31%). In terms of income, most respondents have a net monthly income between 3 million to 5 million rupiahs, with 112 (49%) respondents falling into this category. Regarding the business tenure, most respondents have been in business for a period ranging from 4 to 7 years, totalling 122 (53%).

Measures

We conducted a literature review to operationalize the variables and select suitable instruments and adapt scales used in previous studies. We modified the questions and adapted them to ensure better understanding among Indonesian respondents. All participants were asked to provide their responses using a 7-point Likert scale, where they indicated their level of agreement or disagreement with each statement. The scale ranged from 1 (strongly disagree) to 7 (strongly agree). Table 1 presents the complete research variables, including indicators and references of each.

Table 1. Variables and indicators

No.	Variable	Indicator	Reference
1.	Sensing Capability (SC)	a. Sensing the environment to identify new opportunities; b. Observing the change in the business environment and its impact on customers; c. Understanding the market to develop products desired by customers; d. Applying ideas to new products and improving the quality of old products.	(Hernández-Linares *et al.*, 2021)
2	Learning Capability (LC)	a. Seeking, identifying, and learning new information; b. Assimilation of various new information into the selected new information; c. Transforming new information into new knowledge; d. Using new knowledge for developing new products; e. Using new knowledge for improving customers service.	(Hernández-Linares *et al.,* 2021)
3.	Integrating Capability (IC)	a. Giving contributions and input to the organization; b. Creating good understandings about tasks and responsibilities; c. Knowing individuals in the group who have skills and knowledge relevant to the job; d. Correlating carefully one action to another to anticipate the always-changing business environment; e. Connecting various activities into a strong linkage.	(Hernández-Linares *et al.,* 2021)
4	Coordinating Capability (CC)	a. Ensuring that the job output of one individual is in accord with that of others; b. Ascertaining that resources (for instance, information, schedules, reports) are fairly allocated in the group; c. Giving assignments based on the knowledge and skills that the individuals have; d. Making sure that the skills of group members are in tune with job process; e. Making sure that the groups are well coordinated.	(Hernández-Linares *et al.,* 2021)
5	Digitalization (DIGIT)	a. Using digital marketing technologies to capture a larger customers share; b. Using social media to promote and offer the products; c. Providing online payment services (including money transfers) to facilitate customers transactions; d. Optimizing the utilization of mobile marketing for promotion events; e. Using email marketing to reach special customers; f. Building a collaboration with an online sale platform (application); g. Using software to record daily transactions (point of sale system/ POS); h. Optimizing online marketing services to still serve customers despite their physical absence in the store; i. Optimizing the corporate profile on the internet to make the corporate contents easily recognized by internet search engines.	(Susanto *et al.,* 2021; Olson *et al*., 2021; Trinugroho *et al*., 2022)
6	Competitive Advantage (CA)	a. Our product is competitively priced; b. The quality of our product meets the consumer expectations; c. Our product innovations can adapt to current trends; d. Fast and responsive customer service; e. Our product can reach the market more efficiently.	(Gutiérrez-Martínez & Duhamel, 2019; Kristal *et al*., 2010; Liao *et al*., 2017)

Source: own study based on literature.

Estimation Method

We employed PLS-SEM as the estimation method, which is a commonly used approach in the field of business and management sciences. It aims to estimate models by minimizing the squared deviation between observed values and estimated values (Dijkstra & Henseler, 2015; Hair *et al*., 2011). The selection of PLS-SEM over covariance-based SEM (CB-SEM) is driven by its predictive orientation. As outlined by Hair *et al*. (2011), CB-SEM is suited for causal modelling in situations characterized by well-established prior theory and a goal of further testing and confirmation, while PLS-SEM is aligned with a predictive focus. Sholihin (2013) outlines a few stages involved in the implementation of PLS-SEM. These stages include conceptualizing the model, selecting the appropriate algorithm analysis method for the outer and inner models, and applying the resampling method. A path diagram is then constructed, which incorporates the components of an empirical model along with the results of the measurement and structural model evaluations. Furthermore, evaluating the reliability and validity of the indicators employed to measure theoretical concepts is crucial to ensure the factorial structure of the instrument (Hair *et al*., 2019; Sarstedt *et al*., 2019). We utilized PLS-SEM technique supported by WarpPLS version 8.0 to conduct this analysis.

RESULTS AND DISCUSSION

The Evaluation of the Research Model

The evaluation of the research model consists of two stages: the measurement model evaluation and the structural model evaluation. The measurement model is evaluated using the PLS mode B algorithm method, which is suitable for constructs with reflective indicators. For the structural model, we employed the Warp algorithm method, known for its capability to estimate non-linear relationships among variables. The resampling method, known for its stability, is utilized to assess the stability of the estimated path coefficients (Sholihin, 2013).

The Evaluation of Measurement Model

The purpose of evaluating the measurement model is to evaluate the reliability and validity of the reflective indicators used to measure the research variables. In line with the model conceptualization, we measured all variables in the research model using reflective indicators. Following the guidelines by Latan and Ghozali (2016), the evaluation of the reliability and validity (outer model) of the reflective indicators involves the following rules of thumb:

1. Indicator reliability: An indicator is considered reliable if its factor loading value is greater than 0.7.
2. Internal consistency reliability: The internal consistency reliability is considered acceptable if the composite reliability value is greater than 0.7.
3. Convergent validity: Convergent validity is achieved if the average variance extracted (AVE) value exceeds 0.5.
4. Discriminant validity: Discriminant validity is established if the square root of the AVE exceeds the inter-construct correlations.

In the preliminary test of the research instrument, we found that one indicator, efficiency/price advantage (KK1) had a factor loading value below 0.7 (0.504). According to the rules of thumb mentioned above, this indicator will be eliminated from the measurement of the research variables. Table 2 provides detailed information regarding the factor loading values, composite reliability values, and AVE values.

Table 2 displays the factor loading values for all indicators, which are found to be above 0.5. However, one indicator (CA1) has a loading value below 0.5 and is therefore excluded from the variable measures. Moreover, all construct indicators exhibit an AVE value exceeding 0.5, indicating good convergent validity. The construct reliability and Cronbach's Alpha values are also above 0.7,

indicating good instrument reliability. Thus, considering the factor loading, AVE, and composite reliability values, we can infer that the instruments used were valid and reliable. Despite composite reliability values surpassing 0.95, such as those for IC and DIGIT, being undesirable due to the potential presence of redundant items restating the same question (Hair *et al*., 2022), we were confident in the absence of such redundancy in our questionnaire items. Hence, we maintained that the values in our study were acceptable, which is a stance supported by Latan and Ghozali (2016).

Table 2. Factor loading, composite reliability, and average variance extract

Variable	Indicator	Factor Loading	Composite Reliability	AVE
Sensing Capability (SC)	SC1	0.882	0.930	0.768
	SC2	0.932		
	SC3	0.876		
	SC4	0.810		
Learning Capability (LC)	LC1	0.892	0.936	0.746
	LC2	0.900		
	LC3	0.944		
	LC4	0.861		
	LC5	0.905		
Integrating Capability (IC)	IC1	0.892	0.956	0.811
	IC2	0.900		
	IC3	0.944		
	IC4	0.861		
	IC5	0.905		
Coordinating Capability (CC)	CC1	0.868	0.934	0.739
	CC2	0.879		
	CC3	0.916		
	CC4	0.761		
	CC5	0.865		
Digitalization (DIGIT)	DTBBS1	0.869	0.954	0.699
	DTBBS2	0.828		
	DTBBS3	0.776		
	DTBBS4	0.906		
	DTBBS5	0.776		
	DTBBS6	0.872		
	DTBBS7	0.778		
	DTBBS8	0.861		
	DTBBS9	0.850		
Competitive Advantage (CA)	CA2	0.821	0.936	0.786
	CA3	0.883		
	CA4	0.889		
	CA5	0.911		

Source: own study.

The next step was to evaluate the discriminant validity, a concept that assesses the distinctiveness of different constructs or variables in a study. It examines whether the measures used to assess different constructs truly capture unique aspects of those constructs and do not overlap with one another. A common method to assess discriminant validity is to compare the correlations between constructs with the square root of the AVE for each construct (Awang, 2014). If the AVE square root is greater than the correlation between constructs, it indicates that the constructs have good discriminant validity. The evaluation results in Table 3 show that all variables have good discriminant validity.

Table 3. Discriminant validity

Construct	Correlations						AVE Square Root
	SC	LC	IC	CC	DTBBS	CA	
SC	–	0.804	0.622	0.769	0.502	0.703	0.876
LC	0.804	–	0.719	0.785	0.616	0.677	0.864
IC	0.622	0.719	–	0.879	0.501	0.670	0.901
CC	0.769	0.785	0.879	–	0.511	0.803	0.860
DIGIT	0.502	0.616	0.501	0.511	–	0.634	0.836
CA	0.703	0.677	0.670	0.803	0.634	–	0.887

Source: own study.

Evaluation of the Structural Model

The evaluation of the structural model, also known as the inner model, aims to predict the relationships between variables by estimating the explained variance and determining the significance of the P-values (Latan & Ghozali, 2016). This evaluation serves as a hypothesis test for the conceptual framework. Prior to examining the relationships between variables, it is crucial to evaluate the goodness of fit of the proposed research model.

Table 4 presents the results of the goodness of fit assessment for the research model, indicating that the model fits well. This is supported by the significant P-values (<0.05) for APC, ARS, and AARS, with values of APC = 0.314, ARS = 0.478, and AARS = 0.461. Moreover, both AVIF and AFVIF values are below 5. According to Hair *et al*. (2022) and Latan and Ghozali (2016), the VIF value is recommended to be below 5 and ideally below approximately 3. Therefore, we considered the values acceptable. Meanwhile, the value of goodness of fit was 0.602, which exceeds the threshold of 0.36, indicating a very good fit for the model. Furthermore, SPR, RSCR, SSR, and NLBCDR had values of 1, suggesting the absence of causality problems in the model (Latan & Ghozali, 2016).

Table 4. Goodness of fit of structural model

Criteria	Value	Rules of Thumb
Average path coefficient (APC)	0.314, P<0.001	Acceptable P < 0.05
Average R-squared (ARS)	0.478, P<0.001	Acceptable P < 0.05
Average adjusted R-squared (AARS)	0.461, P<0.001	Acceptable P < 0.05
Average block VIF (AVIF)	3.635	acceptable if <= 5, ideally <= 3.3
Average full collinearity VIF (AFVIF)	4.623	acceptable if <= 5, ideally <= 3.3
Tenenhaus GoF (GoF)	0.602	small >= 0.1, medium >= 0.25, large >= 0.36
Sympson's paradox ratio (SPR)	1	acceptable if >= 0.7, ideally = 1
R-squared contribution ratio (RSCR)	1	acceptable if >= 0.9, ideally = 1
Statistical suppression ratio	1	acceptable if >= 0.7
Nonlinear bivariate causality direction ratio (NLBCDR)	1	acceptable if >= 0.7

Source: own study and Latan and Ghozali (2016).

The Direct Effects Among Variables

Table 5 and Figure 1 provide important insights into the explained variance and predictive relevance of the research model. For the variation that affects digital-based business strategy (digitalization), the R-squared (R2) value was 0.54, indicating that 54% of the variation in digitalization can be explained by the combined effects of sensing capability, learning capability, integration, and coordinating capability. The remaining 46% of the variation is attributed to other variables not incorporated in the research model. The R^2 value for digitalization falls within the strong category, as it exceeds the threshold of 0.45, demonstrating a substantial impact. Likewise, the Q-squared value for digitalization was 0.448, indicating predictive relevance of the research model as it was greater than 0, meaning that it effectively predicted the observed data for digitalization (Latan & Ghozali, 2016). Similarly, for the variation that affects competitive advantage, the R^2 value was 0.42, indicating that 42% of the variation in competitive advantage can

be attributed to the variation in digitalization. The remaining 58% of the variation is influenced by other factors beyond the research model. The R2 value for competitive advantage was also classified as strong, because it surpassesed the threshold of 0.45. Moreover, the Q-squared value for competitive advantage was 0.429, which confirmed the predictive relevance of the model (Latan & Ghozali, 2016). Furthermore, Figure 1 visually represents the estimated relationship across variables and its variance. The figure serves as a graphical representation of the statistical findings, allowing for a clear visualization of the relationships and their magnitudes. It provides a concise summary of the estimated results and serves as a useful tool for communication and interpretation of the research findings.

These results provide evidence of the significant contributions of dynamic capabilities, as represented by sensing capability, learning capability, integration, and coordinating capability, in explaining the variation in both digitalization and competitive advantage.

Table 5. Estimated results

Description Path	Path Coeff.	P value	R^2	Q^2
SC → DIGIT	0.181	0.018	0.536	0.448
LC → DIGIT	0.419	<0.001		
IC → DIGIT	0.220	0.006		
CC → DIGIT	0.101	0.119		
DIGIT → CA	0.649	<0.001	0.421	0.429

Source: own study.

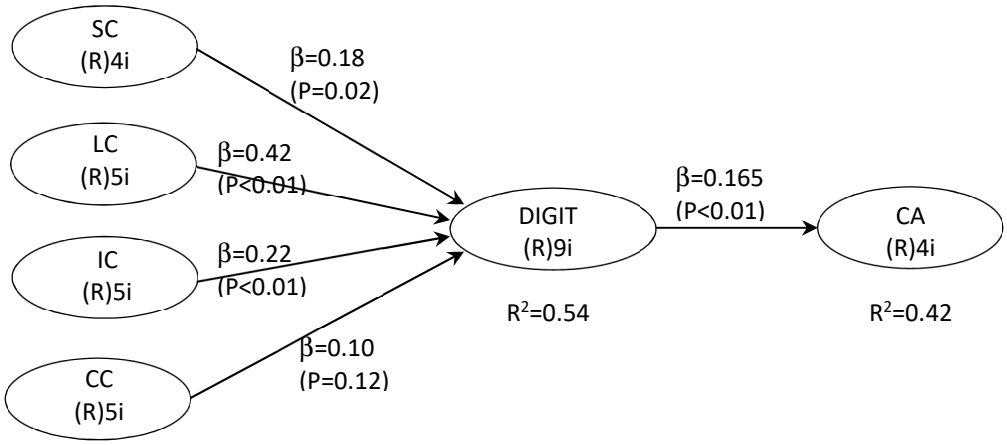

Figure 1. Hypotheses testing results
Source: own elaboration.

The Effect of Sensing Capability on the Digitalization

Based on empirical evidence, we found that sensing capability has a positive and significant impact on the SME's digitalization. It supports the notion that sensing capability plays a crucial role in shaping the success and effectiveness of SMEs in embracing digital technology (Alshanty & Emeagwali, 2019; Baden-Fuller & Teece, 2019). Moreover, SMEs that excel in sensing capability are better positioned to adeptly incorporate digital technology into their business strategies (Hernández-Linares *et al.*, 2021). Entrepreneurs who continuously improve their sensing capability are better equipped to identify environmental changes and new market opportunities. By understanding customer preferences, entrepreneurs can develop new products and address weaknesses in existing ones (Papadopoulos *et al*., 2020). Moreover, a strong sensing capability encourages entrepreneurs to adopt digital technologies and utilize digital platforms (*e.g*., websites, social media, online marketplaces) to expand their customer base (Song *et al*., 2022). Furthermore, online payment options and search engine optimization strategies can further enhance their digital presence.

In a rapidly changing business environment, sensing capability enables companies to adapt to market dynamics and seize new opportunities (Hernández-Linares *et al*., 2021). The need to remain viable in such an environment often prompts businesses to adopt digital technologies (Papadopoulos *et al.*, 2020). Overall, the findings highlight the crucial role of sensing capability in facilitating the successful implementation of digital technology-based business strategies.

The Effect of Learning Capability on the Digitalization

The analysis indicated a significant and positive relationship between learning capability and the digitalization within SMEs. In fact, SMEs with strong learning capabilities are more likely to successfully adopt and utilize digital technologies in their business operations. Learning capability enables SMEs to adapt to technological changes, stay updated with digital trends, and enhance individual skills and competencies related to digital technology (Ahmed *et al*., 2022; Gomes & Wojahn, 2017; Shen *et al.*, 2022). Overall, the ability to learn plays a crucial role in the implementation of digital technology-driven businesses. This capability empowers organizations to adjust, assimilate technology, innovate, enhance business processes, and cultivate the requisite skills and competencies (Hooi, 2020).

The Effect of Integrating Capability on the Digitalization

The empirical analysis provides strong evidence of a notable and favorable association between integrating capability and the integration of digital technology in SME business strategy. This discovery supports the earlier research conducted by Khurana *et al*. (2022) and implies that SMEs possessing higher levels of integrating capability are more likely to successfully incorporate digital technology into their existing processes, systems, and functions (Hernández-Linares *et al.*, 2021). This capability enables SMEs to establish connections between their current applications and systems and new digital technologies. It involves the automation of business processes using digital software or platforms, as well as the integration of data and information from diverse sources (Khurana *et al.,* 2022). By effectively integrating digital technology into their operations, SMEs can enhance efficiency, optimize technology usage, and achieve operational harmony. The integration capability further enhances collaboration and communication among members within an organization, particularly in a business context centered around digital technology. Moreover, SMEs equipped with robust integration capabilities can deploy collaborative tools and platforms, fostering more efficient information sharing and teamwork (Kolbe *et al*., 2021). Overall, integrating capability plays a crucial role in the successful SME digitalization.

The Effect of Coordinating Capability on the Digitalization

The research reveals that among the studied capabilities, coordinating capability is the only one that does not have a statistically significant impact on digitalization within SMEs. One of possible justifications of this finding is that the scale and simplicity of SMEs' scope of work do not require extensive coordination. Aligned with the findings of Verwaal *et al.* (2010), the capacity of a company to synchronize its business strategies and objectives with the integration of digital technology is significantly influenced by factors such as company size and available resources. Moreover, small companies often require hierarchical assistance and government support to effectively coordinate and build networks through partnerships (Gardet & Fraiha, 2012).

The Effect of Digitalization on the Competitive Advantage

The analysis results reveal that the digitalization has a significant positive effect on competitive advantage, aligning with the findings of Valdez *et al.* (2016) that the increased adoption of digital technology is associated with an elevated level of competitive advantage. It also supports the idea that SMEs can boost their competitive edge by aligning digital platform-based capabilities with their business orientation (Cenamor *et al*., 2019).

The integration of digital technology empowers SMEs to create distinctive and specialized products and services, as well as to harness data efficiently. Making decisions based on data allows organizations to improve their responsiveness, adaptability, and proactive approach in navigating market changes

and competition. Utilizing digital platforms offers organizations the opportunity to broaden their consumer base and access wider markets, both geographically and demographically (Cuthbertson & Furseth, 2022). Furthermore, SMEs can leverage social media, websites, mobile applications, and various online channels to extend their reach, enhance brand visibility, and foster connections with potential customers. Embracing business strategies rooted in digital technology empowers organizations to be more agile in responding to market shifts and innovations (Shen *et al*., 2022). This strengthens SME competitive advantage by enabling swift adaptation, innovation, and improved customer satisfaction through better alignment with their needs.

Overall, a well-implemented digitalization significantly impacts an organization's competitive advantage. It enables organizations to differentiate themselves, enhance operational efficiency, expand market presence, leverage data analytics, and respond to changing dynamics. This competitive advantage positions organizations for long-term growth, profitability, and success in the rapidly evolving digital era.

The Mediating Effects of Digitalization

Table 6 displays the analytical outcomes concerning the mediating impact of digitalization on the connection between dynamic capabilities (specifically sensing capability, learning capability, integrating capability, and coordinating capability) and competitive advantage.

Table 6. Estimated results of mediation effect

Description Path	Path Coefficient	P value	Description
Sensing Capability → Digitalization → Competitive Advantage	0.118	0.027	Mediation
Learning Capability → Digitalization → Competitive Advantage	0.272	<0.001	Mediation
Integrating Capability → Digitalization → Competitive Advantage	0.143	0.010	Mediation
Coordinating Capability → Digitalization → Competitive Advantage	0.066	0.139	Non Mediation

Source: own study.

The Mediating Effect of the Digitalization Between Sensing Capability and Competitive Advantage

The results indicate that the effect of sensing capability on the SME's competitive advantage is positive and significant when mediated by the digitalization. Moreover, SMEs that adopt digital technology in their business effectively utilize sensing capability and identifying new opportunities, analyzing the business environment, understanding market preferences, and applying innovative ideas to meet customer demands. In connection with this issue, SMEs that demonstrate proficiency in utilizing digital marketing technologies and social media for the promotion and delivery of their products and services are more likely to enhance their competitive edge (Mikalef & Pateli, 2017). Moreover, the study found that SMEs that can provide online payment services, utilizing mobile marketing for promotional events, and collaborating with online selling applications or platforms have a higher likelihood of improving their competitive advantage, particularly in highly competitive markets. These findings align with earlier research by Hernández-Linares *et al.* (2021) and Teece (2018).

A strong sensing capability enables SME entrepreneurs to detect market changes and business opportunities more effectively. The demonstrated role of digitalization, as a mediator, illustrates the transformation of SMEs into an environment closely intertwined with the use of digital technology, access to information, and the ability to adapt to external changes. Through the utilization of digital technology, SMEs can enhance operational efficiency, respond rapidly to the market, and improve service quality. In turn, this plays a crucial role as a vital link between sensing capability and competitive advantage (Mikalef *et al*., 2020). Through effective adoption of digital technology, SMEs can create a competitive advantage by providing more innovative products and services, delivering superior customer experiences, and strengthening their position in an increasingly dynamic market.

The Mediating Effect of the Digitalization Between Learning Capability and Competitive Advantage

The estimated results on the Table 6 support the mediation role of the digitalization in the relationship between learning capability and the SME's competitive advantage. This suggests that SMEs learning capability has a notable impact on enhancing their competitive advantage through the adoption of

digital technology in their business. The SMEs' abilities to seek, assimilate, identify, and learn new information and knowledge significantly contribute to their capability in implementing digital technology, for instance by using digital marketing technologies and social media to offer their products/services and providing digital payment services to facilitate transactions and collaborating with online selling applications. This strategy is required to improve their competitive advantage, especially in highly competitive markets (Hernández-Linares *et al.*, 2021).

Good learning capability enables SMEs to respond to changes in the business environment and enhance the knowledge and required skills. As a mediator, digitalization reflects the internalization of digital technology in the learning and adaptation processes of SME actors. By leveraging digital technology, SMEs can improve efficiency, optimize production processes, and explore innovation opportunities. Through digitalization, SMEs can more easily access market information and emerging trends. Therefore, through digitalization, SMEs can convert learning capabilities into a competitive advantage by creating more innovative products and services, improving operational efficiency, and adapting quickly to the ever-changing dynamics of the market (Teece, 2020).

The Mediating Effect of the Digitalization Between Integrating Capability and Competitive Advantage

Table 6 also provides support that digitalization acts as a mediator in the relationship between SME's integrating capability and competitive advantage. This implies that integrating capability had a notable impact on enhancing competitive advantage through the implementation of digitalization. Moreover, SMEs that possess the capability to integrate various business activities into a cohesive connection are more likely to implement digitalization, which further improve their competitive advantage (Hernández-Linares *et al*., 2021).

The integrating capability encompasses the agility of SME actors in effectively managing internal and external resources. The proven role of digitalization as a mediating variable illustrates how digital technology facilitates the integration of data, processes, and interactions with various stakeholders. Through the adoption of digital technology, SMEs can strengthen internal collaboration, enhance connectivity with suppliers and customers, and expedite decision-making processes. In turn, this creates a competitive advantage by improving operational efficiency, responsiveness to market changes, and the ability to deliver value more rapidly and effectively (Mikalef *et al.*, 2020). Thus, digitalization serves as a primary link between integrating capability and competitive advantage in the SME context.

The Mediating Effect of the Digitalization Between Coordinating Capability and Competitive Advantage

The findings presented in Table 6 indicate that digitalization does not function as an intermediary factor in the connection between coordinating capability and SMEs' competitive advantage. This suggests that coordinating capability does not exert a significant impact on the competitive advantage of SMEs by way of digitalization. These findings suggest that coordinating capability in SMEs does not contribute significantly to the implementation of digitalization and further the improvement of competitive advantage. Unlike large enterprises that establish elaborate internal coordination mechanisms (Monteiro *et al*., 2019), SMEs often face challenges due to limited resources and manpower. In fact, SMEs may face difficulties in dedicating specific roles or departments solely for coordination purposes. Instead, employees in SMEs often must juggle various tasks and responsibilities simultaneously, which can lead to challenges in effectively coordinating activities and experiencing the full benefits of coordination (Wilden & Gudergan, 2017). Thus, digitalization cannot mediate the relationship coordinating capability and competitive advantage. This discovery may also imply the existence of a direct association between coordinating capability and competitive advantage.

We may attribute the analysis results indicating that digitalization does not mediate the relationship between coordinating capability and competitive advantage to several possibilities. Firstly, it could be due to infrastructure barriers or limited technology access at the SME level, especially in smaller business sectors or groups, resulting in less dependency on digital technology for interdepartmental coordination. Another possibility is the organization's low capacity to align business strategies with digital technology, which could also be a triggering factor. Hence, these constraints may hinder the effective mediating role of digitalization between coordinative capability and competitive advantage.

CONCLUSIONS

This research employs a quantitative approach to explore how digitalization mediates the connection between dynamic capabilities (specifically, sensing capability, learning capability, integrating capability, and coordinating capability) and the attainment of competitive advantage in SMEs. The analysis reveals that dynamic capabilities, except for collaborating capability, positively influence the implementation of digitalization, emphasizing their role in facilitating effective utilization of digital technologies. Moreover, the study finds a significant and positive association between digitalization and SME competitive advantage. Moreover, the findings demonstrate the mediating role of digitalization in the relationships between sensing capability, learning capability, integrating capability, and competitive advantage.

Summarizing, the digitalization has proven to enhance SMEs in elevating their competitive advantage by leveraging dynamic capabilities, particularly sensing, learning, and integrating capabilities. In other words, digitalization serves as a pathway through which dynamic capabilities can influence competitive advantage in the context of Indonesian SMEs.

Theoretical Implications

The present study makes a substantial contribution to the existing literature in strategic management. Specifically, while recent empirical research has delved into the direct impact of dynamic capabilities on SME performance (Ahmad *et al.*, 2022; Anggadwita *et al.*, 2023; Dejardin *et al*., 2023; Heredia-Portillo & Armas-Arévalos, 2023; Hernández-Linares *et al*., 2021; Martins, 2023), our study sheds light on the indirect impact dynamic capabilities and SME's competitive advantage, particularly by examining the mediating role of digitalization. Our findings align with the proposition put forth by Cepeda and Vera (2007), Eisenhardt and Martin (2000), Protogerou *et al*. (2012), and Wilden *et al*. (2013) regarding the pivotal role of operational capability in mediating the connection between an SME's dynamic capabilities and its competitive advantage. This mediation is exemplified by the capability to seamlessly integrate digital technologies into daily operations, which we term 'digitalization' in this study. This concept serves to elucidate how an SME's dynamic capabilities facilitate the successful implementation of digitalization, ultimately leading to an enhanced competitive advantage.

By examining the specific pathways and relationships between dynamic capabilities, represented by sensing, learning, integrating, and collaborating capabilities, and competitive advantage, the study provides a deeper understanding of the strategic management process in SMEs operating in the dynamic and challenging business environment. The findings emphasize the significance of sensing capability, learning capability, and integrating capability as key drivers in the successful implementation of digitalization. The study also highlights the importance of adopting digital technologies and leveraging them strategically to drive competitive advantage.

Practical Implications

The positive and significant of SME's sensing, learning, and integrating capabilities in promoting the SME's digital technology-based business strategies, which further enhance the SME's competitive advantage, lead to several practical implications. Firstly, SMEs should focus on improving their sensing capability to better understand market dynamics and identify new opportunities. This can be achieved by actively monitoring and collecting information about changes in the external and internal business environment. SMEs can leverage digital tools and technologies to gather data, analyze market trends, and gain insights that can inform their strategic decision-making.

Secondly, SMEs should prioritize building a learning culture within their organizations. They can encourage employees to seek new knowledge, attend training programs, and stay updated on technological advancements relevant to their industry. Creating opportunities for knowledge sharing and collaboration can foster a continuous learning environment, enabling SMEs to adapt quickly to technological changes and leverage digital technologies effectively.

Thirdly, SMEs need to strengthen integrating capability. SMEs need to focus on integrating digital technology into their existing processes, systems, and functions. This can involve connecting

various applications, automating business processes, and ensuring seamless data integration. By enhancing their integrating capability, SMEs can optimize the use of digital technology, streamline operations, and improve efficiency.

Fourthly, while collaboration and coordination are important in any organization, for SMEs that are characterized by their limited work scope, the impact of coordinating capability on competitive advantage through the implementation of digitalization is limited. The practical implication of this finding suggests that SMEs should prioritize and allocate their resources to areas that have a more significant impact on their competitive advantage.

The finding that the digitalization of SMEs mediates the relationship between dynamic capabilities and competitive advantage underscore the crucial role of digitalization in enhancing the competitive advantage of SMEs by mediating the impact of dynamic capabilities on their competitiveness. Therefore, the continuous improvement of digital transformation, the adoption of e-commerce technology, innovations in digital marketing, digital entrepreneurship strategies and orientation, the use of information technology to enhance the value chain, and the digital capabilities of SME actors are logical consequences of the recognized vital role of digitalization in enhancing SME competitiveness.

Limitations and Future Research Direction

This study recognizes various limitations that open avenues for future research. Firstly, the respondent composition was primarily small-scale SMEs, which may limit the generalizability of the findings. Future research should strive to include a more balanced representation of SMEs, including medium-scale SMEs, to enhance the comprehension of the dynamic capabilities and competitive advantage relationship.

Furthermore, this study relied on the perceptions and opinions of SMEs, which may not capture the complete spectrum of SME competitive advantage. To address this limitation, future research could incorporate objective competitive advantage data obtained from local government records or other reliable sources. By combining subjective perceptions with objective competitiveness measures, researchers can gain a more robust understanding of how dynamic capabilities impact the growth and success of SMEs.

Another limitation pertains to the study's scope. While this study aims to represent SMEs from both Java and non-Java regions, it is imperative to acknowledge that drawing conclusions solely from the findings of Central Java as a representative of Java and North Kalimantan as a representation of non-Java might not fully encapsulate the extensive diversity of SMEs across Indonesia. Indonesia is a diverse country with varying business environments, resources, and cultural factors, which can impact the dynamics of SMEs and further influence the relationship among variables under investigation. Future research should consider replicating the study in broader regions or even across different countries to validate the results and examine potential variations in the mediating role of digitalization on the dynamic capabilities and competitive advantage relationship.

Overall, overcoming these limitations and conducting additional research with a more diverse sample, incorporating objective competitiveness data, and expanding the geographical scope will strengthen the validity and applicability of the findings, providing a more comprehensive understanding of the role of dynamic capabilities in enhancing competitive advantage for SMEs.

REFERENCES

Ahmad, M.I., Naseem, M.A., & Rehman, R.U. (2022). Small and medium enterprises dynamic capabilities efficacy during COVID-19: Moderating role of CEO gender. *Review of International Business and Strategy*, *33*(1), 5-17. https://doi.org/10.1108/RIBS-12-2021-0178

Ahmed, A., Bhatti, S.H., Gölgeci, I., & Arslan, A. (2022). Digital platform capability and organizational agility of emerging market manufacturing SMEs: The mediating role of intellectual capital and the moderating role of environmental dynamism. *Technological Forecasting and Social Change*, *177*, 121513. https://doi.org/10.1016/j.techfore.2022.121513

Akenroye, T.O., Owens, J.D., Elbaz, J., & Durowoju, O.A. (2020). Dynamic capabilities for SME participation in public procurement. *Business Process Management Journal*, *26*(4), 857-888. https://doi.org/10.1108/BPMJ-10-2019-0447

Alshanty, A.M., & Emeagwali, O.L. (2019). Market-sensing capability, knowledge creation and innovation: The moderating role of entrepreneurial-orientation. *Journal of Innovation & Knowledge*, *4*(3), 171-178. https://doi.org/10.1016/j.jik.2019.02.002

Ambrosini, V., & Bowman, C. (2009). What are dynamic capabilities and are they a useful construct in strategic management?. *International Journal of Management Reviews*, *11*(1), 29-49. https://doi.org/10.1111/j.1468-2370.2008.00251.x

Anggadwita, G., Indarti, N., Sinha, P., & Manik, H.F.G.G. (2023). The internationalization performance of Indonesian SMEs during COVID-19 pandemic: Exploring a mediation model. *Review of International Business and Strategy*, *ahead-of-print*(ahead-of-print). https://doi.org/10.1108/RIBS-04-2023-0030

Ariansyah, K., & Nuryakin, C. (2019). Competition and Mobile Network Operator's Investment Relationship: A Firm Level Empirical Evidence for Developing Countries. *Journal of Telecommunications and the Digital Economy*, *7*(4), 17-32. https://doi.org/10.18080/jtde.v7n4.205

Ariansyah, K., Sirait, E.R.E., Nugroho, B.A., & Suryanegara, M. (2021). Drivers of and barriers to e-commerce adoption in Indonesia: Individuals' perspectives and the implications. *Telecommunications Policy*, *45*(8), 102219. https://doi.org/10.1016/j.telpol.2021.102219

Ariansyah, K., Barsei, A.N., Syahr, Z.H.A., Sipahutar, N.Y.P., Damanik, M.P., Perdananugraha, G.M., … Suryanegara, M. (2023). Unleashing the potential of mobile broadband: Evidence from Indonesia's underdeveloped regions on its role in reducing income inequality. *Telematics and Informatics*, *82*, 102012. https://doi.org/10.1016/j.tele.2023.102012

Awang, Z. (2014). *A Handbook on Structural Equation Modeling*. Bangi, Malaysia: MPWS Rich Resources.

Baden-Fuller, C., & Teece, D. (2019). Market sensing, dynamic capability, and competitive dynamics. *Industrial Marketing Management*, *89*. https://doi.org/10.1016/j.indmarman.2019.11.008

Bank Indonesia. (2022). Tak Hanya Keren, Pakai Produk UMKM juga Dapat Membantu Perekonomian. Retrieved from Bank Indonesia website: https://www.bi.go.id/id/publikasi/ruang-media/cerita-bi/Pages/Tak-Hanya-Keren,-Pakai-Produk-UMKM-juga-Dapat-Membantu-Perekonomian.aspx on August 8, 2023.

Barney, J. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of Management*, *17*(1), 99-120. https://doi.org/10.1177/014920639101700108

Barreto, I. (2010). Dynamic Capabilities: A Review of Past Research and an Agenda for the Future. *Journal of Management*, *36*(1), 256-280. https://doi.org/10.1177/0149206309350776

Bharadwaj, A., El Sawy, O.A., Pavlou, P.A., & Venkatraman, N.V. (2013, June 1). *Digital Business Strategy: Toward a Next Generation of Insights* [SSRN Scholarly Paper]. Rochester, NY. Retrieved from https://papers.ssrn.com/abstract=2742300 on August 2, 2023.

Bloomberg, J. (2018). Digitization, Digitalization, And Digital Transformation: Confuse Them At Your Peril. Retrieved from Forbes website: https://www.forbes.com/sites/jasonbloomberg/2018/04/29/digitization-digitalization-and-digital-transformation-confuse-them-at-your-peril/ on August 8, 2023.

Bukht, R., & Heeks, R. (2017, August 3). *Defining, Conceptualising and Measuring the Digital Economy* [SSRN Scholarly Paper]. Rochester, NY. https://doi.org/10.2139/ssrn.3431732

Cenamor, J., Parida, V., & Wincent, J. (2019). How entrepreneurial SMEs compete through digital platforms: The roles of digital platform capability, network capability and ambidexterity. *Journal of Business Research*, *100*, 196-206. https://doi.org/10.1016/j.jbusres.2019.03.035

Cepeda, G., & Vera, D. (2007). Dynamic capabilities and operational capabilities: A knowledge management perspective. *Journal of Business Research*, *60*(5), 426-437. https://doi.org/10.1016/j.jbusres.2007.01.013

Chen, Y.-Y. K., Jaw, Y.-L., & Wu, B.-L. (2016). Effect of digital transformation on organisational performance of SMEs: Evidence from the Taiwanese textile industry's web portal. *Internet Research*, *26*(1), 186-212. https://doi.org/10.1108/IntR-12-2013-0265

Cheng, R., Ho, C.-Y., & Huang, S. (2023). Digitalization and firm performance: Channels and heterogeneities. *Applied Economics Letters*, *30*(17), 2401-2406. https://doi.org/10.1080/13504851.2022.2097178

Corredoira, R.A., & McDermott, G.A. (2014). Adaptation, bridging and firm upgrading: How non-market institutions and MNCs facilitate knowledge recombination in emerging markets. *Journal of International Business Studies*, *45*(6), 699-722. https://doi.org/10.1057/jibs.2014.19

Cuthbertson, R.W., & Furseth, P.I. (2022). Digital services and competitive advantage: Strengthening the links between RBV, KBV, and innovation. *Journal of Business Research*, *152*, 168-176. https://doi.org/10.1016/j.jbusres.2022.07.030

Dejardin, M., Raposo, M.L., Ferreira, J.J., Fernandes, C.I., Veiga, P.M., & Farinha, L. (2023). The impact of dynamic capabilities on SME performance during COVID-19. *Review of Managerial Science*, *17*(5), 1703-1729. Scopus. https://doi.org/10.1007/s11846-022-00569-x

Dijkstra, T.K., & Henseler, J. (2015). Consistent and asymptotically normal PLS estimators for linear structural equations. *Computational Statistics & Data Analysis*, *81*, 10-23. https://doi.org/10.1016/j.csda.2014.07.008

Eisenhardt, K.M., & Martin, J.A. (2000). Dynamic capabilities: What are they?. *Strategic Management Journal*, *21*(10-11), 1105-1121. https://doi.org/10.1002/1097-0266(200010/11)21:10/11<1105::AID-SMJ133>3.0.CO;2-E

Ellström, D., Holtström, J., Berg, E., & Josefsson, C. (2021). Dynamic capabilities for digital transformation. *Journal of Strategy and Management*, *15*(2), 272-286. https://doi.org/10.1108/JSMA-04-2021-0089

Elo, M., Ermolaeva, L., Ivanova-Gongne, M., & Klishevich, D. (2022). Resilience and business model adaptation in turbulent times: Experiences of Russophone migrant entrepreneurs in Germany during Covid-pandemic. *Small Enterprise Research*, *29*(3), 250-272. https://doi.org/10.1080/13215906.2022.2134916

Ettlie, J.E., & Pavlou, P.A. (2006). Technology-Based New Product Development Partnerships*. *Decision Sciences*, *37*(2), 117-147. https://doi.org/10.1111/j.1540-5915.2006.00119.x

Farhikhteh, S., Kazemi, A., Shahin, A., & Mohammad Shafiee, M. (2020). How competitiveness factors propel SMEs to achieve competitive advantage?. *Competitiveness Review: An International Business Journal*, *30*(3), 315-338. https://doi.org/10.1108/CR-12-2018-0090

Ferreira, J., Cardim, S., & Coelho, A. (2020). Dynamic capabilities, innovation and branding capabilities and their impact on competitive advantage and SME's performance in Portugal: The moderating effects of entrepreneurial orientation. *International Journal of Innovation Science*, *12*(3), 255-286. https://doi.org/10.1108/IJIS-10-2018-0108

Ferreira, J., & Coelho, A. (2017). Dynamic capabilities, managerial and marketing capabilities and their impact on the competitive advantage and firm performance. *International Journal of Entrepreneurship and Small Business*, *30*(4), 629. https://doi.org/10.1504/IJESB.2017.082925

Fonseka, K., Jaharadak, A.A., & Raman, M. (2022). Impact of E-commerce adoption on business performance of SMEs in Sri Lanka; moderating role of artificial intelligence. *International Journal of Social Economics*, *49*(10), 1518-1531. https://doi.org/10.1108/IJSE-12-2021-0752

Florek-Paszkowska, A., Ujwary-Gil, A., & Godlewska-Dzioboń, B. (2021). Business innovation and critical success factors in the era of digital transformation and turbulent times. *Journal of Entrepreneurship, Management and Innovation*, *17*(4), 7-28. https://doi.org/10.7341/20211741

Gardet, E., & Fraiha, S. (2012). Coordination Modes Established by the Hub Firm of an Innovation Network: The Case of an SME Bearer. *Journal of Small Business Management*, *50*(2), 216-238. https://doi.org/10.1111/j.1540-627X.2012.00351.x

Gomes, G., & Wojahn, R.M. (2017). Organizational learning capability, innovation and performance: Study in small and medium-sized enterprises (SMES). *Revista de Administração*, *52*(2), 163-175. https://doi.org/10.1016/j.rausp.2016.12.003

Gutiérrez-Martínez, I., & Duhamel, F. (2019). Translating sustainability into competitive advantage: The case of Mexico's hospitality industry. *Corporate Governance: The International Journal of Business in Society*, *19*(6), 1324-1343. https://doi.org/10.1108/CG-01-2019-0031

Hair, J.F., Hult, G.T.M., Ringle, C.M., & Sarstedt, M. (2022). A primer on partial least squares structural equation modeling (PLS-SEM) (Third edition). Los Angeles London New Delhi Singapore Washington DC Melbourne: SAGE.

Hair, Joe F., Ringle, C.M., & Sarstedt, M. (2011). PLS-SEM: Indeed a Silver Bullet. *Journal of Marketing Theory and Practice*, *19*(2), 139-152. https://doi.org/10.2753/MTP1069-6679190202

Hair, Joseph F., Risher, J.J., Sarstedt, M., & Ringle, C.M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, *31*(1), 2-24. https://doi.org/10.1108/EBR-11-2018-0203

Harun, M.D., Hogset, H., & Mwesiumo, D. (2023). Dynamic capabilities and sustainability performance: Exploring the moderating role of environmental dynamism in the Norwegian fishing industry. *Sustainable Development*, *31*(4), 2636-2655. https://doi.org/10.1002/sd.2536

Helfat, C.E., & Peteraf, M.A. (2003). The Dynamic Resource-Based View: Capability Lifecycles. *Strategic Management Journal*, *24*(10), 997-1010. https://doi.org/10.1002/smj.332

Helfat, C.E., & Raubitschek, R.S. (2018). Dynamic and integrative capabilities for profiting from innovation in digital platform-based ecosystems. *Research Policy*, *47*(8), 1391-1399. https://doi.org/10.1016/j.respol.2018.01.019

Henderson, R., & Cockburn, I. (1994). Measuring Competence? Exploring Firm Effects in Pharmaceutical Research. *Strategic Management Journal*, *15*, 63-84. https://doi.org/10.1002/smj.4250150906

Heredia-Portillo, O., & Armas-Arévalos, E. (2023). Explaining the international opportunity recognition with the qualitative comparative analysis: The role of dynamic capabilities self-efficacy and global mindset. *Entrepreneurial Business and Economics Review*, *11*(1), 29-56. https://doi.org/10.15678/EBER.2023.110102

Hernández-Linares, R., Kellermanns, F.W., & López-Fernández, M.C. (2021). Dynamic capabilities and SME performance: The moderating effect of market orientation. *Journal of Small Business Management*, *59*(1), 162-195. https://doi.org/10.1111/jsbm.12474

Hodgkinson, G.P., & Healey, M.P. (2011). Psychological foundations of dynamic capabilities: Reflexion and reflection in strategic management. *Strategic Management Journal*, *32*(13), 1500-1516. https://doi.org/10.1002/smj.964

Hooi, L.W. (2020). SME performance: Does organizational learning capability really matter?. *International Journal of Organizational Analysis*, *ahead-of-print*. https://doi.org/10.1108/IJOA-12-2019-1962

Huang, K.-F., Wu, L.-Y., Dyerson, R., & Chen, C.-F. (2012). How Does a Technological Firm Develop Its Competitive Advantage? A Dynamic Capability Perspective. *IEEE Transactions on Engineering Management*, *59*(4), 644-653. https://doi.org/10.1109/TEM.2011.2176340

Hung, R.Y.Y., Yang, B., Lien, B.Y.-H., McLean, G.N., & Kuo, Y.-M. (2010). Dynamic capability: Impact of process alignment and organizational learning culture on performance. *Journal of World Business*, *45*(3), 285-294. https://doi.org/10.1016/j.jwb.2009.09.003

Jean, R.-J. (Bryan), Sinkovics, R.R., & Cavusgil, S.T. (2010). Enhancing international customer–supplier relationships through IT resources: A study of Taiwanese electronics suppliers. *Journal of International Business Studies*, *41*(7), 1218-1239. https://doi.org/10.1057/jibs.2010.4

Jurksiene, L., & Pundziene, A. (2016). The relationship between dynamic capabilities and firm competitive advantage: The mediating role of organizational ambidexterity. *European Business Review*, *28*(4), 431-448. Scopus. https://doi.org/10.1108/EBR-09-2015-0088

Kalemli-Ozcan, S., Gourinchas, P.-O., Penciakova, V., & Sander, N. (2020). COVID-19 and SME Failures. Retrieved from IMF website https://www.imf.org/en/Publications/WP/Issues/2020/09/25/COVID-19-and-SME-Failures-49753 on July 18, 2023.

Khurana, I., Dutta, D.K., & Singh Ghura, A. (2022). SMEs and digital transformation during a crisis: The emergence of resilience as a second-order dynamic capability in an entrepreneurial ecosystem. *Journal of Business Research*, *150*(C), 623-641. https://doi.org/10.1016/j.jbusres.2022.06.048

Kim, L. (1998). Crisis Construction and Organizational Learning: Capability Building in Catching-up at Hyundai Motor. *Organization Science*, *9*(4), 506-521. https://doi.org/10.1287/orsc.9.4.506

Knudsen, E.S., Lien, L.B., Timmermans, B., Belik, I., & Pandey, S. (2021). Stability in turbulent times? The effect of digitalization on the sustainability of competitive advantage. *Journal of Business Research*, *128*, 360-369. https://doi.org/10.1016/j.jbusres.2021.02.008

Kogut, B., & Zander, U. (1992). Knowledge of the Firm, Combinative Capabilities, and the Replication of Technology. *Organization Science*, *3*(3), 383-397. https://doi.org/10.1287/orsc.3.3.383

Kolbe, D., Calderón, H., & Frasquet, M. (2021). Multichannel integration through innovation capability in manufacturing SMEs and its impact on performance. *Journal of Business & Industrial Marketing*, *37*(1), 115-127. https://doi.org/10.1108/JBIM-04-2020-0204

Kristal, M.M., Huang, X., & Roth, A.V. (2010). The effect of an ambidextrous supply chain strategy on combinative competitive capabilities and business performance. *Journal of Operations Management*, *28*(5), 415-429. https://doi.org/10.1016/j.jom.2009.12.002

Kump, B., Engelmann, A., Kessler, A., & Schweiger, C. (2019). Toward a dynamic capabilities scale: Measuring organizational sensing, seizing, and transforming capacities. *Industrial and Corporate Change*, *28*(5), 1149-1172. Scopus. https://doi.org/10.1093/icc/dty054

Kuuluvainen, A. (2012). How to concretize dynamic capabilities? Theory and examples. *Journal of Strategy and Management*, *5*(4), 381-392. https://doi.org/10.1108/17554251211276353

Latan, H., & Ghozali, I. (2016). *Partial Least Square Konsep, Metode dan Aplikasi Menggunakan WarpPLS 5.0*. Semarang: Badan Penerbit Universitas Diponegoro.

Li, L. (2022). Digital transformation and sustainable performance: The moderating role of market turbulence. *Industrial Marketing Management*, *104*, 28-37. https://doi.org/10.1016/j.indmarman.2022.04.007

Liao, S.-H., Hu, D.-C., & Ding, L.-W. (2017). Assessing the influence of supply chain collaboration value innovation, supply chain capability and competitive advantage in Taiwan's networking communication industry. *International Journal of Production Economics*, *191*, 143-153. https://doi.org/10.1016/j.ijpe.2017.06.001

Limanseto. (2022). Perkembangan UMKM sebagai Critical Engine Perekonomian Nasional Terus Mendapatkan Dukungan Pemerintah—Kementerian Koordinator Bidang Perekonomian Republik Indonesia. Retrieved from https://www.ekon.go.id/publikasi/detail/4593/perkembangan-umkm-sebagai-critical-engine-perekonomian-nasional-terus-mendapatkan-dukungan-pemerintah on August 28, 2023.

Lin, D.-Y., Rayavarapu, S.N., Tadjeddine, K., & Yeoh, R. (2022). Helping small and medium-size enterprises thrive | McKinsey. Retrieved from McKinsey&Compacy website: https://www.mckinsey.com/industries/public-sector/our-insights/beyond-financials-helping-small-and-medium-size-enterprises-thrive on December 16, 2023.

Lin, Y., & Wu, L.-Y. (2014). Exploring the role of dynamic capabilities in firm performance under the resource-based view framework. *Journal of Business Research*, *67*(3), 407-413. https://doi.org/10.1016/j.jbusres.2012.12.019

Lo, M.F., & Tian, F. (2020). Enhancing competitive advantage in Hong Kong higher education: Linking knowledge sharing, absorptive capacity and innovation capability. *Higher Education Quarterly*, *74*(4), 426-441. https://doi.org/10.1111/hequ.12244

Martins, A. (2023). Dynamic capabilities and SME performance in the COVID-19 era: The moderating effect of digitalization. *Asia-Pacific Journal of Business Administration*, *15*(2), 188-202. https://doi.org/10.1108/APJBA-08-2021-0370

Masoud, R., & Basahel, S. (2023). The Effects of Digital Transformation on Firm Performance: The Role of Customer Experience and IT Innovation. *Digital*, *3*(2), 109-126. https://doi.org/10.3390/digital3020008

Matarazzo, M., Penco, L., Profumo, G., & Quaglia, R. (2021). Digital transformation and customer value creation in Made in Italy SMEs: A dynamic capabilities perspective. *Journal of Business Research*, *123*, 642-656. https://doi.org/10.1016/j.jbusres.2020.10.033

McDermott, G.A., & Corredoira, R.A. (2010). Network composition, collaborative ties, and upgrading in emerging-market firms: Lessons from the Argentine autoparts sector. *Journal of International Business Studies*, *41*(2), 308-329. https://doi.org/10.1057/jibs.2009.7

Mikalef, P., Krogstie, J., Pappas, I.O., & Pavlou, P. (2020). Exploring the relationship between big data analytics capability and competitive performance: The mediating roles of dynamic and operational capabilities. *Information & Management*, *57*(2), 103169. https://doi.org/10.1016/j.im.2019.05.004

Mikalef, P., & Pateli, A. (2017). Information technology-enabled dynamic capabilities and their indirect effect on competitive performance: Findings from PLS-SEM and fsQCA. *Journal of Business Research*, *70*, 1-16. https://doi.org/10.1016/j.jbusres.2016.09.004

Miller, D., & Shamsie, J. (1996). The Resource-Based View of the Firm in Two Environments: The Hollywood Film Studios from 1936 to 1965. *The Academy of Management Journal*, *39*(3), 519-543. https://doi.org/10.2307/256654

Monteiro, A.P., Soares, A.M., & Rua, O.L. (2019). Linking intangible resources and entrepreneurial orientation to export performance: The mediating effect of dynamic capabilities. *Journal of Innovation & Knowledge*, *4*(3), 179-187. https://doi.org/10.1016/j.jik.2019.04.001

Noe, R., Hollenbeck, J., Gerhart, B., & Wright, P. (2017). *Fundamentals of Human Resource Management* (7th edition). New York, NY: McGraw Hill.

Nyamrunda, F.C., & Freeman, S. (2021). Strategic agility, dynamic relational capability and trust among SMEs in transitional economies. *Journal of World Business*, *56*(3), 101175. https://doi.org/10.1016/j.jwb.2020.101175

OECD. (2020). *OECD Economic Outlook, Volume 2020 Issue 1: Preliminary version*. OECD. https://doi.org/10.1787/0d1d1e2e-en

Olson, E.M., Olson, K.M., Czaplewski, A.J., & Key, T.M. (2021). Business strategy and the management of digital marketing. *Business Horizons*, *64*(2), 285-293. https://doi.org/10.1016/j.bushor.2020.12.004

Onngam, W., & Charoensukmongkol, P. (2023). Effect of social media agility on performance of small and medium enterprises: Moderating roles of firm size and environmental dynamism. *Journal of Entrepreneurship in Emerging Economies*, *ahead-of-print*(ahead-of-print). https://doi.org/10.1108/JEEE-11-2022-0331

Pagani, M., & Pardo, C. (2017). The impact of digital technology on relationships in a business network. *Industrial Marketing Management*, *67*, 185-192. https://doi.org/10.1016/j.indmarman.2017.08.009

Papadopoulos, T., Baltas, K.N., & Balta, M.E. (2020). The use of digital technologies by small and medium enterprises during COVID-19: Implications for theory and practice. *International Journal of Information Management*, *55*, 102192. https://doi.org/10.1016/j.ijinfomgt.2020.102192

Pavlou, P.A., & El Sawy, O.A. (2011). Understanding the Elusive Black Box of Dynamic Capabilities. *Decision Sciences*, *42*(1), 239-273. https://doi.org/10.1111/j.1540-5915.2010.00287.x

Porter, M.E. (1985). *Competitive advantage: Creating and sustaining superior performance*. New York: London: Free Press; Collier Macmillan.

Prange, C., & Verdier, S. (2011). Dynamic capabilities, internationalization processes and performance. *Journal of World Business*, *46*(1), 126-133. https://doi.org/10.1016/j.jwb.2010.05.024

Protogerou, A., Caloghirou, Y., & Lioukas, S. (2012). Dynamic capabilities and their indirect impact on firm performance. *Industrial and Corporate Change*, *21*(3), 615-647. https://doi.org/10.1093/icc/dtr049

Pundziene, A., Nikou, S., & Bouwman, H. (2021). The nexus between dynamic capabilities and competitive firm performance: The mediating role of open innovation. *European Journal of Innovation Management*, *25*(6), 152-177. https://doi.org/10.1108/EJIM-09-2020-0356

Ramaswamy, V., & Ozcan, K. (2016). Brand value co-creation in a digitalized world: An integrative framework and research implications. *International Journal of Research in Marketing*, *33*(1), 93-106. https://doi.org/10.1016/j.ijresmar.2015.07.001

Ratanavanich, M., & Charoensukmongkol, P. (2023). Effects of improvisational behavior on entrepreneurial activities and firm performance: The moderating roles of firm size and business experience. *Journal of Entrepreneurship in Emerging Economies*, *ahead-of-print*(ahead-of-print). https://doi.org/10.1108/JEEE-11-2022-0350

Sarstedt, M., Hair, J.F., Cheah, J.-H., Becker, J.-M., & Ringle, C.M. (2019). How to Specify, Estimate, and Validate Higher-Order Constructs in PLS-SEM. *Australasian Marketing Journal*, *27*(3), 197-211. https://doi.org/10.1016/j.ausmj.2019.05.003

Schumpeter, J.A. (1934). *The Theory of Economic Development*. Cambridge, MA: Harvard University Press.

Setyowati, D. (2020, June 26). Survei KIC: Mayoritas UMKM Terpukul Corona, Ada Dua Strategi Bertahan. Retrieved from https://katadata.co.id/desysetyowati/berita/5ef5fa2686f71/survei-kic-mayoritas-umkm-terpukul-corona-ada-dua-strategi-bertahan on August 10, 2023.

Shen, C.-C., Yeh, C.-C., & Lin, C.-N. (2022). Using the perspective of business information technology technicians to explore how information technology affects business competitive advantage. *Technological Forecasting and Social Change*, *184*, 121973. https://doi.org/10.1016/j.techfore.2022.121973

Shen, L., Zhang, X., & Liu, H. (2022). Digital technology adoption, digital dynamic capability, and digital transformation performance of textile industry: Moderating role of digital innovation orientation. *Managerial and Decision Economics*, *43*(6), 2038-2054. https://doi.org/10.1002/mde.3507

Sholihin, M. (2013). *Analisis SEM-PLS dengan WarpPLS 3.0 Untuk Hubungan Non Linier Dalam Penelitian Sosial Dan Bisnis*. Yogyakarta: Andi.

Skare, M., & Riberio Soriano, D. (2021). How globalization is changing digital technology adoption: An international perspective. *Journal of Innovation & Knowledge*, *6*(4), 222-233. https://doi.org/10.1016/j.jik.2021.04.001

Song, J., Lee, K.-B., Zhou, Z., Jia, L., Cegielski, C., & Shin, S.I. (2022). Enhancing supply chain sensing capability through social media: An environmental scanning perspective. *Information Technology & People*, *35*(1), 367-391. https://doi.org/10.1108/ITP-11-2019-0609

Soto-Acosta, P. (2020). COVID-19 Pandemic: Shifting Digital Transformation to a High-Speed Gear. *Information Systems Management*, *37*(4), 260-266. https://doi.org/10.1080/10580530.2020.1814461

Sousa-Zomer, T.T., Neely, A., & Martinez, V. (2020). Digital transforming capability and performance: A microfoundational perspective. *International Journal of Operations & Production Management*, *40*(7/8), 1095-1128. https://doi.org/10.1108/IJOPM-06-2019-0444

Teece, D. (2020). Hand in Glove: Open Innovation and the Dynamic Capabilities Framework. *Strategic Management Review*, *1*, 233-253. https://doi.org/10.1561/111.00000010

Teece, D.J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, *28*(13), 1319-1350. https://doi.org/10.1002/smj.640

Teece, D.J. (2014). A dynamic capabilities-based entrepreneurial theory of the multinational enterprise. *Journal of International Business Studies*, *45*(1), 8-37. https://doi.org/10.1057/jibs.2013.54

Teece, D.J. (2018). Business models and dynamic capabilities. *Long Range Planning*, *51*(1), 40-49. https://doi.org/10.1016/j.lrp.2017.06.007

Teece, D.J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, *18*(7), 509-533. https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z

Trinugroho, I., Pamungkas, P., Wiwoho, J., Damayanti, S.M., & Pramono, T. (2022). Adoption of digital technologies for micro and small business in Indonesia. *Finance Research Letters*, *45*, 102156. https://doi.org/10.1016/j.frl.2021.102156

Tsai, W. (2001). Knowledge Transfer in Intraorganizational Networks: Effects of Network Position and Absorptive Capacity on Business Unit Innovation and Performance. *The Academy of Management Journal*, *44*(5), 996-1004. https://doi.org/10.2307/3069443

Turban, E., King, D., Lee, J., Liang, T.-P., & Turban, D.C. (2009). *Electronic Commerce 2010: A Managerial Perspective* (0006-edition ed.). Pearson College Div.

Valdez, L.E., Lema, D.G.-P. de, & Maldonado-Guzmán, G. (2016). Management of Knowledge, Innovation and Performance in SMEs. *Interdisciplinary Journal of Information, Knowledge, and Management*, *11*, 141-176. https://doi.org/10.28945/3455

Verwaal, E., Bruining, H., Wright, M., Manigart, S., & Lockett, A. (2010). Resources access needs and capabilities as mediators of the relationship between VC firm size and syndication. *Small Business Economics*, *34*(3), 277-291. https://doi.org/10.1007/s11187-008-9126-x

Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *The Journal of Strategic Information Systems*, *28*(2), 118-144. https://doi.org/10.1016/j.jsis.2019.01.003

Victoria, A.O. (2021, March 26). Hanya 12,5% UMKM di Indonesia yang Kebal dari Pandemi Covid-19. Retrieved from https://katadata.co.id/agustiyanti/finansial/605d9f635fdf7/hanya-12-5-umkm-di-indonesia-yang-kebal-dari-pandemi-covid-19 on August 8, 2023.

Vo Thai, H.C., Hong-Hue, T.-H., & Tran, M.-L. (2024). Dynamic capabilities and digitalization as antecedents of innovation and sustainable performance: Empirical evidence from Vietnamese SMEs. *Journal of Asia Business Studies*, *ahead-of-print*(ahead-of-print). https://doi.org/10.1108/JABS-08-2023-0325

Warner, K.S.R., & Wäger, M. (2019). Building dynamic capabilities for digital transformation: An ongoing process of strategic renewal. *Long Range Planning*, *52*(3), 326-349. https://doi.org/10.1016/j.lrp.2018.12.001

Westerman, G., Bonnet, D., & McAfee, A. (2014). *Leading Digital: Turning Technology into Business Transformation*. Boston, Massachusettes: Harvard Business Review Press.

Wilden, R., & Gudergan, S. (2017). Service-dominant orientation, dynamic capabilities and firm performance. *Journal of Service Theory and Practice*, *27*(4), 808-832. https://doi.org/10.1108/JSTP-04-2016-0077

Wilden, R., Gudergan, S.P., Nielsen, B.B., & Lings, I. (2013). Dynamic Capabilities and Performance: Strategy, Structure and Environment. *Long Range Planning*, *46*(1), 72-96. https://doi.org/10.1016/j.lrp.2012.12.001

Yeow, A., Soh, C., & Hansen, R. (2018). Aligning with New Digital Strategy: A Dynamic Capabilities Approach. *Journal of Strategic Information Systems*, *27*(1), 43-58. https://doi.org/10.1016/j.jsis.2017.09.001

Zahra, S.A., Sapienza, H.J., & Davidsson, P. (2006). Entrepreneurship and Dynamic Capabilities: A Review, Model and Research Agenda*. *Journal of Management Studies*, *43*(4), 917-955. https://doi.org/10.1111/j.1467-6486.2006.00616.x

Zhang, J., & Wu, W. (2013). Social capital and new product development outcomes: The mediating role of sensing capability in Chinese high-tech firms. *Journal of World Business*, *48*(4), 539-548. https://doi.org/10.1016/j.jwb.2012.09.009

Zollo, M., & Winter, S.G. (2002). Deliberate Learning and the Evolution of Dynamic Capabilities. *Organization Science*, *13*(3), 339-351. https://doi.org/10.1287/orsc.13.3.339.2780

Authors

The contribution share of authors is described as follows: Murry Harmawan Saputra (25%) – conceptualisation, literature review, data collection, data analysis, data interpretation, and draft preparation. Mohamad Nur Utomo (20%) – conceptualisation, literature review, data collection, data analysis, data interpretation, and draft preparation. Kasmad Ariansyah (15%) – hypothesis development, literature review, data analysis, and review/final manuscript preparation. Yanuar Farida Wismayanti (10%) – research supervision, quality-checking data, and assisting in draft preparation and revisions. Rahmat Husein Andri Ansyah (10%) – data collection and draft preparation. Koeswinarno (10%) – offering critical insights during the whole research process, and review/final manuscript preparation. Suradi (10%) – offering critical insights during the whole research process, and review/final manuscript preparation.

Murry Harmawan Saputra

Murry Harmawan Saputra holds a Ph.D. in Marketing/Marketing Management from Universitas Diponegoro. Murry Harmawan Saputra serves as a lecturer at the Economic Faculty, Department of Management, Universitas Muhammadiyah Purworejo, Indonesia, and is also a Post-Doctoral Researcher at the Research Center for Public Policy, National Research and Innovation Agency, Indonesia. His research interest include marketing management, entrepreneurship, and small and medium-sized enterprises (SME).

Correspondence to: Murry Harmawan Saputra, Department of Management, Faculty of Economics, Universitas Muhammadiyah Purworejo, Purworejo, Central Java 54224, Indonesia. e-mail: murryhs@umpwr.ac.id

ORCID http://orcid.org/0000-0002-2924-9892

Mohamad Nur Utomo

Mohamad Nur Utomo holds a Ph.D. in Financial Management from Diponegoro University. Currently, Mohamad Nur Utomo is a lecturer at the Economic Faculty, Department of Management, Universitas Borneo Tarakan, Indonesia. His research interest include corporate finance, green business, entrepreneurship, corporate governance, and local leading product development.

Correspondence to: Mohamad Nur Utomo, Department of Management, Faculty of Economics, Universitas Borneo Tarakan, North Kalimantan 77115, Indonesia. e-mail: mohnurutomo@gmail.com

ORCID http://orcid.org/0000-0003-1445-5009

Kasmad Ariansyah

Kasmad Ariansyah received the bachelor's degree in electrical engineering from Mercubuana University and a master's degree in economics from Universitas Indonesia. He is currently a doctoral student in economics at Universitas Indonesia. In addition to his academic pursuits, he serves as a senior researcher at the the Research Center for Public Policy, National Research and Innovation Agency in Jakarta, Indonesia. His research interest include public policy, social informatics, digital economy, and ICT policy, making him a well-rounded contributor to our work.

Correspondence to: Kasmad Ariansyah, Research Center for Public Policy, National Research and Innovation Agency, Jakarta 12710, Indonesia. e-mail: ariansyah.kasmad@gmail.com

ORCID http://orcid.org/0000-0002-8128-8733

Yanuar Farida Wismayanti

Yanuar Farida Wismayanti holds a Ph.D. from Griffith University, Brisbane, Australia, specializing in the School of Human Services and Social Work. Currently, Yanuar Farida Wismayanti serves as a senior researcher at the Research Center for Public Policy within the National Research and Innovation Agency in Indonesia. His research interest include social welfare, gender, and child protection.

Correspondence to: Yanuar Farida Wismayanti, Research Center for Public Policy, National Research and Innovation Agency, Jakarta 12710, Indonesia. e-mail: yanu011@brin.go.id

ORCID http://orcid.org/0000-0002-2398-8053

Rahmat Husein Andri Ansyah

Rahmat Husein Andri Ansyah obtained his master's degree in Islamic Studies with a focus on nonprofit management from UIN Surabaya. Currently, Rahmat Husein Andri Ansyah works as a junior researcher at the Research Center for Public Policy within the National Research and Innovation Agency in Indonesia. His research interest include nonprofit management and civil society.

Correspondence to: Rahmat Husein Andri Ansyah, Research Center for Public Policy, National Research and Innovation Agency, Jakarta 12710, Indonesia. e-mail: rahm054@brin.go.id

ORCID http://orcid.org/0000-0002-0526-0077

Koeswinarno

Koeswinarno holds a Ph.D. in Anthropology from UGM. Presently, Koeswinarno holds the position of Research Professor at the Research Center for Public Policy within the National Research and Innovation Agency in Indonesia. His research interest include the areas of halal products, lifestyle, and conflict.

Correspondence to: Koeswinarno, Research Center for Public Policy, National Research and Innovation Agency, Jakarta 12710, Indonesia. e-mail: koes001@brin.go.id

ORCID http://orcid.org/0000-0003-4198-2154

Suradi

Suradi earned his Ph.D. in Social Welfare from Universitas Padjadjaran Bandung. Suradi currently holds the position of Research Professor at the Research Center for Public Policy within the National Research and Innovation Agency in Indonesia. His research interest include social policy, social protection, and empowerment.

Correspondence to: Suradi, Research Center for Public Policy, National Research and Innovation Agency, Jakarta 12710, Indonesia. e-mail: sura023@brin.go.id

ORCID http://orcid.org/0000-0001-6528-2406

Acknowledgements and Financial Disclosure

The authors would like to convey the appreciation to the anonymous reviewers for their valuable and constructive feedback, which contributed to enhancing the quality of the final version of this manuscript. The authors also affirm that the study received no external financial support.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Published by Krakow University of Economics – Krakow, Poland

Ministry of Education and Science
Republic of Poland

The journal is co-financed in the years 2022-2024 by the Ministry of Education and Science of the Republic of Poland in the framework of the ministerial programme "Development of Scientific Journals" (RCN) on the basis of contract no. RCN/SP/0583/2021/1 concluded on 13 October 2022 and being in force until 13 October 2024.

Entrepreneurial Business and Economics Review

2024, Vol. 12, No. 3

10.15678/EBER.2024.120304

Market share and financial results of insurance companies: The case of the UE-15 countries

Marzanna Lament, Sławomir Bukowski

ABSTRACT

Objective: The objective of the article is to examine the relationship between insurance market share and the financial results of insurance companies. We formulated the following research question: Is an insurance company's market position (market share) influenced by its financial results? If so, which ones?

Research Design & Methods: The scope of research covers insurance companies operating in the insurance markets of the EU-15 countries. We surveyed the insurance companies with the largest market share. The research period covered the years 2012-2021. We compiled the data on the insurance markets of the EU-15 countries based on the OECD Statistics database and the financial data characterising the insurance companies selected for the study – based on the ORBIS Database. We used STATISTICA 13 and GRETL software to compile the survey results. We used the method of analysis of scientific literature – domestic and foreign, statistical and econometric methods and own observations.

Findings: The research has made it possible to answer the research questions. Financial results influence the market position of an insurance company. This means that financial performance was one of the determinants of an insurance company's market position. This is indicated both by the analysis of the literature on the subject, where some studies confirm the existence of a relation between market position, measured by insurance market share, and the financial results of insurance companies and by our research covering the EU-15 insurance market.

Implications & Recommendations: The research conducted will serve insurance companies and insurance market institutions – in financial management strategies, as well as by policyholders and beneficiaries of insurance contracts, i.e. consumers – in consumer decision-making.

Contribution & Value Added: The study fills a research gap in the determinants of the efficiency of insurance companies and, in particular, the issue of the relation between the market share of a single operator and its financial results. They also contribute to the development of research in insurance finance falling within the discipline of economics and finance. The study of a homogeneous group of insurance companies – with the largest share in a given national market – as well as the study of the insurance market of the EU-15 countries, which should be considered stable with an established market structure, should be regarded as innovative.

Article type:	research article
Keywords:	insurance market; insurance companies; structure of insurance market; results of insurance companies; efficient structure hypothesis; UE-15 countries
JEL codes:	F3, F4, G2, 004

Received: 21 October 2023 Revised: 22 May 2024 Accepted: 6 June 2024

Suggested citation:
Lament, M., & Bukowski, S. (2024). Market share and financial results of insurance companies: The case of the UE-15 countries. *Entrepreneurial Business and Economics Review,* 12(3), 69-82. https://doi.org/10.15678/EBER.2024.120304

INTRODUCTION

The structure of the market, competition in the insurance sector, and the profitability and financial performance of insurance companies are important economic issues that we can analyse in many aspects. The determinants of the financial efficiency of the insurance sector are of interest not only at the level of individual insurance companies, but are also important in macroeconomic terms, as

well as in relation to policyholders and beneficiaries of insurance contracts. The macroeconomic perspective relates to financial security issues and affects supervisory policy, while the microeconomic perspective affects sales policy. Clearly, the two approaches are interlinked. It seems that an important determinant of the financial performance of insurance companies is their market share, which contributes to improving or increasing the efficiency of insurance companies through economies of scale. Scholars have conducted research in this area for a long time, for various actors, including in the insurance sector. However, they are of a fragmented nature, as they either refer to selected, mostly national insurance markets (among others: Marjanović and Popović (2020) – Serbian insurance market, Jedlicka and Jumah (2006) – Austrian insurance market) or to selected groups of insurance companies (among others: Cole *et al.* (2015) – health insurance companies in USA, Pope and Ma (2008) – non-life insurance markets of 23 countries). They also cover different research periods, often too short (among others: Guendouz and Ouassaf (2018) – 6 years, Al-Arif and Firmansyah (2021) – 8 years). Research to date does not clearly indicate that there is a relation between insurance market share and the financial results of insurance companies. Some studies indicate the existence of such a relationship, *e.g*. Varga and Madari (2023), Bukowski and Lament (2021). Others do not confirm the impact of an insurance company's market position on its financial results, *e.g.* Ofori-Boateng *et al.* (2022); Derbali and Jamel (2018). Noteworthy, research to date has mainly focused on validating the structure-conduct-performance (SCP) paradigm. The undertaken subject matter extends previous research in this area in relation to insurance markets by reviewing the relative market power (RMP) paradigm, which examines the relation between the market share of a single operator and its financial results. The study of a homogeneous group of insurance companies – with the largest share in a given national market – as well as the study of the insurance market of the EU-15 countries, which should be considered stable with an established market structure, should be considered innovative and fills a research gap in this area.

The research aims to analyse the relation between insurance market share and the financial results of insurance companies. For the purpose of the article, we formulated the following research question: Are insurance companies' market positions (market share) influenced by their financial results? If so, which ones?

The subject scope of the research includes insurance companies operating in the insurance markets of the EU-15 countries. We surveyed the insurance companies with the largest market share. The research period covers the years 2012-2021.

We compiled the data on the insurance markets of the EU-15 countries from the OECD Statistics database, while financial data characterising the insurance companies selected for the study – from the ORBIS Database. We used STATISTICA 13 and GRETL software to compile the survey results. The article uses the method of analysis of scientific literature – domestic and foreign, statistical and econometric methods, and own observations.

The article is structured as follows: the first part of the article presents a review of specialist literature, the second part describes the research methodology, and the third part reports on empirical findings and discusses the findings.

LITERATURE REVIEW

The theory of efficient structure hypothesis (ESH) explains the relation between the market structure and the financial results of business entities. It has been described, inter alia, by Hicks (1935), Demsetz (1973, 1974), and Peltzman (1977). The efficiency hypothesis proposed by Demsetz (1973) argues that larger firms benefit from economies of scale and that higher efficiencies enable them to capture a larger market share. The positive relationship between competition and financial performance supports the efficiency hypothesis, according to which competition and financial performance are further enhanced by the market share gains of efficient firms. Research on ESH indicates that there is a relationship between competitiveness, concentration, and financial performance. Berger (1995) explained the relationship between market structure and financial performance as

the SCP paradigm, whereby in highly concentrated markets firms may set prices that are less favourable to consumers as a result of imperfect competition in the markets. Research in this area concerns the relationship between market structure and financial performance. Scholars assume that greater market power consisting of lower market competition leads to higher profitability. A complement to the SCP model, and at the same time an alternative explanation of the theory of ESH, is the relative market power (RMP) paradigm, according to which firms with well-differentiated products can increase their market share and use their market power in product pricing, thereby achieving windfall profits. The developer of RMP was Smirlock (1985) who concluded that there is no relationship between market structure and profitability, but rather it is between the market share of an individual operator and its profitability. Some literature considers competition, often measured as the number of firms in the market, while others focus on concentration.

Studies related to the assessment of the relationship between market structure and financial performance are also the subject of research in relation to insurance companies. Table 1 presents the selected results from a survey of the literature in this area.

The literature analysis shows that the topic of the relation between market structure (insurance, market share) and the financial performance of insurance companies is an important research area, analysed in many aspects, to different extents and with different effects. Some studies indicate the existence of such a relationship, *e.g.* Varga and Madari (2023), Bukowski and Lament (2021), Ben-Dhiab (2021), Akhtar (2018), Ortyński (2016). Others do not confirm the impact of insurance company size on its financial performance, *e.g.* Ofori-Boateng *et al.* (2022); Derbali and Jamel (2018); Moro and Anderloni (2014), Berry-Stölzlea *et al.* (2011). In the absence of research clearly indicating the existence or not of an influence of the market position of an insurance company on its financial results, we formulated the following question:

> Are insurance companies market positions (market share) influenced by their financial results? If so, which ones?

The analysis of the conducted studies shows that they cover diverse insurance markets. Most of the studies cover single national markets, among others, the Hungarian insurance market – Varga and Madari (2023), the Polish insurance market – Bukowski and Lament (2021), Ortyński (2016), Romanian insurance – Burca and Batrinca (2014). Some studies involve a larger sample and include the European insurance market – Berry-Stölzlea *et al.* (2011) and Moro and Anderloni (2014), and the US insurance sector – Cummins and Nini (2002). We can also identify studies on selected segments of the insurance market, *e.g.* life insurance – Al-Arif and Firmansyah (2021), Bukowski and Lament (2021), non-life insurance – Choi and Weiss (2005), Berry-Stölzlea *et al.* (2011) and health insurance – Cole *et al.* (2015).

Noteworthy, as Table 1 presents, the research to date has mainly focused on validating the SCP paradigm. It would be reasonable to address the topic of verifying the RMP paradigm, which examines the relationship between the market share of a single operator and its financial performance in relation to insurance markets. This was the focus of the research, the results of which we will present in the following sections.

In conclusion, the research to date on the relationship between market structure and the financial performance of insurance companies is a poorly recognized research topic. The research to date is fragmented, *i.e.* it often refers to selected national markets or selected segments of the insurance market. It would be reasonable to examine the relationship between the market share of a single insurance company and its financial performance (a verification of the RMP paradigm). The research should cover relatively homogeneous insurance markets, but in a broader sense than just the national market, thus eliminating the legal and financial differences associated with conducting insurance business in a diverse economic environment. It would therefore be necessary to examine similar groups of insurance companies operating in a relatively homogeneous insurance market but covering a wider scope than just the national market.

Table 1. Market share as a determinant of insurance companies' profitability and financial results

Year	Authors	Scope of research	Results of research
2023	Varga, Madari	Hungarian insurance market between 2010 and 2019.	The structure of the insurance market influences the profitability of insurance companies.
2022	Ofori-Boateng, Ohemeng, Boro, Agyapong	29 Ghanaian general insurance companies between 2008 and 2019.	The structure of the insurance market does not influence the profitability of insurance companies.
2021	Bukowski, Lament	Polish life insurance companies between 2004 and 2019.	The structure of the insurance market influences the financial effectiveness of life insurance companies.
2021	Ben.-Dhiab	20 Saudi insurance companies from 2009 to 2017.	The company size and profitability of insurance companies are positively correlated but their impacts is not statistically significant.
2021	Ambaw, LiJuan	17 Ethiopian insurance companies from 2005 to 2020.	The size of an insurance company, market share, and age of the company significantly influence the financial results.
2021	Al-Arif, Firmansyah	Islamic life insurance industry in Indonesia between 2012 and 2019.	The market structure influences the profitability of the Islamic life insurance industry.
2020	Marjanović, Popović	14 Serbian insurance companies between 2006 and 2016.	Market share has a statistically significant effect on the insurance company's financial results, as measured by the ROA.
2018	Derbali, Jamel	19 Tunisian insurance companies.	The company size does not influence the profitability of insurance companies.
2018	Akhtar	8 Insurance companies operating in Saudi Arabia between 2010 and 2015.	Market share affects the efficiency of Saudi insurance companies. The structure of the insurance market influences the profitability of insurance companies.
2018	Guendouz, Ouassaf	6 insurance companies operating in Saudi Arabia from 2010 to 2016.	The size of the insurance company has a significant impact on the profitability of insurance companies.
2016	Ortyński	Polish insurance companies 2006 and 2013.	The size of the insurance company positively influences the profitability of Polish insurance companies.
2015	Cole, He, Karl	All health insurers operating in all states from 2002 to 2010.	There is a positive relationship between market concentration and health insurers' profits.
2014	Burca, Batrinca	Romanian insurance sector during the period 2008-2012.	Some specific factors, such as company size affect the financial results of the insurance company.
2014	Moro, Anderloni	198 European insurance companies from 2002 to 2014.	The size of the asset negatively influences ROA.
2013	Yuvaraj, Abate	9 Ethiopian insurance companies from 2003 and 2011.	The company size positively affects the profitability of insurance company.
2012	Pervan, Ćurak, Marijanović	The insurance companies from Bosnia and Herzegovina between 2005 to 2010.	The company size has a significant impact on ROA.
2011	Berry-Stölzlea, Weiss, Wende	Non-life insurance sector for 12 European countries from 2003 to 2007.	The structure of the insurance market does not influence the profitability of insurance companies.
2008	Pope, Ma	Non-life insurance markets of 23 countries.	The structure of the insurance market influences the profitability of insurance companies
2006	Jedlicka, Jumah	52 Austrian companies from 2002 to 2003.	The structure of the insurance market influences the profitability of insurance companies.
2005	Choi, Weiss	American non-life insurance companies from 1992 and 1998.	There exists a relationship between market share and financial results in non-life insurance companies.
2003	Adams, Buckle	47 Bermuda insurance companies during 1993-1997.	The size of the insurance company has no substantial impact on its financial results
2002	Cummins, Nini	The US insurance sector from 1993 to 1998.	The size of the insurance company has a significant impact on ROA – larger companies generate higher profits.

Source: own study.

RESEARCH METHODOLOGY

The research aimed to analyse the relationship between insurance market share and the financial results of insurance companies. We studied insurance companies operating in the insurance markets of the EU-15 countries. We compiled the data on the studied insurance markets based on the OECD Statistics database. We used them to present the structure of the insurance market of the EU-15 countries (Table 2).

Table 2. The structure of the UE-15 insurance markets in 1999-2021

Specification	Years				
	2001	2006	2011	2016	2021
Gross written premium (US Dollar, Million)					
AT – Austria	12 117.868	21 272.486	25 978.234	20 647.127	28 202.254
BE – Belgium	18 530.611	37 148.925	40 871.687	30 431.826	41 070.564
DK – Denmark	30 431.826	23 669.081	33 844.253	33 498.134	46 770.715
FI – Finland	5 374.673	7 809.245	10 132.502	10 011.939	6 051.734
FR – France	122 085.052	292 646.034	289 081.939	314 250.561	362 503.823
DE – Germany	166 058.671	264 402.328	255 708.473	294 660.464	396 718.174
GR – Greece	2 379.899	6 004.015	6 893.276	3 908.444	5 330.032
IE – Ireland	14 764.005	45 848.191	44 591.479	54 181.801	58 729.076
IT – Italy	73 682.546	147 497.278	156 981.595	151 423.405	168 471.187
LU – Luxembourg	5 468.714	14 697.399	19 176.113	20 288.771	34 796.097
NL – Netherlands	39 546.522	57 360.201	58 654.211	77 358.138	97 957.043
PT – Portugal	7 150.265	16 204.446	15 642.457	12 079.183	15 574.432
ES – Spain	38 685.822	72 289.847	86 378.201	73 654.743	76 473.056
SE – Sweden	20 245.837	30 864.775	28 062.491	39 107.022	73 097.394
GB – United Kingdom[1]	230 521.626	525 857.922	339 364.898	403 794.037	445 432.153
EU-15	787 043.937	1 563 572.173	1 411 361.809	1 539 295.595	1 857 177.734
Share in the UE-15 insurance market (%) (1)					
AT – Austria	1.54	1.36	1.84	1.34	1.52
BE – Belgium	2.35	2.37	2.89	1.98	2.21
DK – Denmark	3.88	1.52	2.39	2.18	2.52
FI – Finland	0.68	0.49	0.72	0.65	0.33
FR – France	15.51	18.72	20.48	20.42	19.52
DE – Germany	21.09	16.91	18.12	19.15	21.36
GR – Greece	0.31	0.38	0.49	0.25	0.29
IE – Ireland	1.87	2.94	3.16	3.52	3.16
IT – Italy	9.36	9.43	11.12	9.83	9.07
LU – Luxembourg	0.69	0.94	1.36	1.32	1.87
NL – Netherlands	5.03	3.67	4.16	5.03	5.27
PT – Portugal	0.91	1.05	1.11	0.78	0.84
ES – Spain	4.92	4.62	6.12	4.78	4.12
SE – Sweden	2.57	1.97	1.99	2.54	3.94
GB – United Kingdom[2]	29.29	33.63	24.05	26.23	23.98
EU-15	100.00	100.00	100.00	100.00	100.00

Note: The share of the gross written premium of a given country in the gross premiums written of the EU-15 (data in %).
Source: own study based on OECD Statistics.

The analysis of the structure of the EU-15 insurance market shows that it has remained broadly constant throughout the period under review. The dominant market shares in the EU-15 belong to UK, Germany, France, Italy, and Spain. Of course, there are changes in the market shares of individual

[1] From 2020 leaving the EU.
[2] From 2020 leaving the EU.

countries, but these should be considered negligible. This means that the surveyed insurance market is stable with an established market structure. Similar conclusions are also drawn from studies by Swiss Re (2023) and Bukowski and Lament (2020).

We pursued the primary research objective by assessing the insurance market share in relation to the financial performance of selected insurance companies operating in the EU-15. For the purpose of the article, we formulated the following research question: Are insurance companies' market positions (market share) influenced by their financial results? If so, which ones? For the study, we selected insurance undertakings with the greatest importance for the insurance market in a given country. We attempted to select insurance undertakings so that they corresponded to the structure of the EU-15 insurance market. Table 3 shows the structure of the surveyed insurance undertakings.

Table 3. Structure of the surveyed insurance companies by EU-15 country

No.	Country	Number of insurance companies	Share of insurance companies in total number of research insurance companies (%)
1.	AT – Austria	2	5.41
2.	BE – Belgium	2	5.41
3.	DK – Denmark	2	5.41
4.	FI – Finland	1	2.70
5.	FR – France	4	10.81
6.	DE – Germany	4	10.81
7.	GR – Greece	2	5.41
8.	IE – Ireland	2	5.41
9.	IT – Italy	3	8.10
10.	LU – Luxembourg	2	5.41
11.	NL – Netherlands	3	8.10
12.	PT – Portugal	2	5.41
13.	ES – Spain	3	8.10
14.	SE – Sweden	1	2.70
15.	GB – United Kingdom	4	10.81
	Total	**37**	**100.0**

Source: own study.

We collected financial data characterising the insurance companies selected for the study from the ORBIS Database. The time scope of the study covered the years 2012-2021 – the data available in the database ORBIS covers a period of 10 years.

We assumed a dependence between the insurance market structure and the financial results of insurance companies. To this end, we constructed a panel model. Market share of insurance companies measured with gross written premium. It is the dependent variable (explicated feature). We chose gross premiums written to assess the market position of the insurance company. This is the most commonly used category to assess market share, next to asset value. Other studies confirm this, *e.g.* Ortyński (2016), Kramaric *et al.* (2017), Batool and Sahi (2019). Moreover, reports by the Polish Financial Supervision Authority (2023) and the Polish Chamber of Insurance (2023) use gross premiums written as the main category for assessing the market position of an insurance company. We chose variables for assessing the financial results of insurance companies based on previous research as well as the company's own observations. The literature analysis shows that researchers can measure the financial performance and profitability of insurance businesses in different ways. Typically, in empirical studies, scholars measure profitability using ROA, ROE, or a combination of the above-mentioned measures is used. Studies confirming it are *e.g.* Lee (2014), Kramaric *et al.* (2017), Kripa and Ajasllari (2016). Moreover, the analysis of the research results shows that the financial performance of insurance companies can be influenced by decisions and actions located in different areas. They are both macroeconomic and microeconomic in nature. However, they largely depend on the specifics of the financial management of insurance companies, *i.e.* factors specific only to this type of entity. We should regard the following as important determinants of the financial

result of insurance companies: technical and insurance provisions, investments and their profitability, loss ratio, reinsurance, as well as costs of insurance activity. Solvency issues, assessing the level of financial security, are also not without significance. Previous research findings confirm it, *e.g.* Lament (2019), Batool and Sahi (2019), Bukowski and Lament (2021), Burca and Batrinca (2014), Ben-Dhiab (2021), Ofori-Boateng *et al.* (2022). Moreover, scholars measure the financial results of insurance companies measured by technical results, ROE, ROS, ROA, and ROI. There are independent variables. Furthermore, the elements influencing the assumed market structure of insurance companies are total investments, capital and surplus, net premiums written, total underwriting expenses and solvency ratio. Table 4 presents the methods of calculating these variables.

Table 4. Methods of calculating the variables analyses

Variable	Variable designation	Method of calculating the variable
Market share	$MS_{i,t}$	Gross written premium in an insurance company in euro/year* 100/ Gross written premium in an insurance market of country in euro/year.
Total investments	$INV_{i,t}$	Total investments in an insurance company in mln euro/year.
Capital and surplus	$CS_{i,t}$	Capital and surplus in an insurance company in mln euro/year.
Net premiums written	$PN_{i,t}$	Net premiums written in an insurance company in mln euro/year.
Total underwriting expenses	$CL_{i,t}$	Total underwriting expenses in an insurance company in mln euro/year.
Technical results	$TR_{i,t}$	Technical results in an insurance company in mln euro/year.
Return on equity ratio (ROE)	$ROE_{i,t}$	Net profit in an insurance company in mln euro/year * 100/ Equity in an insurance company in mln euro/year.
Return on sales ratio (ROS)	$ROS_{i,t}$	Net profit in an insurance company in mln euro/year * 100/ Gross written premium in an insurance company in mln euro/year.
Return on assets ratio (ROA)	$ROA_{i,t}$	Net profit in an insurance company in mln euro/year * 100/ Assets in an insurance company in mln euro/year.
Return on investments ratio (ROI)	$ROI_{i,t}$	Profit of investments in an insurance company in mln euro/year *100/Investments in an insurance company in mln euro/year.
Solvency ratio	$SOLV_{i,t}$	Own funds in an insurance company in mln euro/year * 100/ Net premiums written in an insurance company in mln euro/year.

Source: own study.

Table 5 presents the basic statistics of the study variables.

The analysis of the shares in the national insurance markets for individual insurance companies showed that they vary considerably, as illustrated in the basic statistics for the variable MSi,t (market share). The analysis of the minimum and maximum values evidences it as the values were respectively 1.9% and 39.1% (Table 5). This indicates the structural diversity of the surveyed insurance markets due to their size. The studied insurance markets vary in terms of their size, as well as the associated number of insurance companies, which affects their structure and the market shares of the insurance companies operating in them.

We have built the following panel data model:

$$lnMS_{i,t}=a_1+a_2 lnINV_{i,t}+a_3 lnCL_{i,t}+ a_4 lnPN_{i,t}+ u_{i.t} \quad (1)$$

where:

$MS_{i,t}$ - market share (%);
$INV_{i,t}$ - total investments (mln EUR);
$CL_{i,t}$ - total underwriting expenses (mln EUR);
$PN_{i,t}$ - net premiums written (mln EUR);
ln - natural logarithm;
$u_{i.t}$ - joint random factor.

Table 5. Basic statistics concerning the variables studied of the insurance companies active in UE-15 countries in 2012–2021

Specification	$MS_{i,t}$	$INV_{i,t}$	$CS_{i,t}$	$PN_{i,t}$	$CL_{i,t}$	$TR_{i,t}$	$ROE_{i,t}$	$ROS_{i,t}$	$ROA_{i,t}$	$ROI_{i,t}$	$SOLV_{i,t}$
N importance	370	370	370	370	370	370	370	370	370	370	370
Average	15.55	101045.05	8946.00	10018.02	13165.08	778.04	11.05	14.36	1.57	1.12	16.02
Median	13.05	36371.15	3571.06	2862.79	3633.38	182.15	11.25	8.54	1.02	0.36	10.42
Maximum	39.10	748059	65126.00	90308.00	115401.00	10167.00	67.48	300.18	9.29	9.97	66.05
Minimum	1.90	181.55	-11.74	12.23	26.39	-962.00	-467.24	-129.09	-28.12	-0.01	-4.35
Variance	90.86	2.47E+10	156188873	246264969	447201328	1938570	765.35	1042.15	5.86	3.13	235.08
Standard deviation	9.53	157229.1	12497.55	15692.83	21147.14	1392.32	27.66	32.28	2.42	1.77	15.33
Coefficient of variation	61.26	155.60	139.69	156.64	160.63	178.95	250.15	224.67	153.67	157.48	95.66

Note:

$MS_{i,t}$ – market share (%);
$INV_{i,t}$ – total investments (mln EUR);
$CS_{i,t}$ – capital and surplus (mln EUR);
$PN_{i,t}$ – net premiums written (mln EUR);
$CL_{i,t}$ – total underwriting expenses (mln EUR);
$TR_{i,t}$ – technical results (mln EUR);
$ROE_{i,t}$ – return on equity ratio (%);
$ROS_{i,t}$ – return on sales ratio (%);
$ROA_{i,t}$ – return on assets ratio (%);
$ROI_{i,t}$ – return on investments ratio (%);
$SOLV_{i,t}$ – solvency ratio (%).

Source: own study based on STATISTICA 13.

We built the model using stepwise regression with backward elimination. As a criterion, we have taken collinearity and correlation between independent variables and explanatory variables. We used weighted least squares (WLS) as the method of model's estimation. This was because of the existing heteroscedasticity and autocorrelation.

RESULTS AND DISCUSSION

The model explained the market share of insurance companies measured by gross written premium in insurance companies as dependent on ten independent variables:

- $INV_{i,t}$ – total investments (mln EUR);
- $CS_{i,t}$ – capital and surplus (mln EUR);
- $PN_{i,t}$ – net premiums written (mln EUR);
- $CL_{i,t}$ – total underwriting expenses (mln EUR);
- $TR_{i,t}$ – technical results (mln EUR);
- $ROE_{i,t}$ – return on equity ratio (%);
- $ROS_{i,t}$ – return on sales ratio (%);
- $ROA_{i,t}$ – return on assets ratio (%);
- $ROI_{i,t}$ – return on investments ratio (%);
- $SOLV_{i,t}$ – solvency ratio (%).

Noteworthy, we rejected some of the variables that were to be accepted for model estimation. This was due to the existing relationships between variables mainly concerning correlation and collinearity. Variables depicting typical financial results of insurance companies and their measures – profitability ratios, calculated for different ranges, were not included. Table 6 shows the results of the model estimation.

Table 6. Results of model estimation: WLS, using 333 observations. Included 37 cross-sectional units. Dependent variable: l_MS. Weights based on per-unit error variances

Variable	Coefficient	Std. Error	t-ratio	p-value	
const	2.30872	0.124029	18.61	<0.0001	***
l_INV	0.321094	0.0176362	18.21	<0.0001	***
l_CL	-0.338248	0.0219817	-15.39	<0.0001	***
d_PN	1.28626e-011	4.81512e-012	2.671	0.0079	***
Statistics based on the weighted data					
Sum squared resid		324.9876	S.E. of regression		0.993883
R-squared		0.572949	Adjusted R-squared		0.569055
F(3, 329)		147.1333	P-value(F)		1.80e-60
Log-likelihood		-468.4513	Akaike criterion		944.9027
Schwarz criterion		960.1353	Hannan-Quinn		950.9768
Statistics based on the original data					
Mean dependent var		2.543191	S.D. dependent var		0.668036
Sum squared resid		126.2095	S.E. of regression		0.619367
Test for normality of residual					
Null hypothesis:			error is normally distributed		
Test statistic:			Chi-square(2) = 13.1297		
			with p-value = 0.001409		

Note: *** The variable is significant at the significance level of 0.01; ** The variable is significant at the significance level of 0.05; * The variable is significant at the significance level of 0.1.

$INV_{i,t}$ – total investments (mln EUR);

$CL_{i,t}$ – total underwriting expenses (mln EUR);

$PN_{i,t}$ – net premiums written (mln EUR).

Source: own study.

The results of model's estimation indicated that all independent variables were statistically significant and the signs are in accordance with theory and hypothesis. In 57.29%, the model explained the variability of the explanatory variable, *i.e.* market share ($MS_{i,t}$). In the case of panel models, it is a good result. The variables which influenced the variability of market share ($MS_{i,t}$) were total investments ($INV_{i,t}$) total underwriting expenses ($CL_{i,t}$) and net premiums written ($PN_{i,t}$). The model estimation results indicated that all variables were statistically significant, influencing the market share of insurance companies operating in the EU-15 insurance market in 2012-2021. This means that the market share of insurance companies is influenced by market variables related to their financial economy and financial management. This is consistent with the results of the research conducted by Pope and Ma (2008). We studied both developed and developing groups of countries. The study covered the period from 1996 to 2003. We surveyed non-life insurance companies from 23 countries and confirmed that the structure of the insurance market influences the profitability of insurance companies. The research also showed that the presence of foreign insurers significantly changed the dynamics of non-life insurance markets. Moro and Anderloni (2014) and Berry-Stölzlea *et al.* (2011) also conducted research in relation to a similar study group. According to them, the structure of the insurance market does not influence the profitability of insurance companies. Moro and Anderloni (2014) studied insurance companies operating in the main European markets between 2004 and 2012. Their results show that financial performance, as measured by return on equity and return on assets, is influenced by insurance-specific characteristics as well as country institutional characteristics. Berry-Stölzlea *et al.* (2011) conducted a study in the non-life insurance sector in 12 European countries between 2003 and 2007. Comparing the studies mentioned above, we can see that they have in common the subject scope of the studies, which includes non-life insurance. The differences lie in the period of study and the geographical scope of the insurance markets studied. Pope and Ma's (2008) research, which confirmed the existence of a relationship between market structure and the financial performance of insurance companies, concerns a diverse group of countries, *i.e.* developed and developing countries. The studies by Moro and Anderloni (2014) and Berry-Stölzlea *et al.* (2011) did not confirm the existence of a relationship between market position and the financial performance of insurance companies covering European insurance markets. This implies that in more developed insurance markets, market position is not influenced by financial performance but by other factors. This indicates a more level playing field and the need for other non-financial competitive factors. In insurance markets that are more diverse in terms of development, the market position of insurance company is influenced by its financial performance. This demonstrates the importance of financial factors in competition between insurance companies and their importance in consumer decision-making.

Our research concerned a homogeneous group of EU-15 countries, *i.e.* well-developed insurance markets, but included both life and non-life insurance companies. However, the results do not coincide with the studies by Berry-Stölzlea *et al.* (2011) and Moro and Anderloni (2014) on a similar research group. This may be due, firstly, to a different research period. Secondly, their research covered insurance companies with the largest share of a given national market for the EU-15 countries. This may mean that the financial performance of insurance companies with the largest market share influences their market position. Therefore, this is one of the factors of competition between insurance companies which influence consumer decisions.

The conducted research helped to answer the research question: Are an insurance companies' market positions (market share) influenced by their financial results? If so, which ones? Financial results influence the market position of an insurance company operating in the EU-15 market. These include investments, underwriting expenses, and net premiums written.

Therefore, we confirmed that there is a correlation between market structure and the financial results of insurance companies operating in a market with a stable and established structure. In the case studied, this was the EU-15 market.

CONCLUSIONS

The research showed that the financial results of insurance companies affect their market position, as measured by their share of the insurance market. This is indicated both by the literature analysis as some studies confirm the existence of a relationship between market position, as measured by the insurance market share, and the financial results of insurance companies, and by own research covering the EU-15 insurance market. According to the results of the model estimation, variables which influence the variability of market share ($MS_{i,t}$) were total investments ($INV_{i,t}$), total underwriting expenses ($CL_{i,t}$), and net premium written ($PN_{i,t}$). This means that the market position of the surveyed insurance companies, as measured by their share of the insurance market, depends on the scale and efficiency of their investment activities, the value of the costs they incur and the value of their net insurance premiums, *i.e.* adjusted for the reinsurer's share, indicating that risk management policies, including the scope and efficiency of reinsurance programmes, are important.

The research fills a research gap in the determinants of the efficiency of insurance companies and, in particular, the study of the relationship between the market share of a single operator and its financial performance. It also contributes to the development of research in insurance finance falling within the discipline of economics and finance. Moreover, we should regard as innovative the study of a homogeneous group of insurance companies – with the largest share in a given national market – as well as the study of the insurance market of the EU-15 countries, which should be considered stable with an established market structure.

The research can serve insurance companies and insurance market institutions in financial management strategies. It can also help policyholders and beneficiaries of insurance contracts, *i.e.* consumers, in consumer decision-making.

The limitation of the study is the assessment of the insurance companies with the largest share in a given national market. These are entities with a stable market position, which contributes to the strengthening of business results. Therefore, the impact of financial results on market position can be two-way. A limitation is also the lack of consideration of the specificities of insurance companies resulting from their scope of business and the study of the most developed insurance market – the EU-15. Further research should concern insurance companies – separately life and non-life, in relation to insurance markets other than EU-15. The separate subjecting of life and non-life insurers to examination is due to the peculiarities of both the insurance contracts themselves and the associated different financial management rules. Therefore, it would be appropriate to identify the determinants of the financial efficiency of insurance companies, considering their specificities arising from the scope of their business and determining the importance of their size (market share) for their financial performance. Researchers would need to conduct such studies for reasonably homogeneous insurance markets of more than national scope. This will be the subject of our further research.

REFERENCES

Adams, M., & Buckle, M. (2003). The determinants of corporate financial performance in the Bermuda insurance market. *Applied Financial Economics*, *13*(2), 133-143. https://doi.org/10.1080/09603100210105030

Akhtar, M.H. (2018). Performance analysis of Takaful and conventional insurance companies in Saudi Arabia. *Benchmarking: An International Journal, 25*(2), 677-695. https://doi.org/10.1108/BIJ-01-2017-0018

Al -Arif, M.N.R., & Firmansyah, B. (2021). Market structure and profitability: evidence in the Indonesian Islamic insurance industry. *International Journal of Business and Society, 22*(2), 1004-1014. https://doi.org/10.33736/ijbs.3778.2021

Ambaw, Z.M., & LiJuan S. (2021). The micro economic determinants of insurance profitability in Ethiopian insurance industry - evidenced from life and non-life insurance products. *Journal of Insurance and Financial Management*, *5*(1), 87-123.

Batool, A., & Sahi, A. (2019). Determinants of financial performance of insurance companies of USA and UK during global financial crisis (2007-2016). *International Journal of Accounting Research, 7*(1), 2-9. https://doi.org/10.35248/2472-114X.19.7.194

Ben-Dhiab, L. (2021). Determinants of insurance firms' profitability: an empirical study of Saudi insurance market. *Journal of Asian Finance, Economics and Business, 8*(6), 235-243. https://doi:10.13106/jafeb.2021.vol8.no6.0235

Berger, A.N. (1995). The profit-structure relationship in banking—tests of market-power and efficient-structure hypotheses. *Journal of Money Credit and Banking*, *27*, 404-431. https://doi.org/10.2307/2077876

Berry-Stölzlea, T.R., Weiss, M.A., & Wende, S. (2011). *Market structure, efficiency, and performance in the European property–liability insurance industry*. American risk and insurance association meeting. Retrieved from www.aria.org/meetings/2011%20papers/Market_Structure_in_EU_insurance_markets%20072311.pdf on May 17, 2021.

Bukowski, S.I., & Lament, M. (2021). Market structure and financial effectiveness of life insurance companies. *European Research Studies Journal, 24*(2B), 533-545. https://doi.org/10.35808/ersj/2248

Bukowski, S.I., & Lament, M. (2020). Foreign capital impact on insurance market development in EU-15 countries. *Entrepreneurial Business and Economics Review*, *8*(3), 205-219. https://doi.org/10.15678/EBER.2020.080312

Burca, A.M., & Batrinca, G. (2014). The determinants of financial performance in the Romanian insurance market. *International Journal of Academic Research in Accounting*, *Finance and Management Sciences*, *4*(1), 299-308. https://doi.org/10.6007IJARAFMS/v4-i1/637

Choi, B.P., & Weiss, M.A. (2005). An empirical investigation of market structure, efficiency, and performance in property-liability insurance. *Journal of Risk and Insurance*, *4*(72), 635-673. https://doi.org/10.1111/j.1539-6975.2005.00142.x

Cole, C.R., He, E., & Karl, J.B. (2015). Market structure and the profitability of the U.S. Health insurance marketplace: a state-level analysis. *Journal of Insurance Regulation*, *34*(4), 1-29. Retrieved from https://content.naic.org/sites/default/files/inline-files/JIR-ZA-34-04-EL.pdf on June 17, 2021.

Cummins, J.D., & Nini, G.P. (2002). Optimal capital utilization by financial firms: evidence from the property-liability insurance industry. *Journal of Financial Services Research*, *21*, 15-53. https://doi.org/10.1023/A:1014369617192

Demsetz, H. (1973). Two systems of belief about monopoly. In Goldschmid, H.J., Mann, H.M., Weston, J.F (Eds.) *Industrial concentration: the new learning* (pp. 164-184). Boston: Little Brown.

Derbali, A., & Jamel, L. (2018). Determinants of performance of Tunisia insurance companies: case of life insurance. *International Journal of Productivity and Quality Management, 24*(4), 531-542. https://doi.org/10.30560/rfm.v1n1p1

Guendouz, A.A., & Ouassaf, S. (2018). Determinants of Saudi Takaful insurance companies profitability. *Academy of Accounting and Financial Studies Journal*, *22*(5), 1-24. Retrieved from www.abacademies.org/articles/Determinants-of-Saudi-Takaful-Insurance-Companies-Profitability-1528-2635-22-5-280.pdf on June 23, 2023.

Hicks, J.R. (1935). Annual survey of economic theory: the theory of monopoly. *Econometrica*, *3*(1), 1-20.

Jedlicka, L., & Jumah, A. (2006). The Austrian insurance industry: a structure, conduct and performance analysis. *Economics series*, *189*. Institute for Advanced Studies. Retrieved from https://ideas.repec.org/cgi-bin/htsearch?q=The+Austrian+Insurance+Industry%3A+A+Structure%2C+Conduct+and+Performance+Analysis on June 23, 2023.

Kramaric, T.P., Miletic, M., & Pavic, I. (2017). Profitability determinants of insurance markets in selected Central and Eastern European countries. *International Journal of Economic Sciencies, VI*(2), 100-123. https://doi.org/10.52950/ES.2017.6.2.006

Kripa, D., & Ajasllari, D. (2016). Factors affecting the profitability of insurance companies in Albania. *European Journal of Multidisciplinary Studies, 1*(1), 352-360. https://doi.org/10.26417/ejms.v1i1.p352-360

Lament, M. (2019). *Raportowanie niefinansowe a wyniki finansowe zakładów ubezpieczeń.* Warszawa: CeDeWu.

Lee, Ch.Y. (2014). The effects of firm specific factors and macroeconomics on profitability of property-liability insurance industry in Taiwan. *Asian Economic and Financial Review, 4*(5), 681-691. Retrieved from https://archive.aessweb.com/index.php/5002/article/view/1191 on June 23, 2023.

Marjanović, I., & Popović, Ž. (2020). Profitability determinants of insurance companies in the Republic of Serbia. In: *Economic and financial challenges for Balkan and Eastern European countries* (pp. 133-159). Springer, Cham.

Moro, O., & Anderloni, L. (2014). Non-life insurance economic performance - an empirical investigation. *Journal of Economics & Management*, *18*, 159-177.

OECD Statistics. Insurance Statistics. Retrieved from https://stats.oecd.org, on August 15, 2023.

Ofori-Boateng, K., Ohemeng, W., Boro, E.H., & Agyapong, E.K. (2022). Efficiency, market structure and performance of the insurance industry in an emerging economy. *Cogent Economics & Finance*, *10*, 2068784. https://doi.org/10.1080/23322039.2022.2068784

ORBIS Database. Bureau van Dijk. A Moody's Analytics Company.

Ortyński, K. (2016). Determinants of profitability of general insurance companies performance in Poland. *Central European Review of Economics & Finance*, *12*(2), 53-66.

Peltzman, S. (1977). The gains and losses from industrial concentration. *Journal of Law and Economics, 2*(20), 229-263. https://doi.org/10.3386/w0163

Pervan, M., Ćurak, M., & Marijanović, I. (2012). Dynamic panel analysis of B&H insurance companies' profitability. *Recent Researches in Business and Economics, 1*, 158-163.

Polish Chamber of Insurance (2023). *Insurance figures in 2022.* Retrieved from https://piu.org.pl/en/insurance-figures-in-2022/ on May 12, 2023.

The Polish Financial Supervision Authority (2023). *Annual bulletin. Insurance market 2022*. Retrieved from https://www.knf.gov.pl/en/REPORTS_AND_ANALYSIS/Insurance/Annual_data/2022 on May 12, 2023.

Pope, N., & Ma, Y.L. (2008). The market structure – performance relationship in the international insurance sector. *Journal of Risk and Insurance*, *75*(4), 947-966. https://doi.org/10.1111/j.1539-6975.2008.00292.x

Smirlock, M. (1985). Relationship between concentration and profitability in banking. *Journal of Money, Credit and Banking*, *17*(1), 69-83.

Swiss Re (2023). *World insurance: stirred, and not shaken*. Zurich: Swiss Re Institute, Sigma 3, 1-65.

Varga, V., & Madari, Z. (2023). The Hungarian insurance market structure: an empirical analysis. *Central European Journal of Operations Research, 31*, 927-940. https://doi.org/10.1007/s10100-023-00842-8

Yuvaraj, S., & Abate, G. (2013). A study on the financial performance of insurance companies in Ethiopia. International. *Journal of Marketing, Financial Services and Management Research*, *2*(7), 138-150.

Authors

The contribution share of authors was equal and amounted to 50% for each of them.

Marzanna Lament
Associate Professor in Finance and Accounting, the Faculty of Economics and Finances, Casimir Pulaski Radom University in Radom, Poland. Her research interests include the accounting and finance of insurance companies and the insurance market.
Correspondence to: Dr. Hab. Marzanna Lament, prof. URad., Faculty of Economic and Finance, Casimir Pulaski Radom University in Radom, Chrobrego 31, 26-600 Radom, Poland, e-mail: m.lament@urad.edu.pl
ORCID http://orcid.org/0000-0003-3450-5122

Sławomir I. Bukowski
Professor in Economics and Finance, the Faculty of Economics and Finances, Casimir Pulaski Radom University in Radom, Poland. His research interests include the integration of financial markets, international finance, and econometrics methods.
Correspondence to: Prof. Dr. Hab. Sławomir Bukowski, Faculty of Economic and Finance, Casimir Pulaski Radom University in Radom, Chrobrego 31, 26-600 Radom, Poland, e-mail: s.bukowski@urad.edu.pl
ORCID http://orcid.org/0000-0001-8039-895X

Acknowledgements and Financial Disclosure

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright and License

Published by Krakow University of Economics – Krakow, Poland

Ministry of Education and Science
Republic of Poland

The journal is co-financed in the years 2022-2024 by the Ministry of Education and Science of the Republic of Poland in the framework of the ministerial programme “Development of Scientific Journals” (RCN) on the basis of contract no. RCN/SP/0583/2021/1 concluded on 13 October 2022 and being in force until 13 October 2024.

EBER
Entrepreneurial Business and Economics Review
2024, Vol. 12, No. 3
10.15678/EBER.2024.120305

Crowdfunding in the museum context: Exploring alternative approaches to financial support

Marta Najda-Janoszka, Magdalena Sawczuk

ABSTRACT

Objective: The objective of the article is to investigate the applicability of crowdfunding in the museum context, addressing the limited research available in this area. By focusing on museums in Poland, known for their cultural diversity, the objective was to examine how crowdfunding can provide financial support, enhance museum visibility, and foster community engagement.

Research Design & Methods: Using an exploratory qualitative approach, we analysed digital data from 28 Polish museum crowdfunding projects collected between May and July 2023. We examined structural choices, social communication strategies, and goal achievement using online promotional channels. This analysis followed predefined research questions and a theory-driven coding method with consensus coding by two researchers.

Findings: Our research highlights crowdfunding's potential in addressing museums' financial challenges, and offering tailored support, especially for smaller institutions. It also identifies cases of campaigns falling short of funding goals due to inadequate promotion and donor communication. Reward-based crowdfunding consistently outperforms donation-based models, strengthening audience connections and cultural heritage dissemination in the museum context.

Implications & Recommendations: This study underscores crowdfunding as a financial solution for museums, emphasizing the need for digital literacy and employee training. Variations in communication strategies among museums highlight the importance of strategic planning. Crowdfunding can enhance financial stability, audience connections, and societal impact when aligned with other financial measures, making it a viable strategy for museums.

Contribution & Value Added: This research contributes to the existing body of knowledge on innovative fundraising, engagement, and museum management. It bridges the gap in research regarding crowdfunding in museums. The study's value lies in its comprehensive understanding of how crowdfunding can be applied across various facets of museum operations, providing museums with valuable insights for financial support, audience engagement, and enhancing their societal impact.

Article type: research article
Keywords: crowdfunding; financing; museum; social media, digital
JEL codes: L32, M1, G23

Received: 9 November 2023 Revised: 16 April 2024 Accepted: 17 April 2024

Suggested citation:
Najda-Janoszka, M., & Sawczuk, M. (2024). Crowdfunding in the museum context: Exploring alternative approaches to financial support. *Entrepreneurial Business and Economics Review,* 12(3), 83-97. https://doi.org/10.15678/EBER.2024.120305

INTRODUCTION

Crowdfunding is a well-recognized financial model for funding various projects. It has gained prominence for its capacity to gather modest contributions from a wide pool of individuals, primarily through online platforms (Mollick, 2014; Moysidou & Hausberg, 2020). This innovative approach is not only a valuable financial model but also a platform for testing ideas and enhancing consumer engagement (Younkin & Kashkooli, 2016). However, its specific application within museums remains relatively underexplored, despite its success in areas like non-profit initiatives, cultural projects, and the arts

(Handke & Dalla Chiesa, 2022). Only a handful of articles (Web of Science, Scopus) present research on crowdfunding in museums. This lack of research may be attributed to a relatively recent shift in the managerial approach within museums (Najda-Janoszka & Sawczuk, 2018), grappling with budget limitations, funding reductions, and heightened competition from the entertainment industry (O'Hagan, 2021). In this context, crowdfunding emerges as a promising and innovative solution (Pan, 2021).

The current state of research on museum crowdfunding highlights a fragmented landscape, dominated by selective case studies and broader discussions within the cultural and creative industries (Pan, 2021; Handke & Dalla Chiesa, 2022). The existing literature, emphasizes the role of online crowdfunding platforms, and the impact of social media on project promotion (Prokůpek *et al.*, 2023). However, while touching upon intriguing themes, demonstrates notable gaps, particularly concerning the application of crowdfunding models to specific museum initiatives and types. The focus on large art institutions located in major cities, while showcasing their unique potential for interactive content, generates a risk of thematic and ownership bias (Pan, 2021). This research aims to bridge these gaps, by exploring the structure and communication of museum crowdfunding projects, with a focus on delivering both financial and social outcomes.

We adopted an explorative qualitative approach, focusing on the diverse landscape of Polish museums. The analysis covered digital data from 28 museum crowdfunding projects sourced from crowdfunding platforms and online promotional channels. Crowdfunding emerges as a flexible financial solution, especially beneficial for smaller institutions, democratizing fundraising, enhancing visibility, and mobilizing local support. Our findings stress the importance of digital literacy and employee training for successful crowdfunding. Reward-based models consistently outperform donation-based ones, fostering audience connections and cultural heritage dissemination. This research enriches the theoretical framework of fundraising and museum management, providing valuable insights for museums seeking financial support, deeper audience connections, and societal impact through crowdfunding.

In the following, we first present the theoretical background of crowdfunding in the museum context. The next section describes the methodological approach applied. Then, the narrative shifts to the findings, shedding light on the diverse models, motivations, and promotional strategies observed in museum crowdfunding. The study concludes with a discussion of the implications, focusing on the innovative role of crowdfunding in addressing financial sustainability challenges and enhancing audience engagement in museums.

LITERATURE REVIEW

Crowdfunding emerges in the literature as a transformative model for funding diverse projects, leveraging the collective might of broad communities through the Internet and social media (Mollick, 2014; Moysidou & Hausberg, 2020). This digital model transcends traditional funding avenues by offering real-time concept testing and enhanced consumer engagement, underscoring a crucial social dimension (Younkin & Kashkooli, 2016; Zhang & Chen, 2019). Distinct crowdfunding models – ranging from equity to reward-based systems – demonstrate the versatility and adaptability of crowdfunding across sectors, including museums (Magliacani, 2020; Sahaym *et al*., 2021).

Crowdfunding bridges financial support and social engagement, moving beyond traditional funding to foster community involvement alongside capital gathering (Porter & Veenswijk, 2018; Sahaym *et al*., 2021). Therefore, success in crowdfunding hinges on both these dimensions, necessitating well-structured projects characterized by clear objectives, attractive incentives, mission-aligned narratives, and effective digital media promotion (Shneor & Vik, 2020; Cavalcanti Junqueira & Discua Cruz, 2019).

A precise understanding of what the project aims to achieve is crucial, as having clearly defined goals ensures alignment with the campaign's purpose (Nielsen & Binder, 2021). Moreover, aligning the message framing with the personal values of the backers requires a deep understanding of the target audience (Nielsen & Binder, 2021). This alignment significantly influences the motivational approach and the composition of rewards – both tangible and intangible (Thürridl & Kamleitner, 2016). Duration choice for the campaign is equally important, as studies suggest a correlation between time and pro-

ject success (Lukkarinen *et al.,* 2016; Liu *et al.,* 2023). Longer durations may create uncertain narratives, decrease interest, and demobilize potential backers (Frydrych *et al.,* 2014). Nevertheless, conflicting findings in certain studies leave the optimal duration unresolved (Salahaldin *et al.*, 2019).

Integrating financial aims with community engagement hinges on a strategic digital communication approach. Research highlights online crowdfunding platforms and social media as key factors in attracting support and building community (Borst *et al.*, 2017; Rykkja *et al.*, 2020). The combined use of digital channels enhances outreach, and sharing early pledges promotes campaign success, highlighting the critical role of social capital in crowdfunding (Riley-Huff *et al.*, 2016). However, existing studies suggest significant potential for further investigation into the impact of social media engagement, reach, and virality on campaign success (Shneor & Vik, 2020). Moreover, while the financial metrics of crowdfunding success are well-documented, non-financial success factors require further exploration (Shneor & Vik, 2020).

The scholarship indicates that crowdfunding's strategic importance lies in its ability to achieve and align with organizers' broader goals, integrating campaigns into larger objectives (Handke & Dalla Chiesa, 2022). Such integration requires a thoughtful strategic framework that navigates the complex dynamics between campaign structuring, effective communication, and the metrics of success (Mollick, 2014; Belleflamme *et al.,* 2014) aiming for financial goals while also enhancing community engagement and achieving long-term aims. This approach is vital for museums because project value extends to cultural enrichment and societal impact, highlighting the need to generate social capital as well as financial gains (Cavalcanti Junqueira & Discua Cruz, 2019).

Within the realm of cultural projects crowdfunding has found a distinctive niche. Museums have embraced crowdfunding to navigate financial constraints, competing against budget cuts and the broader entertainment industry for public attention and resources (O'Hagan, 2021). This shift towards diversified funding sources and digital integration reflects a broader trend of blending commercial activities with non-profit goals, evident in both private and public museum sectors (Prokůpek *et al*., 2023; Riley-Huff *et al.,* 2016). The adaptation to crowdfunding within museums is further prompted by global crises, notably the COVID-19 pandemic, signalling a paradigm shift in museum financing (Prokůpek *et al*., 2023).

However, despite its potential to enhance museum initiatives, there remains a significant gap in the literature regarding the specific application of crowdfunding within the museum context. While existing research provides valuable insights through case studies and discussions within the GLAM sector (galleries, libraries, archives, and museums), it often presents a fragmented picture by focusing on selected aspects of structuring, communication, and measuring success (Handke & Dalla Chiesa, 2022; Riley-Huff *et al*., 2016). This approach largely overlooks the strategic interplay between these dimensions and lacks a detailed exploration of crowdfunding's adaptability to the varied needs and objectives of different museum types and projects (Pan, 2021; Cavalcanti Junqueira & Discua Cruz, 2019).

To date, research has primarily concentrated on larger, urban-based museums, overlooking how smaller institutions might harness crowdfunding (Kolbe *et al*., 2022; Porter & Veenswijk, 2018). The literature suggests that larger museums are better equipped to implement innovative fundraising strategies, whereas smaller museums face challenges due to limited staffing and the significant preparation needed for crowdfunding campaigns (Prokůpek *et al.,* 2023). Moreover, there's a noticeable gap in the exploration of crowdfunding applications across various museum types, with scant details on campaign structures, reward types or campaign duration (Magliacani, 2020). Most studies have centred on private art and nature museums (Pan, 2021; Prokůpek *et al.*, 2023), potentially skewing insights towards those more inclined to engage in digital and interactive content creation (Najda-Janoszka & Sawczuk, 2021). Moreover, while the use of crowdfunding platforms and social media by museums for project promotion has been examined, the exploration into how these elements synergize within an 'outreach strategy' and their correlation with campaign success remains limited (Riley-Huff *et al.*, 2016; Pan, 2021). Current research on museum crowdfunding campaigns is narrowly focused, either highlighting isolated success stories (Pan, 2021; Prokůpek *et al.*, 2023; Cavalcanti Junqueira & Discua Cruz, 2019) or aggregating data without linking project structure to outcomes (Riley-Huff *et al.*, 2016). This results in a scant discussion on how different funding models

align with project types and supporter expectations, underscoring a gap in understanding the impact of crowdfunding models on museums' financial and social objectives.

The literature points to an emerging trend but highlights a gap in detailed exploration, especially regarding how museums structure their campaigns, communicate with potential backers, and measure the success of their crowdfunding endeavours. Our approach seeks to address this gap by focusing on the synergistic relationship between campaign structuring, communication strategies, and success evaluation in museum crowdfunding. Inspired by insights from Belleflamme *et al*. (2014) and Mollick (2014) and recognizing the strategic potential of crowdfunding in enhancing museums' missions and outreach, we formulated the following research questions to guide our inquiry:

RQ1: *How do different types of museums structure their crowdfunding projects?* This question probes the strategic decisions behind campaign structuring within the diverse museum landscape, seeking to uncover patterns or divergences in approach.

RQ2: *How do museums adapt their social communication strategies within the context of crowdfunding?* Recognizing the critical role of digital and social media platforms in campaign promotion, this question explores the nuances of how museums navigate these spaces to foster community engagement and support.

RQ3: *To what extent are museums successful in achieving the goals defined for their crowdfunding projects?* This inquiry examines the alignment of campaign outcomes with initial goals, delving into the effectiveness of different crowdfunding models in meeting both financial and non-financial objectives.

RESEARCH METHODOLOGY

To address the research gap concerning the specificity of the crowdfunding process within museums, we adopted an explorative qualitative approach. Our empirical investigation was conducted within the context of museums operating in Poland. Poland boasts a rich and diverse cultural heritage, resulting in numerous museums dedicated to its preservation (NIMOZ, 2021). Consequently, the Polish museum landscape presents a complex mix of institutions, including state-owned, private, and community-based entities, covering a wide array of thematic areas such as art, history, science, and technology (*e.g.* Najda-Janoszka & Sawczuk, 2021). This diversity provides an opportunity to examine a broad spectrum of crowdfunding campaign types and themes, contributing to a comprehensive understanding of how crowdfunding can be applied across various facets of museum operations. Furthermore, Poland holds a significant position as a Central and Eastern European (CEE) country (Central European Times, 2023), and its experiences with crowdfunding may yield valuable insights into emerging trends within the CEE region.

Our investigation focused exclusively on institutions listed in the Ministry of Culture and National Heritage or National Institute for Museums databases, including their branches (Public Information Bulletin, 2023). We employed deliberate selection criteria to maintain the study's clarity and ensure that entities self-identified as 'museums' and undertake specific museum-related duties were included, while those operating primarily as enterprises or not fulfilling distinct museum functions were excluded from further analysis.

The investigation involved the analysis of digital data collected from May to July 2023, sourced from selected crowdfunding platforms, and used online promotional channels, such as official social media profiles and websites. To identify crowdfunding projects related to Polish museums, we performed a two-stage screening process.

In the first stage, we examined both international and national crowdfunding platforms. The results revealed the absence of crowdfunding projects from Polish museums on international crowdfunding platforms. Consequently, our investigation focused on Polish crowdfunding platforms. While this concentration on domestic platforms may limit the range of potential funders, it offers several advantages relevant to our research context. Specifically, it aligns with cultural nuances, enhances

communication effectiveness, ensures compliance with local regulations, and leverages community engagement – factors that hold significant relevance to the core issues addressed in this study.

Following the outcomes of the initial screening process, we identified five crowdfunding platforms featuring museum-related projects for inclusion in our investigation: Polakpotrafi, Odpalprojekt, Patronite, Zrzutka, and Pomagam. To precisely define the conditions governing the structuring of museum crowdfunding projects, we assessed these platforms based on several criteria, including the crowdfunding model, financial model, platform commission fees, campaign duration, and project categories relevant to the museum context (Appendix 1).

Recognizing the possibility that museums might implement and promote crowdfunding projects outside dedicated crowdfunding platforms, the second stage of our screening process involved the review of official online profiles and websites of museums. We examined all available historical data on social media platforms. After identifying posts on official museum profiles, we further investigated posts within social and thematic groups (Table 1). Next, we identified one crowdfunding project co-organized with other institutions and conducted on one of the co-organizers' websites, specifically the 'Restoration of Children's Shoes from Auschwitz' project. In total, we identified 28 museum crowdfunding projects.

Table 1. Digital promotion channels

Information sources	Number of pages/posts
1. Project showcase on a crowdfunding platform	27
2. Social media:	
a. Official Facebook profiles	28
b. Social and Thematic Facebook Groups	10
Posts	*72*
3. Official websites (including partners and local media)	30

Source: own study.

Our theoretical framework for analyzing museum crowdfunding focuses on the interplay and synergy between campaign structuring, communication strategies, and success evaluation, drawing on insights from Belleflamme *et al*. (2014) and Mollick (2014). It views crowdfunding as not just a financial tool but also a strategic asset supporting museums' missions and outreach (Cavalcanti Junqueira & Discua Cruz, 2019). At the core of this framework lies the careful crafting of structural elements – including objectives, funding goals, campaign duration, and alignment with museum types – to resonate with the needs of museums, thereby facilitating cultural preservation and community engagement. The framework further underscores the pivotal role of digital platforms and social media in fostering community bonds and stakeholder engagement. Central to our analysis is the belief that clearly defined campaign goals are indispensable for measuring success, encompassing fundraising performance, the realization of non-financial objectives, and the transparent communication of outcomes to stakeholders.

In our analysis, we applied theory-driven codes derived from museum crowdfunding literature, refining these codes through a systematic iterative consensus process undertaken by two researchers to ensure reliability (Table 2). This careful process involved analyzing and coding a wide array of digital materials, including texts, videos, and images from various platforms (Table 3). We aimed to enrich established analytical frameworks with novel insights, particularly focusing on how museums structure their crowdfunding campaigns and communicate their progress and achievements. The introduction of emergent codes, such as transparency challenges, duration ambiguity, post-campaign engagement, and personal involvement, serves to refine our understanding of campaign structuring. These codes highlight the significance of establishing clear objectives and precise timelines, thereby enhancing backer interest and fostering a deeper connection with the audience. This framework emphasizes the pivotal roles of accountability, clarity, and community engagement in driving the success of crowdfunding initiatives within the museum sector.

Table 2. Theory-driven and emerging codes used for the analysis

Code	Description	Source/emerging
Structuring crowdfunding projects		
Project purpose and objectives	specific objectives and purposes of crowdfunding projects within museums, their alignment with the museums' missions, and association with measurable outcomes	Riley-Huff *et al.* (2016); Handke & Dalla Chiesa (2022)
Campaign timeframe strategy	established timeframes for crowdfunding projects and any project duration adjustments, along with their role in generating a sense of urgency	Pan (2021)
Campaign timeline clarity	Clarity of the project duration or adjustments to campaign timelines	Emerging
Funding goals	financial objectives set by crowdfunding campaigns and their alignment with the needs of the projects being funded	Riley-Huff *et al.* (2016); Pan (2021); Handke & Dalla Chiesa (2022)
Backer incentives and acknowledgement	The tangible rewards and intangible aspects that backers receive, highlighting the reciprocal nature of crowdfunding	Handke & Dalla Chiesa (2022); Thürridl & Kamleitner (2016)
Campaign transparency	Clarity of the campaign's outcome and funding sources' divergence	Emerging
Museum type	thematic categories and ownership structures of museums	Magliacani (2020); Pan (2021)
Social communication strategies		
Social media presence and integration	presence on various social media platforms and their utilization for promoting crowdfunding campaigns and directing traffic to the crowdfunding platform	Riley-Huff *et al.* (2016); Pan (2021)
Audience and community engagement	interactions between the museum and its social media audience and community (*e.g.* response to comments and questions, user-generated content)	Riley-Huff *et al.* (2016); Pan (2021)
Content consistency	posting schedule and coherence of the content shared by the museum on social media with the crowdfunding campaign's goals	Cavalcanti Junqueira & Discua Cruz, (2019); Handke & Dalla Chiesa (2022)
Communication style	formality/informality of the communication style, emotional appeal	Riley-Huff *et al.* (2016)
Post-fundraising engagement	communication and updates provided to backers and followers post-campaign, including sharing updates on the project's progress, developments, and milestones achieved with the funds raised and expressions of gratitude	Emerging
Personal involvement	Incorporation of personal identity, activity and images of museum employees, and members of associations, into campaign communication	Emerging
Success in achieving goals		
Fundraising achievement	financial performance and overall success of a crowdfunding campaign in terms of funds raised and their composition, progress toward the funding goal	Riley-Huff *et al.* (2016); Magliacani, (2020); Pan (2021)
Goal achievement	Achievement of non-financial objectives and goals	Riley-Huff *et al.* (2016); Pan (2021)
Achievement reporting	communication provided to backers and followers on achieved outcomes and goals	Pan (2021)

Source: own study.

Table 3. Example of the coding procedure

Coded material	Structuring	Communicating	Success Reporting
Pitch video on the platform polakpotrafi.pl [project_1_v]	*Project purpose and objectives* Outline of the project purpose and alignment with the museum mission	*Social media presence and integration* *Content consistency* Pitch video available on YouTube, accessible directly through a link provided on the crowdfunding platform *Communication style* Emotional appeal to community heritage and feelings of belonging *Personal involvement* Real visuals and narration by the play's producer *Post-fundraising engagement* Announcement of personal thanks to supporters during the premiere	–
photo-relation of the neon sign renovation process [project 5_f3]	*Project purpose and objectives* Confirming compliance with the broader mission of preserving cultural heritage Indicating measurable outcomes of the project *Museum type* Indication of the thematic scope of the museum and the project	*Social media presence and integration* Content provided on museum and central museum FB profile *Communication style* Emotional and informal appeal to supporters *Personal involvement* Real visuals of museum employees *Post-fundraising engagement* Updating on project progress post-fundraising	*Achievement reporting* Informing on completion of fundraising and initiation of financed tasks
Social media posts announcing the conclusion of the campaign [project 2_fb14]	*Project purpose and objectives* Underlined project title emphasizing compliance with the mission of preserving cultural heritage and indicating measurable outcomes of the project *Campaign timeline clarity* *Campaign transparency* Transparent information on achieving financial goals four days before the deadline *Funding goals* Clear information on the set and achieving the funding goal *Museum type* Indication of the thematic scope of the museum and the project	*Social media presence and integration* *Content consistency* Content provided on museum FB profile, linked to crowdfunding platform *Communication style* Emotional and informal appeal to supporters *Personal involvement* Real visuals of museum employees	*Fundraising achievement* completion of fundraising goal *Achievement reporting* Indication of achieving the financial goal before the deadline Underlining the 'shared success' – 'we did it'

Source: own study.

RESULTS AND DISCUSSION

The analysis encompassed the entire identified population of crowdfunding campaigns within the museum context, totalling 28 projects (Appendix 2). Museums that organized, co-organized, or benefited from crowdfunding projects exhibited variation in terms of size and profile, encompassing: five military-themed, four technology and science-themed, three interdisciplinary, three regional, two artistic, two ethnographic, one biographical, one martyrdom, one historical and one categorized as 'other' (lacking a dominant collection theme). Moreover, three museums initiated more than one crowdfunding project, consisting of two private and one public museum.

It is noteworthy that crowdfunding finds application in both public and private museums officially registered in databases, with a particular prevalence among institutions from smaller towns or those with less established brands or recognition (*e.g.* The Village Museum in Maruszów and the Museum of Historical Costume). Conversely, larger state-owned museums show limited engagement with crowdfunding. Our research identified just two instances where such museums were involved but as beneficiaries, not organizers (the National Museum in Warsaw, and the Auschwitz-Birkenau Memorial). Museums initiated 20 campaigns, while eight projects were organized by community stakeholders (*e.g.* museum friends' associations, city or regional promotion associations, informal groups of enthusiasts):

> The collection is organized with the assistance of Mr. Edward's friends, who wish to support him in continuing his passion and educating future generations about past eras (zrzutka.pl, 2023).

When examining the motives behind launching crowdfunding campaigns, we have identified several overarching categories all framed within the mission of the museums:

- **artefact acquisition and transport** – *e.g.* the National Museum of the Przemyśl Land: 'Funds collected through the PolakPotrafi.pl platform will assist us in acquiring a painting and covering the costs of transporting the artwork, which is still located in Poland' (polakpotrafi.pl, 2023);
- **event organization** – *e.g.* the Museum of Warmia and Masuria in Olsztyn initiated a campaign to prepare a special theatrical performance coupled with interactive elements, allowing a glimpse into a morning in Copernicus's life;
- **artefact conservation/renovation** – *e.g.* the Association of Friends of the National Museum in Warsaw: 'Let's make a gift to the National Museum in Warsaw and fund the research and conservation of the extraordinary painting 'Palace steps' by Francesco Guardi. This exceptional work was stolen during World War II and returned to the National Museum in Warsaw only in 2014,' (odpalprojekt.pl, 2023);
- **general museum support** – *e.g.* the Museum of Historical Costume sought support for the daily museum's operations by emphasizing its non-governmental status and the lack of public funding for its activities;
- **commemoration of special occasions** – *e.g.* the Regional Museum in Bydgoszcz initiated a campaign to celebrate the 100th anniversary of the institution, inviting backers to contribute to acquiring a meaningful birthday gift for the museum's collection;
- **urgent aid in difficult situations –** *e.g.* The Museum of Archaeology at Przemyśl Fortress experienced a break-in resulting in losses such as damage and theft. They have launched a fundraising campaign for security system installation to safeguard their artefacts.

Our analysis identified two crowdfunding models in the examined campaigns: the donation model and the reward-based model. Among these, the donation model was the most prevalent, being employed in 16 projects. Within this donation-based approach, six public and 10 private museums were identified. In all the cases except one (Conservation work on children's shoes – the Auschwitz-Birkenau Memorial) the projects were run on dedicated crowdfunding platforms. Campaign durations ranged between two and 12 months, although the transparency of this information varied and seven projects did not disclose the timeline. Platforms like Zrzutka.pl, for instance, do not strictly enforce project timelines and deadlines. Notably, all donation-based projects applied a flexible funding approach. Moreover, in three cases, we identified dual funding schemes, allowing parallel contributions through

dedicated crowdfunding platforms and direct donations to museum accounts. The funding targets exhibited significant diversity, ranging from 3 500 to 1 520 000 PLN, with an average of 500 000 PLN.

Six public museums and six private museums adopted the reward-based model. These campaigns had varying durations, ranging from 36 to 78 days (4 projects with no timeline), and were all organized on dedicated crowdfunding platforms. Only one project applied dual funding scheme (Henryk Sienkiewicz Museum). Public museums predominantly utilized a more stringent financial model, known as 'all or nothing,' whereas all private museums opted for either flexible or subscription modes. The reward-based model had two main variations: eight campaigns with multiple reward tiers and four campaigns with a single-tier model. There was a balanced mix of tangible and intangible rewards. Rewards were often scarce, enhancing their unique appeal (*e.g.* invitation to dress rehearsal, limited edition of a catalogue, participation in conservation workshop), but typically held low monetary value compared to their social and cultural significance. A remarkable exception was a weekend stay at a spa resort for six people as a reward for contributions of 350 PLN or more (Project 2). Recognition for contributions was predominantly private, favouring a more personalized acknowledgement approach. The targeted funding amounts spanned from 6 000 to 71 500 PLN, with an average of 73 500 PLN.

Crowdfunding campaigns predominantly used both social media, especially Facebook and YouTube, and direct links on crowdfunding platforms to promote projects. In 13 cases, direct links to organizers' Facebook pages were provided, increasing accessibility and engagement. Campaign descriptions emphasized emotional context, social support, and local identity, often through compelling narratives that strengthened the connection to the mission. Pitch videos were utilized in two campaigns to convey the essence of the project and offer an additional layer of visual and emotional storytelling for potential backers. Updates and comments on these platforms, though sporadic, were more frequent in successful campaigns, helping maintain communication with backers. On Facebook, promotional strategies extended to sharing posts from local media and participating in region-focused thematic groups, broadening the outreach:

- **invitation posting:** Inviting potential backers to support the campaign,
- **reminders:** Occasional reminders about the ongoing campaign,
- **updates:** Providing real-time updates about funding progress and rewards,
- **project completion posting:** Sharing the successful completion of the crowdfunding campaign, although this was not a standard practice,
- **media coverage sharing:** Sharing media coverage related to their crowdfunding initiatives, though this was also not a common practice,
- **building and strengthening relations:** Engaging in dialogue, addressing critiques, and fostering conversations. This was not standard practice, as many posts received likes but did not engage in dialogue or comments.

> [audience] *Legend I still remember Mr. Marian, the manager.*
> [museum] *Do you have a favourite book that you bought there, one you eagerly awaited?*
> [audience] *I remember a subscription for the complete works of Dostoevsky* ☺
> *Mr Marian was friends with my Dad, and the ladies who worked there still remembered me as a little kid coming with my Grandma (who passed away in 1976).*
> [museum] *wonderful stories! That's why Facebook is sometimes a great thing: you can hear such beautiful stories from people like you* (Facebook, 2021)

Social media activity varied significantly in the campaigns examined. Some maintained a regular and systematic presence, while others provided sporadic updates or had no presence at all (3 projects). Commonly, campaigns with intensive promotional efforts highlighted individual employees, initiators, and creators involved in the crowdfunding project. Both crowdfunding platform materials and social media posts showcased these individuals along with their messages. Private museums displayed the most diversity in promotional activity with some lacking a social media presence and others actively sharing updates within enthusiast groups.

Evaluating the effectiveness of museum crowdfunding projects was challenging because the dual funding schemes added complexity in determining the success of these campaigns. While crowdfunding platforms readily display project progress, traditional contributions may not provide the same transparency level. For instance, in the cases where traditional bank transfers were encouraged, the information about the campaign's progress was not publicly available.

> The Litwos foundation is on Facebook, where the purpose and scope of the project are described. You can donate there directly to sign up for donor cards (zrzutka.pl, 2023).

Based on the data from crowdfunding platforms and the dedicated project site for the Restoration of Children's Shoes from Auschwitz, only eight projects successfully met their financial goals (Table 4). However, 20 projects did not reach their targets, yet they were able to retain the funds collected thanks to the flexible funding mode they utilized.

Table 4. Financial goal achievement

Financial goal achievement	Types of museums
Success	
8	6 public, two private Interdisciplinary, regional, biographic, historical, martyrdom, and other
Failure	
20	6 public, 14 private Interdisciplinary, regional, biographic, military-themed, technology and science-themed, artistic, and other

Source: own study.

Moreover, reporting on the success and outcomes of completed campaigns beyond financial gains was not a standard practice. Only nine projects out of all the campaigns provided such information.

> It was an extraordinary, intimate, and exclusive family evening. Yesterday, our neon sign 'Bookstore' lit up. This happened in the presence and thanks to the generosity of the donors invited to the event. The fortunate guests at the pre-premiere of the Podgórze glow contributed over 100 PLN for the restoration of the neon and, as per our agreement, had the privilege of lighting up our blue gem ☺ (Facebook, 2021).

The synthesis of campaign structuring and communication efforts reveals significant variations in campaign strategies, which can be pivotal for achieving both financial and broader non-financial goals. The interplay between these elements illustrates a consistent pattern. Successful crowdfunding campaigns often demonstrate strategic coherence, including well-defined goals, appropriate campaign duration, engaging funding methods, enticing incentives, and effective communication strategies. Conversely, campaigns that lacked in one or more of these areas tended to see diminished returns and engagement, highlighting the need for a strategic approach to campaign design and execution (Mollick, 2014; Belleflamme *et al*., 2014):

- Reward-based projects outperformed donation-based ones, indicating a potential mismatch with backers' expectations or motivations for the latter (Nielsen & Binder, 2021; Handke & Dalla Chiesa, 2022). Campaigns offering multiple tiers of rewards, including diverse options from tangible items to unique experiences, engaged backers more effectively (Thürridl & Kamleitner, 2016; Arshad *et al.*, 2024). This highlights the importance of tailoring campaign structures to match backer preferences for optimal results (Handke & Dalla Chiesa, 2022). Notably, museums relying on public subsidies may face audience resistance when using donation-based models, as evidenced by only one public museum achieving its financial target in the study sample.
- The funding mode chosen by museums often reflects the risk level they were willing to undertake based on their objectives (Salahaldin *et al.*, 2019). Flexible funding ensures that all raised funds are retained, while all-or-nothing funding carries the risk of receiving no funds unless the target is met.

The latter mode presents a high-risk, high-reward scenario, potentially driving urgency and stronger motivation (Mollick, 2014). Notably, all three projects by public museums employing this mode exceeded their financial targets. In contrast, only four out of 20 projects using the flexible mode were successful. This mode lacks the same sense of urgency, which was further highlighted by the investigated projects having also longer durations (over two months), lacking clear deadlines, and in four cases, employing dual funding streams. The opacity in project funding streams poses a threat to the trust and credibility of museum initiatives (Handke & Dalla Chiesa, 2022; Pan, 2021).

- The sample comprised campaigns of varying durations, with shorter ones aligning more closely with recommended timelines for crowdfunding projects (Frydrych *et al.*, 2014; Liu *et al.*, 2023). These shorter durations tended to encourage a sense of urgency and led to faster and more successful funding outcomes. In contrast, projects lasting over three months or lacking a clearly defined deadline risked decreased motivation, prolonged consideration by potential supporters, or even being forgotten altogether (Lukkarinen *et al.,* 2016). However, it's important for the campaign duration to not only adhere to general recommendations from crowdfunding platforms (Frydrych *et al.*, 2014) but also align with the nature and complexity of the set objectives (Salahaldin *et al.*, 2019). Projects with clear, specific objectives such as acquiring an artefact are expected to have moderate durations that match the urgency and scope of the goal. Conversely, more complex goals, such as conservation work (Project 3, 28), may require a longer duration to give backers enough time to engage with and fund the campaign. Nevertheless, longer durations pose the additional challenge of sustaining interest and engagement from both organizers and supporters (Chemla & Tinn, 2020).
- We found the integration of digital and social media strategies to be crucial in driving the success of museum crowdfunding campaigns (Shneor & Vik, 2020). Intense communication, including frequent updates and interaction, across multiple platforms ensured high visibility and engagement, which are essential for reaching financial targets in crowdfunding (Rykkja *et al.*, 2020; Borst *et al.*, 2017). Projects with clear objectives but longer durations and sporadic digital media communication often failed to meet funding targets, unlike Project 28, which lasted a year but had strong digital visibility and outreach. The standout success of Project 18 (483 funders, achieving 130% of the financial target) despite its donation and flexible mode, was largely attributed to a clear objective and viral spread across social media, driven by YouTuber content – though this was an exceptional case. Typically, systematic online communication before the crowdfunding campaign played a pivotal role, emphasizing the significance of early support from an established 'fan-base' (Handke & Dalla Chiesa, 2022) and dedicated staff commitment (Riley-Huff *et al.*, 2016).
- Maintaining and fostering engagement to achieve broader non-financial goals requires transparency and interaction not only during but also after completing the crowdfunding campaign (Porter & Veenswijk, 2018). This involves clear and timely reporting of campaign success and outcomes, detailing how funds were utilized, and demonstrating the community's impact and responsibility for cultural heritage (Riley-Huff *et al.*, 2016; Moysidou & Hausberg, 2020). Merely indicating the end and achieving a financial target of the campaign on the crowdfunding platform is not engaging enough. In the examined sample post-campaign communication was often overlooked, despite its pivotal role in preserving trust, sustaining engagement, and garnering ongoing support for future museum endeavours (Porter & Veenswijk, 2018; Pan, 2021). This oversight raises concerns about the viability of potential future crowdfunding initiatives for those museums.

Noteworthy, our empirical findings challenge prior research focused on large art museums, private institutions, and major cities (Pan, 2021; Prokůpek *et al.*, 2023; Riley-Huff *et al.*, 2016). It turned out that crowdfunding spans diverse museum types, including regional, interdisciplinary, and historical themes, involving both private and public institutions. This diversification highlights the need to broaden our understanding of crowdfunding dynamics within the museum sector. Empirical evidence suggests crowdfunding is a vital financial source, especially beneficial for smaller museums lacking recognition (Pan, 2021; Cavalcanti Junqueira & Soetanto, 2022). Unlike traditional funding, crowdfunding democratizes fundraising, empowering communities to support causes they care about (*e.g.* Project 18). Strategic crowdfunding that leverages campaign structuring, communication strategies, and

success evaluation, can deepen audience engagement, strengthen community ties, and amplify cultural institutions' societal impact (Porter & Veenswijk, 2018; Najda-Janoszka & Sawczuk, 2023).

CONCLUSIONS

The study on the applicability of crowdfunding within the museum context significantly enriches the existing literature by providing empirical insights into how diverse types of museums, particularly smaller and lesser-known ones, can leverage crowdfunding. This research was instrumental in demonstrating the feasibility of crowdfunding as an alternative financial model that supports museums in achieving financial sustainability, enhancing visibility, and fostering community engagement. Although crowdfunding can serve as a critical financial strategy for museums struggling with budget constraints, it also validates new project ideas and gauges public interest during times of heightened competition from the entertainment industry (O'Hagan, 2021). A strategic approach to crowdfunding can strengthen the bond between museums and their communities. Successful campaigns typically involve high levels of interaction with the community, underscoring the importance of active engagement strategies such as social media outreach, which can extend beyond fundraising to encompass broader museum activities. The research highlights that crowdfunding increases museum's visibility making them more accessible. This not only helps attract more visitors but also enhances the museum's role as a cultural custodian and educational resource.

However, the observed varied success emphasizes the demanding nature as well as the inherent risks and uncertainties of crowdfunding campaigns, highlighting the potential impacts on organizational reputation and brand. This suggests a nuanced landscape for museums considering crowdfunding, where the strategic advantages of this alternative source of support must be balanced against the unique challenges and uncertainties of the crowdfunding model. Crowdfunding is becoming a method of capital formation increasingly used in the entertainment industry, creating a market with an oversupply of available potential 'candidates' for commercialization (Rykkja *et al.*, 2020). To successfully navigate this market, museums need to strategically leverage structuring and communication efforts. For this, museum management and staff need to enhance their knowledge of crowdfunding methods (structuring) and improve their digital literacy and capabilities (communication). In this matter, policymakers play a pivotal role in fostering the integration of digital tools within cultural institutions, which is crucial for adapting to the evolving landscape of modern fundraising. By supporting initiatives that enhance digital literacy and promote digital transformation, they not only empower museums to effectively engage with contemporary audiences but also ensure these institutions remain competitive and relevant in the digital age.

Nevertheless, this study was bound by limitations. Primarily, they stemmed from the reliance on secondary data and the specificity of the country context. To overcome these constraints, future research should delve into the viewpoints of museum employees, aiming to uncover motivations, identify knowledge gaps, and establish best practices. This approach could also facilitate the use of the gathered material for comparative cross-country studies. Furthermore, there is a pressing need for additional research to explore emerging forms of alternative financing, like 'artefacts' adoption,' block-chain technologies, and their strategic integration within the museum funding mix. This exploration should extend beyond financial strategies to encompass the influence of communication and marketing strategies within these cultural institutions.

REFERENCES

Arshad, N., Shneor, R., & Berndt, A. (2024). The reward crowdfunding campaign management process: an engagement perspective. *International Journal of Entrepreneurial Behavior & Research*, *30*(11), 1-18. https://doi.org/10.1108/IJEBR-05-2023-0480

Belleflamme, P., Lambert, T., & Schwienbacher, A. (2014). Crowdfunding: Tapping the right crowd. *Journal of Business Venturing*, *29*(5), 585-609. https://doi.org/10.1016/j.jbusvent.2013.07.003

Borst, I., Moser, C., & Ferguson, J. (2017). From friendfunding to crowdfunding: Relevance of relationships, social media, and platform activities to crowdfunding performance. *New Media & Society*, *20*(4), 1396-1414. https://doi.org/10.1177/1461444817694599

Cavalcanti Junqueira, M.I., & Discua Cruz, A. (2019). Crowdfunding and Museums: A Field Trip Exemplar in the United Kingdom. *Entrepreneurship Education and Pedagogy*, *2*(2), 151-170. https://doi.org/10.1177/2515127418801

Cavalcanti Junqueira, M.I., & Soetanto, D. (2022). Funding decisions and the role of trust: a qualitative study of reward-based crowdfunding in the creative industries. *Management Decision*, *60*(8), 2174-2194. https://doi.org/10.1108/MD-08-2020-1095

Central European Times (2023). Retrieved from https://centraleuropeantimes.com/2023/08/poland-rapidly-emerging-as-cee-powerhouse-top-uk-researcher-reports/ on October 9, 2023.

Chemla, G., & Tinn, K. (2020). Learning Through Crowdfunding. *Management Science, 66*(5), 1783-1801. https://doi.org/10.1287/mnsc.2018.3278

Frydrych, D., Bock, A.J., Kinder, T., & Koeck, B. (2014). Exploring entrepreneurial legitimacy in reward-based crowdfunding. *Venture Capital. An International Journal of Entrepreneurial Finance*, *16*(3), 247-269. https://doi.org/10.1080/13691066.2014.916512

Handke, C., & Dalla Chiesa, C. (2022). The art of crowdfunding arts and innovation: the cultural economic perspective. *Journal of Cultural Economics, 46*, 249-284. https://doi.org/10.1007/s10824-022-09444-9

Kolbe, K.J., Velthuis, O., Aengenheyster, J., Rozenbaum A., & Zhang M. (2022). The Global Rise of Private Art Museums: A Literature Review. *Poetics*, *95*, 101712. https://doi.org/10.1016/j.poetic.2022.101712

Liu, Z., Ben, S., & Zhang, R. (2023). Factors affecting crowdfunding success. *Journal of Computer Information Systems*, *63*(2), 241-256. https://doi.org/10.1080/08874417.2022.2052379

Lukkarinen, A., Teich, J.E., Wallenius, H., & Wallenius, J. (2016). Success drivers of online equity crowdfunding campaigns. *Decision Support Systems*, *87*, 26-38. https://doi.org/10.1016/j.dss.2016.04.006

Magliacani, M. (2020). How crowdfunding makes museum value relevant: An Italian university museum experience. *African Journal of Business Management*, *14*(2), 73-85. https://doi.org/10.5897/AJBM2019.8932

Mollick, E. (2014). The dynamics of crowdfunding: An exploratory study. *Journal of Business Venturing*, *29*(1), 1-16. https://doi.org/10.1016/j.jbusvent.2013.06.005

Moysidou, K., & Hausberg, J.P. (2020). In crowdfunding we trust: A trust-building model in lending crowdfunding. *Journal of Small Business Management*, *58*(3), 511-543. https://doi.org/10.1080/00472778.2019.1661682

Najda-Janoszka, M., & Sawczuk, M. (2018). Museum as a Research Object in the Strategic Management Field. In A. Nalepka & A. Ujwary-Gil (Eds.) *Business and Non-Profit Organizations Facing Increased Competitions and Growing Customers' Demands* (pp. 51-67). Nowy Sącz: Wyższa Szkoła Biznesu - National Louis University.

Najda-Janoszka, M., & Sawczuk, M. (2021). Interactive Communication Using Social Media- the Case of Museums in Southern Poland. *Museum Management and Curatorship*, *36*(6), 590-609. https://doi.org/10.1080/09647775.2021.1914135

Najda-Janoszka, M., & Sawczuk, M. (2023). Exploring the barriers of multi-stakeholder value co-creation-the museum context. *Journal of Organizational Change Management*, *36*(4), 603-620. https://doi.org/10.1108/JOCM-04-2023-0126

National Institute of Museums (NIMOZ) (2021). Retrieved from https://statystykamuzeow.pl/storage/do%20pobrania/Publikacje/RAPORT-Muzea-w-2021.pdf on June 16, 2023.

Nielsen, K.R., & Binder, J.K. (2021). I Am What I Pledge: The Importance of Value Alignment for Mobilizing Backers in Reward-Based Crowdfunding. *Entrepreneurship Theory and Practice*, *45*(3), 531-561. https://doi.org/10.1177/1042258720929888

O'Hagan, L. (2021). Instagram as an exhibition space: reflections on digital remediation in the time of COVID-19. *Museum Management and Curatorship*, *36*(6), 610-631. https://doi.org/10.1080/09647775.2021.2001362

Odpal Projekt (2023). Retrieved from https://odpalprojekt.pl on June 12, 2023.

Pan, M. (2021). The Museum that Leaps over The Physical Wall: Museum Practices in Japan Under the COVID-19 Pandemic. *Journal of Urban Culture Research*, *23*, 107-122.

Polak Potrafi (2023). Retrieved from https://polakpotrafi.pl on May 12, 2023.

Porter, A.J., & Veenswijk, M. (2018). Narrative "End States" and the Dynamics of Participation in Civic Crowdfunding. *International Journal of Communication*, *12*, 2367-86.

Prokůpek, M., Loots, E., & Betzler, D. (2023). *Emergency* or *emerging* financing strategies of art museums in the context of a pandemic?. *Museum Management and Curatorship*, *38*(5), 530-547. https://doi.org/10.1080/09647775.2022.2111327

Public Information Bulletin, Retrieved from https://bip.mkidn.gov.pl/pages/rejestry-ewidencje-archiwa-wykazy/wykaz-muzeow.php on April 20, 2023.

Renovation of the Village Museum in Maruszów (2023). Retrieved from https://zrzutka.pl/p94ek9 on June 8, 2023.

Riley-Huff, D.A., Herrera, K., Ivey, S., & Harry, T. (2016). Crowdfunding in libraries, archives and museums. *The Bottom Line*, *29*(2), 67-85. https://doi.org/10.1108/BL-03-2016-0014

Rykkja, A., Munim, Z.H., & Bonet, L. (2020). Varieties of cultural crowdfunding: The relationship between cultural production types and platform choice. *Baltic Journal of Management*, *15*(2), 261-280. https://doi.org/10.1108/BJM-03-2019-0091

Sahaym, A., Datta, A.A., & Brooks, S. (2021). Crowdfunding success through social media: Going beyond entrepreneurial orientation in the context of small and medium-sized enterprises. *Journal of Business Research*, *125*, 483-494. https://doi.org/10.1016/j.jbusres.2019.09.026

Salahaldin, L., Angerer, M., Kraus, S., & Trabelsi, D. (2019). A duration-based model of crowdfunding project choice. *Finance Research Letters*, *29*, 404-410. https://doi.org/10.1016/j.frl.2018.11.005

Shneor, R., & Vik, A.A. (2020). Crowdfunding success: a systematic literature review 2010-2017. *Baltic Journal of Management*, *15*(2), 149-182. https://doi.org/10.1108/BJM-04-2019-0148

Thürridl, C., & Kamleitner, B. (2016). What Goes around Comes Around? Rewards as Strategic Assets in Crowdfunding. *California Management Review*, *58*(2), 88-110. https://doi.org/10.1525/cmr.2016.58.2.88

Younkin, P., & Kashkooli, K. (2016). What Problems Does Crowdfunding Solve?. *California Management Review*, *58*(2), 20-43. https://doi.org/10.1525/cmr.2016.58.2.2

Zhang, H., & Chen, W. (2019). Backer Motivation in Crowdfunding New Product Ideas: Is It about You or Is It about Me?. *Journal of Product Innovation Management*, *36*(2), 241-262. https://doi.org/10.1111/jpim.12477

Authors

The contribution share of authors is equal and amounted to 50% for each of them. MNJ – conceptualisation, literature writing, methodology, discussion, MS – literature writing, findings, discussion.

Marta Najda-Janoszka

Marta Najda-Janoszka holds a PhD and post-doctoral degree in Strategic Management (2006, 2017, Cracow University of Economics, Poland); Associate Professor at the Jagiellonian University in Krakow (Poland). Her research interests include the intersection of strategic management and entrepreneurship as well as the competitive dynamics of entrepreneurial ecosystems.

Correspondence to: Prof. UJ dr hab. Marta Najda-Janoszka, Jagiellonian University in Krakow, Faculty of Management and Social Communication, Łojasiewicza 4, 30-348 Krakow, Poland, e-mail: marta.najda-janoszka@uj.edu.pl

ORCID http://orcid.org/0000-0002-5040-7250

Magdalena Sawczuk

Magdalena Sawczuk has a PhD in Management (2023, Jagiellonian University in Krakow, Poland); Assistant at the Jagiellonian University in Krakow (Poland). Her research interests include experience creation, innovative approaches in museum management and the evolving social role of museums in communities.

Correspondence to: Dr Magdalena Sawczuk, Jagiellonian University in Krakow, Faculty of Management and Social Communication, Łojasiewicza 4, 30-348 Krakow, Poland, e-mail: m.sawczuk@uj.edu.pl

ORCID http://orcid.org/0000-0003-2882-1081

Acknowledgements and Financial Disclosure

The authors would like to thank the anonymous referees for their useful comments, which allowed to increase the value of this article.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright and License

Published by Krakow University of Economics – Krakow, Poland

Ministry of Education and Science
Republic of Poland

The journal is co-financed in the years 2022-2024 by the Ministry of Education and Science of the Republic of Poland in the framework of the ministerial programme "Development of Scientific Journals" (RCN) on the basis of contract no. RCN/SP/0583/2021/1 concluded on 13 October 2022 and being in force until 13 October 2024.

EBER
Entrepreneurial Business and Economics Review
2024, Vol. 12, No. 3
10.15678/EBER.2024.120306

The mediating effect of eco-friendly practices on the link between international market orientation and performance: Evidence from Vietnamese small and medium enterprises

Quang-Huy Ngo

ABSTRACT

Objective: This study addresses significant gaps in the existing literature, which shows mixed results on the relationship between international market orientation and international performance. Moreover, the literature needs more research on the mediating role of eco-friendly practices in this dynamic. The study aims to rigorously examine both the direct and indirect effects of this orientation on performance, focusing on the exporting and manufacturing of small and medium enterprises (SMEs) in Vietnam to clarify these complex interactions.

Research Design & Methods: The online survey comprised 319 exporting and manufacturing SMEs. Partial least square structure equation modelling served to examine the data.

Findings: The findings reveal that adopting an international market orientation improves the international performance of those SMEs. Furthermore, this adoption drives the adoption of eco-friendly practices that lead to high international performance.

Implications & Recommendations: This study implies that SMEs in the Vietnamese export sectors succeed in international markets by adopting an international market orientation. Besides, those SMEs benefit from this orientation, because it offers insight into environmental demands in the international markets. As such, SMEs adopt eco-friendly practices to offer products that meet those demands and gain success.

Contribution & Value Added: This study advances the literature by assessing the mixed result of international market orientation, i.e. the international performance association within Vietnamese exporting and manufacturing SMEs. It confirms that international market-oriented firms tend to embrace eco-friendly practices like larger firms. It demonstrates that emerging-market SMEs can succeed internationally by adopting eco-friendly practices. It clarifies the mechanism by which international market orientation improves international performance.

Article type:	research article
Keywords:	eco-friendly practices; exporter; international market orientation; international performance; SME; Vietnam
JEL codes:	F13, M10, Q5

Received: 10 November 2023 Revised: 4 May 2024 Accepted: 28 May 2024

Suggested citation:
Ngo, Q.H. (2024). The mediating effect of eco-friendly practices on the link between international market orientation and performance: Evidence from Vietnamese small and medium enterprises. *Entrepreneurial Business and Economics Review,* 12(3), 99-114. https://doi.org/10.15678/EBER.2024.120306

INTRODUCTION

Small and medium-sized enterprises (SMEs) can benefit from adopting an international market orientation (IMO) to understand target markets, adapt to foreign intelligence, and cater to local needs (Cadogan & Diamantopoulos, 1995; Cadogan *et al.*, 2012). Moreover, IMO fosters networking, collaboration, and adaptability in foreign markets (Lin *et al.*, 2014; Ringo *et al.*, 2023). It is considered an intangible resource for enhancing international performance (IP) based on the resource-based view (RBV) (Cadogan *et al.*, 2009). However, research shows mixed findings on IMO's impact on SME's IP

(Acikdilli *et al.*, 2022; Malca *et al.*, 2023; Olabode *et al.*, 2018; Pascucci *et al.*, 2016). Scholars attribute it to differences in national culture and economic development (Bıçakcıoğlu-Peynirci & Ipek, 2020).

Vietnam is a major global exporter. It has experienced trade exceeding 170% of its GDP and has attracted significant foreign investment (Dang & Yeo, 2018; Dayley, 2019; Ges-Kualalumpur, 2022; Kien & Heo, 2008; Zou & Stan, 1998). However, Vietnamese SMEs, comprising 88% of exporting firms and over half of export volume, face challenges such as limited market understanding and foreign conditions (OECD, 2021; Paul *et al.*, 2017; Zhu *et al.*, 2020). Despite these challenges, there is a limited understanding of how IMO directly results in high Vietnamese manufacturing and exporting SME's IP.

According to Safari and Saleh (2020), various factors can mediate the link between IMO and IP. In recent years, the literature has suggested a positive link between internationalization and the engagement of firms in eco-friendly behaviours (Gómez-Bolaños *et al.*, 2020; Usman *et al.*, 2020). Exporting SMEs are argued to adopt eco-friendly practices (EFP) to meet international market requirements (Chan & Ma, 2016). The institutional theory explains this relationship as that firms are more likely to engage in environmentally friendly actions in international contexts to gain legitimacy under institutional pressures (Leyva-de la Hiz *et al.*, 2019). Environmental scholars draw upon natural resource-based theory (NRBV) to propose that going green can help exporting firms achieve success in international markets (Al-Ghwayeen & Abdallah, 2018; Bıçakcıoğlu *et al.*, 2020).

However, there are two concerns relating to IMO and EFP, as well as the relationship between EFP and IP. Firstly, this adoption faces challenges due to limited resources, information, technology, and government support (Rizos *et al.*, 2016). Literature has a limited understanding of whether IMO significantly increases EFP. Second, SMEs face constraints in emerging countries that may hinder positive outcomes from engaging in eco-friendly actions (Ngo, 2023a). Until now, no study has addressed the fact that IMO has indirect effects on IP through EFP.

In light of these gaps, the study in Vietnam sought to address the following research questions.

RQ1: Does adopting IMO directly enhance IP for exporting and manufacturing SMEs in Vietnam?

RQ2: Does adopting IMO indirectly enhance IP through EFP for those SMEs?

This study contributes to the literature in four ways. Firstly, it sheds light on the dynamics of the IMO-IP relationship within the context of Vietnamese exporting and manufacturing SMEs, a country previously under-explored. Secondly, in line with the growing body of the integration between environment and export studies (Gómez-Bolaños *et al.*, 2020; Usman *et al.*, 2020), the findings corroborate the hypothesis that firms orienting to international markets are more likely to adopt eco-friendly initiatives despite of firm size. Thirdly, aligning with recent NBRV arguments, this study underscores that despite challenges in adopting sustainable practices in emerging countries, SMEs can still succeed in international markets when adopting EFP. Finally, the study delineates how IMO translates into enhanced IP.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

International Market Orientation and Eco-friendly Practices

Cadogan and Diamantopoulos (1995) define IMO (also referred to as export market orientation) as encompassing generation, dissemination, and responsiveness to market intelligence in international markets. Andersen (2006) characterizes international market intelligence as an informal and continuous exchange of information relating to market segmentation, penetration, opportunities, and metrics, providing a comprehensive overview of the market conditions and competitive landscape in international markets. Cadogan *et al.* (1999) explain in detail the processes of generating, distributing, and responding to this intelligence. International market intelligence generation involves developing market information through researching and analyzing international markets. International market intelligence distribution includes all activities related to sharing this market intelligence. International market intelligence responsiveness means strategically acting on creating and disseminating this intelligence.

Pascucci *et al.* (2016) noted that while IMO research has focused on large corporations, its significance in SMEs still needs to be examined. Raju *et al.* (2011) argued that SMEs face challenges due to their size, but their market orientation allows them to compete effectively with larger firms. They

also highlighted SMEs' unique ability to blend information processing, knowledge, and responsiveness into a strategic advantage. However, Ipek and Bıçakcıoğlu-Peynirci (2020) observed that most prior research tends to include firms of all sizes, with studies specific to SMEs being rare. Therefore, the issue requires more research on IMO within SMEs.

Eco-friendly practices, (also known as environmental management practices or green practices), aim to mitigate or eliminate businesses' negative environmental impact (Jeong *et al.*, 2014; Ngo, 2023a; Sharma *et al.*, 2020). This includes a broad range of actions like waste reduction, energy conservation, eco-certification like ISO 14001, eco-design, recycling, and eco-friendly systems indicators (Ngo, 2023a). Montabon *et al.* (2007) highlight that EFP involves controlling harmful operational environmental effects, urging firms to address the impacts of their products and services.

However, the definition of EMPs varies, leading to overlapping practices such as the ISO 14001 eco-certification (Comoglio & Botta, 2012). González-Benito and González-Benito (2006) categorize EFP into three practices, *i.e.* planning and organizational practices (focusing on developing and implementing eco-friendly systems), operational practices (modifying processes for greener operations), and communicational practices (publicizing environmental performance and impact reduction efforts), which are crucial for environmental accountability (Amoako *et al.*, 2021).

Despite the importance of all three categories, scholars disproportionately focus on communicational practices (Aray *et al.*, 2021) and neglect planning and operational practices (Veselova & Sidorenko, 2022). Tomomi (2010) notes the greater relevance of communicational practices in larger firms than in smaller ones. Consequently, this study concentrates on the under-explored planning and organizational and operational practices in exporting and manufacturing SMEs.

International Performance

International performance, also referred to as export performance, is a critical metric assessing how well a firm sells products and services abroad, with scholars examining the factors contributing to some firms' success in international markets (Diamantopoulos & Kakkos, 2007; Ferreira & Simões, 2016; Oliveira *et al.*, 2012). However, inconsistencies in IP's definition and measurement create challenges in comparing studies (Acikdilli *et al.*, 2022; Chen *et al.*, 2016a; Sousa *et al.*, 2008).

Research emphasizes both financial and non-financial indicators for IP, noting the limitations of financial metrics alone and suggesting that a mix of both provides a fuller picture of a firm's performance (Asseraf & Gnizy, 2022; Chen & Liang, 2011; Jusoh & Parnell, 2008; Lee & Choi, 2003; Maldonado *et al.*, 2023). Moreover, researchers often prefer to use subjective measures because of difficulties in obtaining accurate data, with studies showing a strong correlation between subjective and objective IP measures, especially in SMEs (Diamantopoulos & Kakkos, 2007; Haluk Köksal & Kettaneh, 2011; Madsen & Moen, 2018; Sadeghi *et al.*, 2021; Shoham, 1998; Sousa, 2004; Stoian *et al.*, 2011). This research adopts the subjective assessment of IP based on managers' perceptions of achieving financial and non-financial goals in international markets, as it is deemed most appropriate for the study's aims (Sadeghi *et al.*, 2021).

Resource-based View and Natural Resource-based View

The natural resource-based theory builds upon RBV, which attributes organizational performance differences to unique resources that provide competitive advantages (Barney, 1991; Chisholm & Nielsen, 2009). These resources assist the development of distinct capabilities, leading to competitive advantages (Fraj *et al.*, 2013). According to RBV, the firm's resources and capabilities, which are valuable, rare in the market, difficult to imitate, and well organized by the firm, foster competitive advantages (Ngo, 2021).

Natural resource-based theory extends this by emphasizing the strategic management of environmental relations (Hart, 1995). Notably, the capability to align a firm's actions with the environment and innovation resulting from environmental solutions is crucial for firms to secure and sustain their competitive advantage and gain performance implications (Demirel & Kesidou, 2019; Hart, 1995; Menguc & Ozanne, 2005). Natural resource-based theory identifies three competitive advantages from environmental strategies: cost reduction, competitive preemption, and securing future market positions (Hart, 1995).

Institutional Theory

The institutional theory explains that societal norms, laws, and expectations influence organizational behaviours, such as engagement in eco-friendly activities (Colwell & Joshi, 2013; Farrukh *et al.*, 2022; Glover *et al.*, 2014; Latif *et al.*, 2020; Zhang *et al.*, 2018). Firms adjust their structures to align with these institutional pressures, which dictate the legitimacy of their actions (DiMaggio & Powell, 1983; Heugens & Lander, 2009; Meyer & Rowan, 1977; Suchman, 1995; Surroca *et al.*, 2013; Teo *et al.*, 2003). DiMaggio and Powell (1983) categorize these pressures as coercive, from laws and regulations; normative, from societal norms and professional standards; and mimetic, from the desire to emulate successful peers. Failure to adapt can result in legal repercussions, reputational harm, and societal disapproval (Berrone *et al.*, 2013; Cavusoglu *et al.*, 2015; John *et al.*, 2001; Liu *et al.*, 2010a; Liu *et al.*, 2010b; Perez-Batres *et al.*, 2011; Sarkis *et al.*, 2010; Teo *et al.*, 2003).

Proposed Research Framework

To address two research questions, this study draws upon various perspectives, such as NRBV/RBV and institutional theory, to explain the interrelationship between IMO, EFP, and IP. Firstly, from the RBV standpoint, IMO is an intangible resource that holds value and is rare in the global marketplace, challenging for competitors to imitate, and well organized by SMEs. In such regards, this tangible resource strongly impacts competitive advantages, resulting in high IP. Prior researchers, such as Cadogan *et al.* (2012) in Finland, Faroque *et al.* (2021) in Bangladesh and Acikdilli *et al.* (2022) in Turkey, support this association by highlighting IMO's role in enhancing IP. In such a regard, I formulated the first hypothesis.

H1: Adopting IMO directly enhances IP for exporting and manufacturing SMEs in Vietnam.

Secondly, the literature suggests that IMO indirectly influences IP through mediators (Safari & Saleh, 2020). According to Baron and Kenny (1986), the statistical analysis of EFP's mediation necessitates a preliminary examination of two associations: one between IMO and EFP and another between EFP and IP.

The institutional theory posits that firms adopt eco-friendly behaviours in international markets to gain legitimacy and meet global environmental standards (Leyva-de la Hiz *et al.*, 2019). Drawing from institutional theory, SMEs are expected to embrace EFP to secure legitimacy and meet the rising global demands for sustainability, especially when adopting IMO. This expectation aligns with previous researchers (Chen *et al.*, 2016b; Gómez-Bolaños *et al.*, 2020; Usman *et al.*, 2020), which found that highly internationalized firms are inclined to implement eco-friendly policies and follow environmental strategies. In this regard, high IMO is expected for the adoption of the EFP.

Based on NRBV, successfully aligning SMEs' operations with environmental commitment allows firms to effectively compete and gain competitive advantages. In such results, through EFP adoption, SMEs can gain competitive advantages and result in high IP. This prediction is in line with recent studies (Al-Ghwayeen & Abdallah, 2018; Bıçakcıoğlu *et al.*, 2020; Silva *et al.*, 2023) that emphasize the positive impact of green business strategies, green marketing strategies, and green supply chain management on international financial and export performance. Hence, the adoption of EFPs is expected to improve IP.

Based on the above argument, IMO positively impacts EFP, and EFP increases IP. In this regard, EFP potentially mediates the IMO-IP link. This expectation shares similarity with Hojnik *et al.* (2018), who found that eco-innovation mediates the link between internationalization and firm performance. Taken together, I hypothesised.

H2: Adopting IMO leads to the adoption of EFP for exporting and manufacturing SMEs.

H3: Adopting EFP contributes to IP for manufacturing and exporting SMEs in Vietnam.

H4: For exporting and manufacturing SMEs in Vietnam, EFP acts as a mediator in the IMO-IP relationship.

RESEARCH METHODOLOGY

Data Collection

This research employed an online survey method for its speed and ease compared to traditional methods such as telephone or mail surveys, making it ideal for reaching respondents via email (Dillman *et al.*, 2014; Fricker & Schonlau, 2002). While non-coverage bias remains a concern with internet surveys (Dutwin & Buskirk, 2022), its impact is mitigated in Vietnam, where internet usage is high at approximately 73% (VietnamPlus, 2023).

The study follows established methods (Beka Be Nguema *et al.*, 2022; Ngo, 2022, 2023b; Yu *et al.*, 2021) by selecting a sample from the Yellow Pages, an online business directory that now serves as a comprehensive database. The Vietnam Yellow Pages (2022) provides a vast pool of over 250 000 business emails, from which 2 000 manufacturing SMEs were randomly chosen, surpassing the sample sizes of previous research. The sample consisted of 319 exporting and manufacturing SMEs.

Measures

I asked two export and manufacturing SME managers to review the survey to ensure quality (Olson, 2010). I used a 5-point Likert scale to assess four key variables.

The study measured IMO using a construct from Cadogan *et al.* (2009), which has been widely accepted as a second-order construct comprising three dimensions, *i.e.,* international market intelligence generation (IMI_G), dissemination (IMI_D), and responsiveness (IMI_G). I drew EFP from the nine-item scale from Roxas and Chadee (2016), which is reliable for SMEs.

This study treats IP as a multidimensional, second-order construct using the EXPERF scale, validated for cross-national stability and incorporating financial, strategic, and satisfaction metrics (Zou *et al.*, 1998), adopting a reflective-formative second-order approach due to its innovative nature and the scant empirical evidence supporting the dominant reflective measurement model in IP research (Diamantopoulos, 1999; 2008).

Control variables are crucial in the research on IP, with firm age (F_AGE), size (F_SIZE), and export experience (F_EE) identified as essential factors (Cadogan *et al.*, 2012; Gkypali *et al.*, 2021; Saridakis *et al.*, 2019). The current study includes these variables, defining F_AGE as the time since establishment, F_SIZE as employee numbers, and F_EE as the length of export activity involvement.

Common Method and Nonresponse Bias

This study assessed common-method bias using Harman's single-factor test in SPSS, finding no significant bias as only 34.913% of the variance was attributed to one factor (Podsakoff & Organ, 1986). Nonresponse bias was evaluated by comparing early and late survey respondents with a t-test (Clottey & Grawe, 2014), revealing no significant differences and dismissing concerns about this type of bias (Wagner & Kemmerling, 2010).

Statistical Approach

The study used PLS-SEM to evaluate a research framework, focusing on explaining variance and causal relationships between latent variables (Hair *et al.*, 2011). According to Sarstedt and Cheah (2019), the methodology involves a two-step assessment, adhering to criteria set by Hair *et al.* (2019) for evaluating measurement models (indicator loadings, reliability, validity) and structural models (collinearity, explanatory power, predictive accuracy). Moreover, it follows the framework of Zhao *et al.* (2010) to analyse mediating effects, with SmartPLS 3.2.8 software facilitating the PLS-SEM model evaluation.

RESULTS AND DISCUSSION

Descriptive Analysis and Correlation Matrix

Tables 1 and 2 indicate the descriptive analysis of the indicators of corresponding lower-order constructs and Pearson's correlation between those low-order constructs.

Table 1. Evaluation of first-ordered constructs' measurement

Lower-order constructs	Indicators	Min	Max	Mean	Standard deviation	Item loadings	Cronbach's Alpha	Composite Reliability	AVE
International market intelligence generation		–	–	–	–	–	0.772	0.854	0.594
IMI_G	IMI_G_1	1	4	2.77	0.616	0.686	–	–	–
	IMI_G_2	1	4	2.77	0.695	0.733	–	–	–
	IMI_G_3	1	4	2.72	0.701	0.759	–	–	–
	IMI_G_4	1	5	2.77	0.689	0.750	–	–	–
	IMI_G_5	1	4	2.81	0.699	0.774	–	–	–
International market intelligence dissemination		–	–	–	–	–	0.801	0.862	0.556
IMI_D	IMI_D_1	1	4	2.81	0.654	0.748	–	–	–
	IMI_D_2	1	5	2.78	0.684	0.748	–	–	–
	IMI_D_3	1	5	2.76	0.690	0.749	–	–	–
	IMI_D_4	1	5	2.79	0.684	0.769	–	–	–
	IMI_D_5	1	5	2.8	0.686	0.715	–	–	–
International market intelligence responsiveness		–	–	–	–	–	0.745	0.839	0.566
IMI_R	IMI_R_1	1	4	2.78	0.666	0.735	–	–	–
	IMI_R_2	1	5	2.76	0.712	0.763	–	–	–
	IMI_R_3	1	4	2.79	0.678	0.788	–	–	–
	IMI_R_4	1	4	2.76	0.652	0.720	–	–	–
Eco-friendly practices		–	–	–	–	–	0.877	0.904	0.575
EFP	EFP_1	1	5	2.77	0.789	0.763	–	–	–
	EFP_2	1	5	2.80	0.731	0.678	–	–	–
	EFP_3	1	5	2.74	0.815	0.742	–	–	–
	EFP_4	1	5	2.73	0.779	0.755	–	–	–
	EFP_5	1	5	2.82	0.795	0.737	–	–	–
	EFP_6	1	5	2.79	0.814	0.766	–	–	–
	EFP_7	1	5	2.70	0.808	0.755	–	–	–
	EFP_8	1	5	2.80	0.793	0.723	–	–	–
	EFP_9	1	5	2.76	0.765	0.695	–	–	–
Financial international performance		–	–	–	–	–	0.839	0.903	0.756
FIP	FIP_1	1	5	2.88	0.942	0.873	–	–	–
	FIP_2	1	5	2.83	0.909	0.868	–	–	–
	FIP_3	1	5	2.77	0.898	0.868	–	–	–
Strategic international performance		–	–	–	–	–	0.815	0.89	0.730
SIP	SIP_1	1	5	2.75	0.884	0.873	–	–	–
	SIP_2	1	5	2.74	0.865	0.845	–	–	–
	SIP_3	1	5	2.72	0.840	0.844	–	–	–
Satisfaction with international performance		–	–	–	–	–	0.820	0.893	0.735
SAT_IP	SAT_IP_1	1	5	2.81	0.861	0.840	–	–	–
	SAT_IP_2	1	5	2.70	0.868	0.855	–	–	–
	SAT_IP_3	1	5	2.84	0.886	0.876	–	–	–
Firm Age		–	–	–	–	–	1.000	1.000	1.000
F_AGE	F_AGE	7	40	23.63	7.172	1.000	–	–	–
Firm Size		–	–	–	–	–	1.000	1.000	1.000
G_SIZE	G_SIZE	13	276	143.87	44.119	1.000	–	–	–
Export Experience		–	–	–	–	–	1.000	1.000	1.000
F_EE	G_SIZE	5	22	11.090	3.030	1.000	–	–	–

Source: own study based on 319 observations.

Table 2. Pearson's correlation

Variables	IMI_G	IMI_D	IMI_R	EFP	FIP	SIP	SAT_IP	F_Age	F_Size	F_EE
IMI_G	1.000	0.647**	0.641**	0.548**	0.423**	0.427**	0.327**	-0.039	-0.008	0.019
	–	0.000	0.000	0.000	0.000	0.000	0.000	0.489	0.885	0.742
IMI_D	0.647**	1.000	0.656**	0.573**	0.397**	0.370**	0.345**	-0.122*	-0.107	-0.019
	0.000	–	0.000	0.000	0.000	0.000	0.000	0.030	0.057	0.740
IMI_R	0.641**	0.656**	1.000	0.553**	0.325**	0.378**	0.422**	-0.063	-0.082	0.020
	0.000	0.000	–	0.000	0.000	0.000	0.000	0.261	0.144	0.727
EFP	0.548**	0.573**	0.553**	1.000	0.481**	0.340**	0.272**	-0.085	-0.016	-0.032
	0.000	0.000	0.000	–	0.000	0.000	0.000	0.129	0.778	0.572
FIP	0.423**	0.397**	0.325**	0.481**	1.000	0.083	-0.046	0.010	0.016	0.014
	0.000	0.000	0.000	0.000	–	0.140	0.409	0.864	0.774	0.800
SIP	0.427**	0.370**	0.378**	0.340**	0.083	1.000	0.085	-0.067	0.029	0.025
	0.000	0.000	0.000	0.000	0.140	–	0.131	0.235	0.602	0.662
SAT_IP	0.327**	0.345**	0.422**	0.272**	-0.046	0.085	1.000	-0.105	-0.124*	-0.067
	0.000	0.000	0.000	0.000	0.409	0.131	–	0.062	0.027	0.231
F_Age	-0.039	-0.122*	-0.063	-0.085	0.010	-0.067	-0.105	1.000	0.116*	0.422**
	0.489	0.030	0.261	0.129	0.864	0.235	0.062	–	0.038	0.000
F_Size	-0.008	-0.107	-0.082	-0.016	0.016	0.029	-0.124*	0.116*	1.000	0.069
	0.885	0.057	0.144	0.778	0.774	0.602	0.027	0.038	–	0.216
F_EE	0.019	-0.019	0.020	-0.032	0.014	0.025	-0.067	0.422**	0.069	1.000
	0.742	0.740	0.727	0.572	0.800	0.662	0.231	0.000	0.216	–

Note: ** Correlation is significant at the 0.01 level (2-tailed); * Correlation is significant at the 0.05 level (2-tailed).
Source: own study based on 319 observations.

Measurement Models

Sarstedt *et al.* (2019) recommend a two-part process to measure evaluation. Firstly, I analysed lower-order constructs like IMI_G, IMI_D, IMI_R, EFP, FIP, SIP, SAT_IP. Secondly, the focus turned to assessing higher-order constructs IMO and IP.

The Evaluation of First-order Constructs

The study validated the measurement model by checking indicator loadings, construct reliability, and validity. Items with loadings above 0.708 remain (Hair *et al.*, 2019). Constructs showed acceptable reliability with Cronbach's Alpha and composite reliability above 0.7 (Hair *et al.*, 2011). I confirmed convergent validity with average variance extracted (AVE) values over 0.5 and verified discriminant validity with heterotrait-monotrait (HTMT) ratios under 0.850 (Sarstedt *et al.*, 2019). Tables 1 and 3 suggest the removal of IMI_G_1, EFP_2 and EFP_9. The subsequent values confirmed the adequacy of the lower-order constructs' measurement model.

Table 3. The HTMT ratios of lower-ordered constructs

Variables	EFP	FIP	IMI_D	IMI_G	IMI_R	SAT_IP	SIP
EFP	–	–	–	–	–	–	–
FIP	0.559	–	–	–	–	–	–
IMI_D	0.682	0.485	–	–	–	–	–
IMI_G	0.666	0.526	0.823	–	–	–	–
IMI_R	0.679	0.403	0.846	0.844	–	–	–
SAT_IP	0.320	0.064	0.420	0.407	0.533	–	–
SIP	0.403	0.097	0.454	0.535	0.485	0.103	–

Source: own study based on 319 observations.

The Evaluation of Second-order Constructs

International market orientation and IP undergo assessment in the second phase, utilizing the lower-order latent variables scored from the first phase. IMO, as a reflective-reflective higher-order construct, it is appraised in alignment with the approach of Sarstedt *et al.* (2019), which focuses on indicator loadings, Cronbach's Alpha, composite reliability, AVE, and HTMT ratios. The adequacy of these metrics is supported by Table 4.

Table 4. Evaluation of the reflective-reflective higher-ordered construct

Higher-Ordered Constructs	Lower-Order Indicators	Item loadings	Cronbach's Alpha	Composite Reliability	AVE
International market orientation			0.877	0.904	0.575
IMO	IMI_G	0.874	–	–	–
	IMI_D	0.878	–	–	–
	IMI_R	0.873	–	–	–

Source: own study based on 319 observations.

International performance is a reflective-formative higher-order construct. Sarstedt *et al.* (2019) propose that its evaluation should include testing for convergent validity, checking for indicator collinearity, and confirming the significance and relevance of outer weights. Convergent validity is affirmed if the path coefficient between the IP's formative measure and an alternative single-item measure exceeds 0.7 (Hair *et al.*, 2021, p. 93). This criterion was met in the research with a coefficient of 0.729. Moreover, the VIF should remain below 3, and outer weights must be significant – conditions that are also satisfied according to Table 5. Hence, the IP construct's validity was adequate.

Table 5. Evaluation of the reflective-formative higher-ordered construct

Higher-Ordered Constructs	Lower-Order Indicators	Outer Weight	T-Statistics	P-Value	Outer Loadings	VIFs
IP	FIP	0.639	11.529	0.000	0.656	1.010
	SIP	0.502	11.555	0.000	0.599	1.015
	SAT_IP	0.523	8.585	0.000	0.536	1.010

Source: own study based on 319 observations.

Structural Models

Following Hair *et al.* (2019), this study examined collinearity, explanatory power, and predictive accuracy. It used 5 000 bootstrap replicates to confirm low collinearity with VIF under 5, sufficient explanatory power with R^2 over 0.25, and predictive accuracy with Q^2 above zero.

Figure 1 illustrates the results of the tested hypotheses. The results revealed a significant direct correlation between IMO and IP (β=0.550, $p<0.001$) as well as IMO and EFP (β=0.638, $p<0.001$). Besides, EFP positively and directly impacted IP (β=0.268, $p<0.001$). Furthermore, the mediating effect of EFP was significant (β=0.171, $p=0.001$; percentile of confident interval: [0.070; 0.278]). Hence, the data backed the hypotheses of H1, H2, H3, and H4.

Discussions

Theoretical Implications

Firstly, the findings revealed IMO's direct and positive impact on EP, suggesting that SMEs in Vietnam's exporting and manufacturing sector can enhance their IP by adopting IMO. This result aligns with previous research, such as Cadogan *et al.* (2012) in Finland, Faroque *et al.* (2021) in Bangladesh and Acikdilli *et al.* (2022) in Turkey, highlighting IMO's role in enhancing IP for exporters. It contributes to the literature by shedding light on the IMO-IP relationship in Vietnamese contexts, which has different degrees of economic development. Furthermore, it shows that, like larger firms, SMEs also experience export success when adopting IMO.

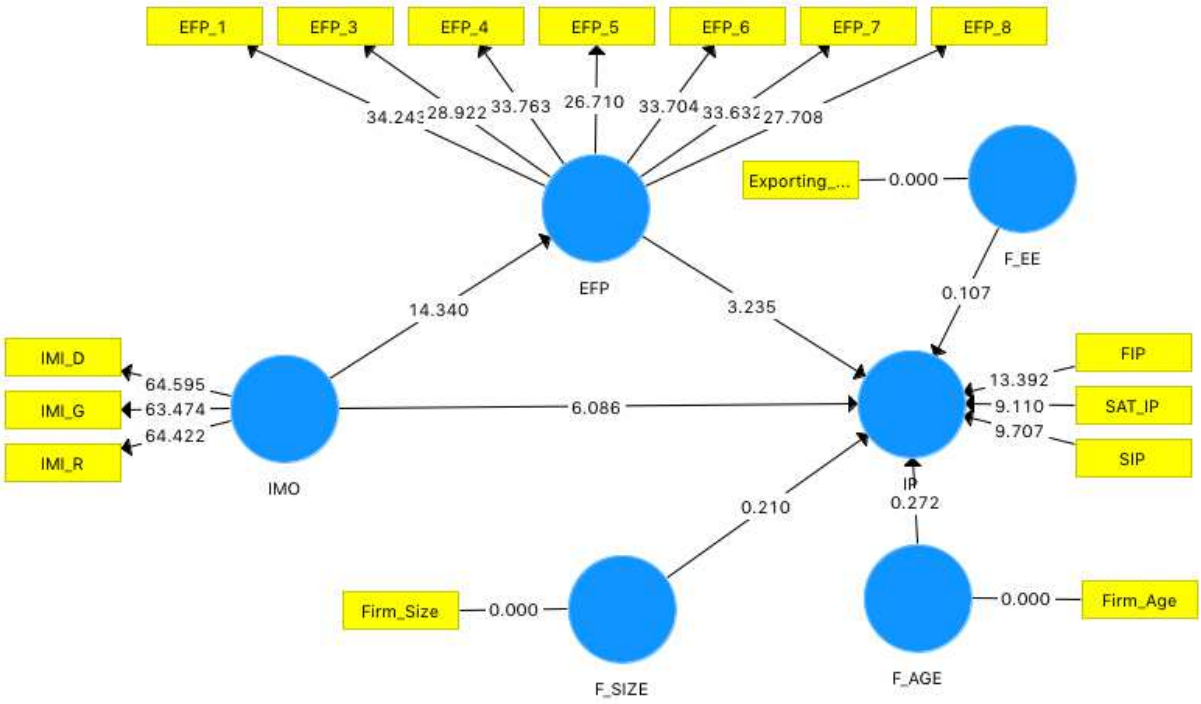

Figure 1. Research results
Source: own elaboration based on 319 observations.

Secondly, the study showed a direct and positive relationship between IMO and EFP in Vietnam. It indicated that Vietnamese exporting and manufacturing SMEs tend to adopt EFP alongside IMO adoption. It aligns with previous research, including studies by Usman *et al.* (2020) in China and Gómez-Bolaños *et al.* (2020) in the energy sector, which found that highly internationalized firms tend to implement eco-friendly policies. This resembles the findings of Chen *et al.* (2016b). According to them, construction firms engage in environmental strategies when internationalizing. This finding contributes to institutional theory by substantiating the hypothesis that global environmental concerns catalyse a more pronounced engagement in environmental practices among firms when they penetrate international markets. Furthermore, it extends the existing body of knowledge by demonstrating that SMEs, despite their smaller size, can exhibit environmentally friendly behaviours when they expand their operations internationally.

Thirdly, the research demonstrated a direct and positive association between EFP and IP among Vietnamese exporting and manufacturing SMEs. It implies that SMEs in Vietnam achieve higher IP by embracing EFP. It is consistent with recent studies, such as those by Bıçakcıoğlu *et al.* (2020) and Al-Ghwayeen and Abdallah (2018), which emphasize the positive impact of green business strategies and green supply chain management on international financial performance. This also aligns with findings by Silva *et al.* (2023) that firms pursue eco-friendly export marketing strategies to achieve high export performance. This result supports the development of NRBV by revealing that firms significantly gain competitive advantages in global contexts when they align their operation toward environmental sustainability. Furthermore, it suggests that SMEs, like larger firms, secure export success through environmental commitment.

Lastly, the study identifies EFP as a partial mediator in the IMO-IP relationship in Vietnam. It suggests that exporting and manufacturing SMEs with a strong IMO are more likely to adopt EFP, which subsequently positively influences their EP. This finding is in harmony with Hojnik *et al.* (2018), who found that eco-innovation mediates the link between internationalization and firm performance. This finding contributes to the literature by showing EFP as a mediator driving the association between IMO and IP.

Relating to controlled variables, this study shows the insignificant impacts of firm size, firm age, and export experience on IP. These findings are similar to Nakos *et al.* (2019) and Peng and Chang

(2023). They imply that in Vietnam, the SME's export success depends more on adopting IMO and EFP than their size, age, and export experience.

Practical Implications

The research highlights crucial strategies for Vietnamese SME managers and owners in manufacturing and exporting. Firstly, success in the international market is linked to adopting IMO. Managers should focus on understanding international markets, sharing this intelligence across departments and using it to align products with customer needs and regulations. It will improve financial metrics and success in gaining strategic goals in the international markets. Moreover, the findings indicate the importance of environmental intelligence when adopting IMO. As Vietnam's exports often go to developed markets with strict environmental standards, SMEs should adopt EFP to exploit this intelligence to offer products to meet these demands, differentiate from competitors, and achieve financial and strategic success in international markets.

CONCLUSIONS

This study addressed the interrelationship between IMO, EFP, and IP of Vietnamese exporting and manufacturing SMEs. Similar to other studies, this research identified limitations that merit consideration in future investigations. Firstly, it is crucial to acknowledge that this study predominantly focused on exporting and manufacturing SMEs in Vietnam. Therefore, we should add caution when extending these findings to other countries. To gain deeper insights into the applicability of the research model, future studies should replicate it using data from other emerging economies. Moreover, the study is limited by a cross-sectional approach, limiting the causality. Employing longitudinal research methods is recommended to explore response changes over time and establish causal relationships among variables. Lastly, it is important to mention that the study had a relatively low response rate. Future research could benefit from incorporating the step-by-step approach proposed by Dillman *et al.* (2014) to address this limitation to enhance survey response rates. It can be beneficial in overcoming the challenge of a low response rate.

REFERENCES

Acikdilli, G., Mintu-Wimsatt, A., Kara, A., & Spillan, J.E. (2022). Export market orientation, marketing capabilities and export performance of SMEs in an emerging market: A resource-based approach. *Journal of Marketing Theory and Practice*, *30*(4), 526-541. https://doi.org/10.1080/10696679.2020.1809461

Al-Ghwayeen, W.S., & Abdallah, A.B. (2018). Green supply chain management and export performance: The mediating role of environmental performance. *Journal of Manufacturing Technology Management*, *29*(7), 1233-1252. https://doi.org/10.1108/JMTM-03-2018-0079

Amoako, G.K., Adam, A.M., Arthur, C.L., & Tackie, G. (2021). Institutional isomorphism, environmental management accounting and environmental accountability: a review. *Environment, Development and Sustainability*, *23*(8), 11201-11216. https://doi.org/10.1007/s10668-020-01140-y

Andersen, P.H. (2006). Listening to the global grapevine: SME export managers' personal contacts as a vehicle for export information generation. *Journal of World Business*, *41*(1), 81-96. https://doi.org/10.1016/j.jwb.2005.10.006

Aray, Y., Dikova, D., Garanina, T., & Veselova, A. (2021). The hunt for international legitimacy: Examining the relationship between internationalization, state ownership, location and CSR reporting of Russian firms. *International Business Review*, *30*(5), 101858. https://doi.org/10.1016/j.ibusrev.2021.101858

Asseraf, Y., & Gnizy, I. (2022). Translating strategy into action: The importance of an agile mindset and agile slack in international business. *International Business Review*, *31*(6), 102036. https://doi.org/10.1016/j.ibusrev.2022.102036

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, *17*(1), 99-120. https://doi.org/10.1177/014920639101700108

Baron, R.M., & Kenny, D.A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*(6), 1173. https://doi.org/10.1037/0022-3514.51.6.1173

Beka Be Nguema, J.-N., Bi, G., Akenroye, T.O., & El Baz, J. (2022). The effects of supply chain finance on organizational performance: a moderated and mediated model. *Supply Chain Management: An International Journal*, *27*(1), 113-127. https://doi.org/10.1108/SCM-05-2020-0223

Berrone, P., Fosfuri, A., Gelabert, L., & Gomez-Mejia, L.R. (2013). Necessity as the mother of 'green'inventions: Institutional pressures and environmental innovations. *Strategic Management Journal*, *34*(8), 891-909. https://doi.org/10.1002/smj.2041

Bıçakcıoğlu, N., Theoharakis, V., & Tanyeri, M. (2020). Green business strategy and export performance: An examination of boundary conditions from an emerging economy. *International Marketing Review*, *37*(1), 56-75. https://doi.org/10.1108/IMR-11-2018-0317

Bıçakcıoğlu-Peynirci, N., & Ipek, I. (2020). Export market orientation and its consequences: A meta-analytic review and assessment of contextual and measurement moderators. *Journal of Business & Industrial Marketing*, *35*(5), 939-954. https://doi.org/10.1108/JBIM-04-2019-0147

Cadogan, J.W., & Diamantopoulos, A. (1995). Narver and Slater, Kohli and Jaworski and the market orientation construct: integration and internationalization. *Journal of Strategic Marketing*, *3*(1), 41-60. https://doi.org/10.1080/09652549500000003

Cadogan, J.W., Diamantopoulos, A., & De Mortanges, C.P. (1999). A measure of export market orientation: scale development and cross-cultural validation. *Journal of International Business Studies*, *30*, 689-707. https://doi.org/10.1057/palgrave.jibs.8490834

Cadogan, J.W., Kuivalainen, O., & Sundqvist, S. (2009). Export market-oriented behavior and export performance: quadratic and moderating effects under differing degrees of market dynamism and internationalization. *Journal of International Marketing*, *17*(4), 71-89. https://doi.org/10.1509/jimk.17.4.71

Cadogan, J.W., Sundqvist, S., Puumalainen, K., & Salminen, R.T. (2012). Strategic flexibilities and export performance: the moderating roles of export market-oriented behavior and the export environment. *European Journal of Marketing*, *46*(10), 1418-1452. https://doi.org/10.1108/03090561211248107

Cavusoglu, H., Cavusoglu, H., Son, J.-Y., & Benbasat, I. (2015). Institutional pressures in security management: Direct and indirect influences on organizational investment in information security control resources. *Information & Management*, *52*(4), 385-400. https://doi.org/10.1016/j.im.2014.12.004

Chan, R.Y., & Ma, K.H. (2016). Environmental orientation of exporting SMEs from an emerging economy: Its antecedents and consequences. *Management International Review*, *56*, 597-632. https://doi.org/10.1007/s11575-016-0280-0

Chen, D.-N., & Liang, T.-P. (2011). Knowledge evolution strategies and organizational performance: A strategic fit analysis. *Electronic Commerce Research and Applications*, *10*(1), 75-84. https://doi.org/10.1016/j.elerap.2010.10.004

Chen, J., Sousa, C.M., & He, X. (2016a). The determinants of export performance: a review of the literature 2006-2014. *International Marketing Review*, *33*(5), 626-670. https://doi.org/10.1108/IMR-10-2015-0212

Chen, P.-H., Ong, C.-F., & Hsu, S.-C. (2016b). The linkages between internationalization and environmental strategies of multinational construction firms. *Journal of Cleaner Production*, *116*, 207-216. https://doi.org/10.1016/j.jclepro.2015.12.105

Chisholm, A.M., & Nielsen, K. (2009). Social capital and the resource-based view of the firm. *International studies of management & organization*, *39*(2), 7-32. https://doi.org/10.2753/IMO0020-8825390201

Clottey, T.A., & Grawe, S.J. (2014). Non-response bias assessment in logistics survey research: use fewer tests? *International Journal of Physical Distribution & Logistics Management*, *44*(5), 412-426. https://doi.org/10.1108/IJPDLM-10-2012-0314

Colwell, S.R., & Joshi, A.W. (2013). Corporate ecological responsiveness: Antecedent effects of institutional pressure and top management commitment and their impact on organizational performance. *Business Strategy and the Environment*, *22*(2), 73-91. https://doi.org/10.1002/bse.732

Comoglio, C., & Botta, S. (2012). The use of indicators and the role of environmental management systems for environmental performances improvement: a survey on ISO 14001 certified companies in the automotive sector. *Journal of Cleaner Production*, *20*(1), 92-102. https://doi.org/10.1016/j.jclepro.2011.08.022

Dang, V.L., & Yeo, G.T. (2018). Weighing the key factors to improve Vietnam's logistics system. *The Asian Journal of shipping and logistics*, *34*(4), 308-316. https://doi.org/10.1016/j.ajsl.2018.12.004

Dayley, R. (2019). *Southeast Asia in the new international era* (8th Edition ed.): Routledge. https://doi.org/10.4324/9780429429071

Demirel, P., & Kesidou, E. (2019). Sustainability-oriented capabilities for eco-innovation: Meeting the regulatory, technology, and market demands. *Business Strategy and the Environment*, *28*(5), 847-857. https://doi.org/10.1002/bse.2286

Diamantopoulos, A. (1999). Viewpoint–export performance measurement: reflective versus formative indicators. *International Marketing Review*, *16*(6), 444-457. https://doi.org/10.1108/02651339910300422

Diamantopoulos, A. (2008). Formative indicators: Introduction to the special issue. *Journal of Business Research*, *61*(12), 1201-1202. https://doi.org/10.1016/j.jbusres.2008.01.008

Diamantopoulos, A., & Kakkos, N. (2007). Managerial assessments of export performance: Conceptual framework and empirical illustration. *Journal of International Marketing*, *15*(3), 1-31. https://doi.org/10.1509/jimk.15.3.1

Dillman, D.A., Smyth, J.D., & Christian, L.M. (2014). *Internet, phone, mail, and mixed-mode surveys: the tailored design method* (4th ed.). New Jersey: John Wiley & Sons.

DiMaggio, P.J., & Powell, W.W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review*, *48*(2), 147-160. https://doi.org/10.2307/2095101

Dutwin, D., & Buskirk, T.D. (2022). A deeper dive into the digital divide: Reducing coverage bias in Internet surveys. *Social Science Computer Review*, 08944393221093467. https://doi.org/10.1177/08944393221093467

Faroque, A.R., Mostafiz, M.I., Faruq, M.O., & Bashar, M.F.B. (2021). Revisiting entrepreneurial capabilities and export market orientation: a multi-scale investigation in an emerging economy. *International Journal of Emerging Markets*, *16*(3), 556-579. https://doi.org/10.1108/IJOEM-08-2019-0644

Farrukh, A., Mathrani, S., & Sajjad, A. (2022). A natural resource and institutional theory-based view of green-lean-six sigma drivers for environmental management. *Business Strategy and the Environment*, *31*(3), 1074-1090. https://doi.org/10.1002/bse.2936

Ferreira, M.P., & Simões, L.G. (2016). The interrelationships between resources, capabilities, export competitive advantages and export performance. *International Journal of Export Marketing*, *1*(2), 142-165. https://doi.org/10.1504/IJEXPORTM.2016.081555

Fraj, E., Martínez, E., & Matute, J. (2013). Green marketing in B2B organisations: An empirical analysis from the natural-resource-based view of the firm. *Journal of Business & Industrial Marketing*, *28*(5), 396-410. https://doi.org/10.1108/08858621311330245

Fricker, R.D., & Schonlau, M. (2002). Advantages and disadvantages of Internet research surveys: Evidence from the literature. *Field Methods*, *14*(4), 347-367. https://doi.org/10.1177/152582202237725

Ges-Kualalumpur. (2022). The Process and Advantages of the Signed Trade Agreements of Vietnam. Retrieved from https://www.geskualalumpur2013.org/ngoai-giao/cac-hiep-dinh-thuong-mai-viet-nam-da-ky-ket-qua-trinh-va-loi-the/ on May 11, 2023.

Gkypali, A., Love, J.H., & Roper, S. (2021). Export status and SME productivity: Learning-to-export versus learning-by-exporting. *Journal of Business Research*, *128*, 486-498. https://doi.org/10.1016/j.jbusres.2021.02.026

Glover, J.L., Champion, D., Daniels, K.J., & Dainty, A.J. (2014). An Institutional Theory perspective on sustainable practices across the dairy supply chain. *International Journal of Production Economics*, *152*, 102-111. https://doi.org/10.1016/j.ijpe.2013.12.027

Gómez-Bolaños, E., Hurtado-Torres, N.E., & Delgado-Márquez, B.L. (2020). Disentangling the influence of internationalization on sustainability development: Evidence from the energy sector. *Business Strategy and the Environment*, *29*(1), 229-239. https://doi.org/10.1002/bse.2360

González-Benito, J., & González-Benito, Ó. (2006). A review of determinant factors of environmental proactivity. *Business Strategy and the Environment*, *15*(2), 87-102. https://doi.org/10.1002/bse.450

Hair, J.F., Hult, G.T.M., Ringle, C.M., Sarstedt, M., Danks, N.P., & Ray, S. (2021). *Partial least squares structural equation modeling (PLS-SEM) using R: A workbook*. Cham, Switzerland: Springer Nature.

Hair, J.F., Ringle, C.M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing theory and Practice*, *19*(2), 139-152. https://doi.org/10.2753/MTP1069-6679190202

Hair, J.F., Risher, J.J., Sarstedt, M., & Ringle, C.M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, *31*(1), 2-24. https://doi.org/10.1108/EBR-11-2018-0203

Haluk Köksal, M., & Kettaneh, T. (2011). Export problems experienced by high-and low-performing manufacturing companies: A comparative study. *Asia Pacific Journal of Marketing and Logistics*, *23*(1), 108-126. https://doi.org/10.1108/13555851111100021

Hart, S.L. (1995). A natural-resource-based view of the firm. *Academy of Management Review*, *20*(4), 986-1014. https://doi.org/10.5465/amr.1995.9512280033

Heugens, P.P., & Lander, M.W. (2009). Structure! Agency!(and other quarrels): A meta-analysis of institutional theories of organization. *Academy of Management Journal*, *52*(1), 61-85. https://doi.org/10.5465/amj.2009.36461835

Hojnik, J., Ruzzier, M., & Manolova, T.S. (2018). Internationalization and economic performance: The mediating role of eco-innovation. *Journal of Cleaner Production*, *171*, 1312-1323. https://doi.org/10.1016/j.jclepro.2017.10.111

Ipek, I., & Bıçakcıoğlu-Peynirci, N. (2020). Export market orientation: An integrative review and directions for future research. *International Business Review*, *29*(4), 101659. https://doi.org/10.1016/j.ibusrev.2019.101659

Jeong, E., Jang, S.S., Day, J., & Ha, S. (2014). The impact of eco-friendly practices on green image and customer attitudes: An investigation in a café setting. *International Journal of Hospitality Management*, *41*, 10-20. https://doi.org/10.1016/j.ijhm.2014.03.002

John, C.H.S., Cannon, A.R., & Pouder, R.W. (2001). Change drivers in the new millennium: implications for manufacturing strategy research. *Journal of Operations Management*, *19*(2), 143-160. https://doi.org/10.1016/S0272-6963(00)00054-1

Jusoh, R., & Parnell, J.A. (2008). Competitive strategy and performance measurement in the Malaysian context: An exploratory study. *Management Decision*, *46*(1), 5-31. https://doi.org/10.1108/00251740810846716

Kien, T.N., & Heo, Y. (2008). Doi moi policy and socio-economic development in Vietnam, 1986-2005. *International Area Review*, *11*(1), 205-232. https://doi.org/10.1177/22338659080110011

Latif, B., Mahmood, Z., Tze San, O., Mohd Said, R., & Bakhsh, A. (2020). Coercive, normative and mimetic pressures as drivers of environmental management accounting adoption. *Sustainability*, *12*(11), 4506. https://doi.org/10.3390/su12114506

Lee, H., & Choi, B. (2003). Knowledge management enablers, processes, and organizational performance: An integrative view and empirical examination. *Journal of Management Information Systems*, *20*(1), 179-228. https://doi.org/10.1080/07421222.2003.11045756

Leyva-de la Hiz, D.I., Hurtado-Torres, N., & Bermúdez-Edo, M. (2019). The heterogeneity of levels of green innovation by firms in international contexts: a study based on the home-country institutional profile. *Organization & Environment*, *32*(4), 508-527. https://doi.org/10.1177/1086026618761623

Lin, K.-H., Huang, K.-F., & Peng, Y.-P. (2014). Impact of export market orientation on export performance: A relational perspective. *Baltic Journal of Management*, *9*(4), 403-425. https://doi.org/10.1108/BJM-03-2012-0012

Liu, H., Ke, W., Wei, K.K., Gu, J., & Chen, H. (2010a). The role of institutional pressures and organizational culture in the firm's intention to adopt internet-enabled supply chain management systems. *Journal of Operations Management*, *28*(5), 372-384. https://doi.org/10.1016/j.jom.2009.11.010

Liu, X., Liu, B., Shishime, T., Yu, Q., Bi, J., & Fujitsuka, T. (2010b). An empirical study on the driving mechanism of proactive corporate environmental management in China. *Journal of Environmental Management*, *91*(8), 1707-1717. https://doi.org/10.1016/j.jenvman.2010.03.011

Madsen, T.K., & Moen, Ø. (2018). Managerial assessments of export performance: What do they reflect?. *International Business Review*, *27*(2), 380-388. https://doi.org/10.1016/j.ibusrev.2017.09.005

Malca, O., Bolaños, J.P., Rubio Donet, J.L., & Acedo, F. (2023). Export market orientation and export performance in emerging markets: insights from the Peruvian agri-export sector. *Journal of Agribusiness in Developing and Emerging Economies*, *13*(1), 70-89. https://doi.org/10.1108/JADEE-12-2020-0308

Maldonado, I., Pinho, C., Lobo, C., & Pacheco, L. (2023). International determinants and inducing factors and performance of Portuguese internationalised companies. *Journal of Organizational Change Management*, *36*(1), 21-46. https://doi.org/10.1108/JOCM-03-2022-0069

Menguc, B., & Ozanne, L.K. (2005). Challenges of the “green imperative”: A natural resource-based approach to the environmental orientation–business performance relationship. *Journal of Business Research*, *58*(4), 430-438. https://doi.org/10.1016/j.jbusres.2003.09.002

Meyer, J.W., & Rowan, B. (1977). Institutionalized organizations: Formal structure as myth and ceremony. *American Journal of Sociology*, *83*(2), 340-363. https://doi.org/10.1086/226550

Montabon, F., Sroufe, R., & Narasimhan, R. (2007). An examination of corporate reporting, environmental management practices and firm performance. *Journal of Operations Management*, *25*(5), 998-1014. doi:https://doi.org/10.1016/j.jom.2006.10.003

Nakos, G., Dimitratos, P., & Elbanna, S. (2019). The mediating role of alliances in the international market orientation-performance relationship of smes. *International Business Review*, *28*(3), 603-612. https://doi.org/10.1016/j.ibusrev.2018.12.005

Ngo, Q.-H. (2021). The impact of market orientation on small businesses' performance in Vietnam: The mediating effects of the management accounting system. *Entrepreneurial Business and Economics Review*, *9*(3), 59-72. https://doi.org/10.15678/EBER.2021.090304

Ngo, Q.-H. (2022). The Adoption of Green Market Orientation in Logistic Industries—Empirical Evidence from Vietnamese SMEs. *Journal of Open Innovation: Technology, Market, and Complexity*, *8*(4), 199. https://doi.org/10.3390/joitmc8040199

Ngo, Q.-H. (2023a). Do environmental management practices mediate institutional pressures-environmental performance relationship? Evidence from Vietnamese SMEs. *Heliyon*, e17635. https://doi.org/10.1016/j.heliyon.2023.e17635

Ngo, Q.-H. (2023b). The effectiveness of strategic alignment between open innovation and generic strategies: Empirical evidence from restaurant SMEs in Vietnam. *Journal of Open Innovation: Technology, Market, and Complexity*, *9*(1), 100016. https://doi.org/10.1016/j.joitmc.2023.100016

OECD. (2021). *SME and Entrepreneurship Policy in Viet Nam*. https://doi.org/10.1787/30c79519-en

Olabode, O.E., Adeola, O., & Assadinia, S. (2018). The effect of export market-oriented culture on export performance: Evidence from a Sub-Saharan African economy. *International Marketing Review*, *35*(4), 637-660. https://doi.org/10.1108/IMR-08-2016-0167

Oliveira, J.S., Cadogan, J.W., & Souchon, A. (2012). Level of analysis in export performance research. *International Marketing Review*, *29*(1), 114-127. https://doi.org/10.1108/02651331211201561

Olson, K. (2010). An examination of questionnaire evaluation by expert reviewers. *Field Methods*, *22*(4), 295-318. https://doi.org/10.1177/1525822X10379795

Pascucci, F., Bartoloni, S., & Gregori, G.L. (2016). Export market orientation and international performance in the context of SMEs. *Journal of Small Business & Entrepreneurship*, *28*(5), 361-375. https://doi.org/10.1080/08276331.2016.1167528

Paul, J., Parthasarathy, S., & Gupta, P. (2017). Exporting challenges of SMEs: A review and future research agenda. *Journal of World Business*, *52*(3), 327-342. https://doi.org/10.1016/j.jwb.2017.01.003

Peng, M.Y.-P., & Chang, Y.-S. (2023). Do social network relationships and overseas market orientation affect SMEs' international performance? A dynamic internationalization capability perspective. *Sage Open*, *13*(1), 21582440231153050. https://doi.org/10.1177/21582440231153050

Perez-Batres, L.A., Miller, V.V., & Pisani, M.J. (2011). Institutionalizing sustainability: an empirical study of corporate registration and commitment to the United Nations global compact guidelines. *Journal of Cleaner Production*, *19*(8), 843-851. https://doi.org/10.1016/j.jclepro.2010.06.003

Podsakoff, P.M., & Organ, D.W. (1986). Self-reports in organizational research: Problems and prospects. *Journal of management*, *12*(4), 531-544. https://doi.org/10.1177/014920638601200408

Raju, P., Lonial, S.C., & Crum, M.D. (2011). Market orientation in the context of SMEs: A conceptual framework. *Journal of Business Research*, *64*(12), 1320-1326. https://doi.org/10.1016/j.jbusres.2010.12.002

Ringo, D.S., Kazungu, I., & Tegambwage, A.G. (2023). Effect of innovation capabilities on export performance: evidence from manufacturing SMEs in Tanzania. *Technological Sustainability*, *ahead-of-print*(ahead-of-print). https://doi.org/10.1108/TECHS-09-2022-0038

Rizos, V., Behrens, A., Van der Gaast, W., Hofman, E., Ioannou, A., Kafyeke, T., ... Hirschnitz-Garbers, M. (2016). Implementation of circular economy business models by small and medium-sized enterprises (SMEs): Barriers and enablers. *Sustainability*, *8*(11), 1212. https://doi.org/10.3390/su8111212

Roxas, B., & Chadee, D. (2016). Knowledge management view of environmental sustainability in manufacturing SMEs in the Philippines. *Knowledge Management Research & Practice*, *14*(4), 514-524. https://doi.org/10.1057/kmrp.2015.30

Sadeghi, A., Rose, E.L., & Madsen, T.K. (2021). Perceived export performance: A contingent measurement approach. *Journal of International Marketing*, *29*(3), 63-84. https://doi.org/10.1177/1069031X20973663

Safari, A., & Saleh, A.S. (2020). Key determinants of SMEs' export performance: a resource-based view and contingency theory approach using potential mediators. *Journal of Business & Industrial Marketing*, *35*(4), 635-654. https://doi.org/10.1108/JBIM-11-2018-0324

Saridakis, G., Idris, B., Hansen, J.M., & Dana, L.P. (2019). SMEs' internationalisation: When does innovation matter?. *Journal of Business Research*, *96*, 250-263. doi:https://doi.org/10.1016/j.jbusres.2018.11.001

Sarkis, J., Gonzalez-Torre, P., & Adenso-Diaz, B. (2010). Stakeholder pressure and the adoption of environmental practices: The mediating effect of training. *Journal of Operations Management*, *28*(2), 163-176. https://doi.org/10.1016/j.jom.2009.10.001

Sarstedt, M., & Ceah, J.-H. (2019). Partial least squares structural equation modeling using SmartPLS: a software review. *Journal of Marketing Analytics*, *7*, 96-202. https://doi.org/10.1057/s41270-019-00058-3

Sarstedt, M., Hair Jr, J.F., Cheah, J.-H., Becker, J.-M., & Ringle, C.M. (2019). How to specify, estimate, and validate higher-order constructs in PLS-SEM. *Australasian Marketing Journal (AMJ)*, *27*(3), 197-211. https://doi.org/10.1016/j.ausmj.2019.05.003

Sharma, N., Saha, R., Sreedharan, V.R., & Paul, J. (2020). Relating the role of green self-concepts and identity on green purchasing behaviour: An empirical analysis. *Business Strategy and the Environment*, *29*(8), 3203-3219. https://doi.org/10.1002/bse.2567

Shoham, A. (1998). Export performance: A conceptualization and empirical assessment. *Journal of International Marketing*, *6*(3), 59-81. https://doi.org/10.1177/1069031X9800600308

Silva, G.M., Dias, Á.L., Lisboa, A.C., & Silva, F.P. (2023). Drivers and outcomes of sustainable export marketing strategies in international environments. *Review of International Business and Strategy*, *33*(4), 627-648. https://doi.org/10.1108/RIBS-05-2022-0056

Sousa, C.M. (2004). Export performance measurement: an evaluation of the empirical research in the literature. *Academy of Marketing Science Review*, *2004*, 1. Retrieved from https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=8a391bfc81f36a627a21339255a31ddb16e4aeef on May 4, 2024.

Sousa, C.M., Martínez-López, F.J., & Coelho, F. (2008). The determinants of export performance: A review of the research in the literature between 1998 and 2005. *International Journal of Management Reviews*, *10*(4), 343-374. https://doi.org/10.1111/j.1468-2370.2008.00232.x

Stoian, M.-C., Rialp, A., & Rialp, J. (2011). Export performance under the microscope: A glance through Spanish lenses. *International Business Review*, *20*(2), 117-135. https://doi.org/10.1016/j.ibusrev.2010.07.002

Suchman, M.C. (1995). Managing legitimacy: Strategic and institutional approaches. *Academy of Management Review*, *20*(3), 571-610. https://doi.org/10.5465/amr.1995.9508080331

Surroca, J., Tribó, J.A., & Zahra, S.A. (2013). Stakeholder pressure on MNEs and the transfer of socially irresponsible practices to subsidiaries. *Academy of Management Journal*, *56*(2), 549-572. doi:https://doi.org/10.5465/amj.2010.0962

Teo, H.-H., Wei, K.K., & Benbasat, I. (2003). Predicting intention to adopt interorganizational linkages: An institutional perspective. *MIS Quarterly*, 19-49. https://doi.org/10.2307/30036518

Tomomi, T. (2010). Environmental management strategy for small and medium-sized enterprises: Why do SMBs practice environmental management?. *Asian Business & Management*, *9*(2), 265-280. doi:https://doi.org/10.1057/abm.2010.6

Usman, M., Javed, M., & Yin, J. (2020). Board internationalization and green innovation. *Economics Letters*, *197*, 109625. https://doi.org/10.1016/j.econlet.2020.109625

Veselova, A., & Sidorenko, A. (2022). The Impact of Firm Characteristics on Adoption of Environmental Management Practices in Russian SMEs. *Journal of East-west Business*, *28*(4), 323-349. https://doi.org/10.1080/10669868.2022.2094522

Vietnam Yellow Pages. (2022). Vietnam Business Directory. Retrieved from https://www.yellowpages.com.vn/ on May 11, 2023.

VietnamPlus. (2023). 25 years of internet access marked in Vietnam. Retrieved from https://en.vietnamplus.vn/25-years-of-internet-access-marked-in-vietnam/245145.vnp on May 11, 2023.

Wagner, S.M., & Kemmerling, R. (2010). Handling nonresponse in logistics research. *Journal of Business Logistics*, *31*(2), 357-381. https://doi.org/10.1002/j.2158-1592.2010.tb00156.x

Yu, Y., Zhang, J.Z., Cao, Y., & Kazancoglu, Y. (2021). Intelligent transformation of the manufacturing industry for Industry 4.0: Seizing financial benefits from supply chain relationship capital through enterprise green management. *Technological Forecasting and Social Change*, *172*, 120999. https://doi.org/10.1016/j.techfore.2021.120999

Zhang, Y., Wei, Y., & Zhou, G. (2018). Promoting firms' energy-saving behavior: The role of institutional pressures, top management support and financial slack. *Energy Policy*, *115*, 230-238. https://doi.org/10.1016/j.enpol.2018.01.003

Zhao, X., Lynch Jr, J.G., & Chen, Q. (2010). Reconsidering Baron and Kenny: Myths and truths about mediation analysis. *Journal of Consumer Research*, *37*(2), 197-206. doi:https://doi.org/10.1086/651257

Zhu, Y., Warner, M., & Sardana, D. (2020). Internationalization and destination selection of emerging market SMEs: Issues and challenges in a conceptual framework. *Journal of General Management*, *45*(4), 206-216. https://doi.org/10.1177/0306307020903530

Zou, S., & Stan, S. (1998). The determinants of export performance: a review of the empirical literature between 1987 and 1997. *International Marketing Review*, *15*(5), 333-356. https://doi.org/10.1108/02651339810236290

Zou, S., Taylor, C.R., & Osland, G.E. (1998). The EXPERF scale: a cross-national generalized export performance measure. *Journal of International Marketing*, *6*(3), 37-58. https://doi.org/10.1108/02651339810236290

Author

Quang-Huy Ngo

He currently holds the position of Head of Academic Affairs at the FPT-Greenwich Center, FPT University, Can Tho campus, Vietnam. He earned his MBA from the University of Houston – Clear Lake in 2011, located in Houston, the United States. Additionally, in 2016, he successfully obtained his Ph.D. in Management Accounting from Ghent University in Ghent, Belgium. His research interests include managerial accounting, strategic management, and green businesses.

Correspondence to: Quang-Huy NGO, FPT-Greenwich Center, FPT University, Can Tho campus, 600 Nguyen Van Cu (extend) street, Ninh Kieu district, Cantho city, Vietnam, e-mail: huynq157@fe.edu.vn

ORCID http://orcid.org/0000-0002-5790-2297

Acknowledgements and Financial Disclosure

The author would like to thank the anonymous referees for their useful comments, which allowed to increase the value of this article. There are no financial conflicts of interest to disclose.

Conflict of Interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright and License

Published by Krakow University of Economics – Krakow, Poland

Ministry of Education and Science
Republic of Poland

The journal is co-financed in the years 2022-2024 by the Ministry of Education and Science of the Republic of Poland in the framework of the ministerial programme "Development of Scientific Journals" (RCN) on the basis of contract no. RCN/SP/0583/2021/1 concluded on 13 October 2022 and being in force until 13 October 2024.

Entrepreneurial Business and Economics Review

2024, Vol. 12, No. 3

10.15678/EBER.2024.120307

Heterogeneous output-employment relationship in the EU: The effects of international trade and regulation

Laura Dargenytė-Kacilevičienė, Mindaugas Butkus, Kristina Matuzevičiūtė

ABSTRACT

Objective: The objective of the article is to assess the impact of economic growth on employment mediated by international trade and regulation, considering the gender-, age- and educational attainment levels of employed in the European Union (EU).

Research Design & Methods: The analysis incorporates the role of international trade and its interaction with regulation in 27 European Union countries over the 2000-2020 period, utilizing an unbalanced panel dataset. The mediating effect of international trade on employment elasticities specific to gender, age, and educational attainment levels is assessed by introducing multiplicative terms involving changes in Gross Domestic Product (GDP) and various international trade variables. A three-way interaction model is employed to capture the mediating effects of international trade and regulation, i.e. labour market and business regulation, on the relationship between output and employment in the EU.

Findings: The findings suggest that the increased imports and exports in the EU are generally associated with a decline in the employment response to economic growth, especially for youth. Notably, we may observe a possible positive impact in the context of women's employment response to economic growth. The results confirm the significance of regulation and international trade in strengthening the impact of economic growth on employment, especially for highly educated 40-64-year-old women.

Implications & Recommendations: The study revealed the mediating effect of international trade and regulation on the relationship between output and employment in the EU. The findings indicate that global trade plays an important role in decreasing the employment response to economic growth. Policymakers should focus on creating adaptive regulatory frameworks to address the relationship between regulation and the demand for skilled and unskilled labour as the reaction to output growth when a high volume of imports and exports occurs in a country. Strategies to mitigate the negative impact of international trade on employment reaction to economic growth need to address issues related to labour productivity growth, emphasising ongoing research on the mediating effect of total factor productivity.

Contribution & Value Added: Our contribution is to complement the previous research by considering regulation as the factor which simultaneously to international trade can boost the impact of economic growth on gender-, age-, and educational attainment level-specific employment in the EU.

Article type:	research article
Keywords:	output-employment relationship; international trade; labour market and business regulation; three-way interaction model; European Union
JEL codes:	C23, E24, F16

Received: 29 December 2023 Revised: 30 March 2024 Accepted: 8 May 2024

Suggested citation:
Dargenytė-Kacilevičienė, L., Butkus, M., & Matuzevičiūtė, K. (2024). Heterogeneous output-employment relationship in the EU: The effects of international trade and regulation. *Entrepreneurial Business and Economics Review,* 12(3), 115-140. https://doi.org/10.15678/EBER.2024.120307

INTRODUCTION

Increasing employment due to economic growth is one of the primary goals of every country. However, it is observed that many countries face the problem of 'jobless growth,' which means that a growing economy does not ensure the creation of new jobs. The relationship between economic

growth and employment can be measured by employment to output elasticity (Anderson, 2016; Dauda & Ajeigbe, 2021), which shows how employment reacts to a 1% increase in output. Analysis of the impact of economic growth on employment allowed us to assess whether economic growth is related to the growth of jobs, labour productivity, or both. As stated by Kapsos (2006), employment growth must be met by an equal and opposite decline in labour productivity growth for a given change in output. Scientific literature notes that each economy needs a balance between these two variables (Perugini, 2009; Dahal & Rai, 2019). However, balancing employment with labour productivity in a growing economy is quite a challenging problem (Herman, 2011).

Previous research on output-employment elasticities already indicated that employment reaction to economic growth is heterogeneous across countries (Kapsos, 2006; Burggraeve *et al.,* 2015; Slimane, 2015; Ben-Salha & Zmami, 2021; Mihajlović & Marjanović, 2021), regions (Furceri *et al.*, 2012; Richter & Witkowski, 2014; Ali *et al.*, 2018), time (Kapsos, 2006; Thuku *et al.*, 2019; Adegboye *et al*., 2019) and business cycle phase (Coşar & Yavuz, 2019; Butkus *et al.*, 2022; 2023). The research by Dargenyte-Kacileviciene *et al.* (2022) also revealed the heterogeneity of output-employment elasticity across age, gender, and educational attainment levels. The results showed that employment reaction to output growth is higher for males compared to females, youth compared to other age cohorts, and uneducated compared to highly educated. The main question most research addresses is what factors are the main drivers of this heterogeneity.

While output-employment elasticity is also closely related to the changes in productivity growth, previous research focuses on indicators related to both employment and productivity growth. Among these factors are economic structure (Ali *et al.*, 2018; Dahal & Rai, 2019; Thuku *et al.*, 2019; Mkhize, 2019; Zaki *et al.*, 2020; Ben-Salha & Zmami, 2021; Butkus *et al.*, 2022; 2023), foreign direct investment (Furceri *et al.*, 2012; Anderson & Braunstein, 2013; Slimane, 2015; Farole *et al.*, 2017; Adegboye *et al.*, 2019, Dargenyte-Kacileviciene *et al.*, 2022), international trade (Kapsos, 2006; Furceri *et al.*, 2012; Anderson & Braunstein, 2013; Goaied & Sassi, 2015; Slimane, 2015; Anderson, 2016; Farole *et al.*, 2017; Ghazali & Mouelhi, 2018; Adegboye *et al.*, 2019; Ben-Salha & Zmami, 2021) and institutional environment (Kapsos, 2006; Furceri *et al.*, 2012; Richter & Witkowski, 2014; Ali *et al.*, 2018; Farole *et al.*, 2017; Ben-Salha & Zmami, 2021; Görg *et al.*, 2023). Butkus *et al.'s* (2022, 2023) research already revealed that we could define service and construction sectors (considering the size of each sector in the economy) as the most employment-intensive in the EU. The research of Dargenyte-Kacileviciene *et al.* (2022) also confirmed the weak and negative impact of foreign direct investment (FDI) on the output-employment relationship in the EU, indicating that FDI is more related to labour productivity growth than employment growth.

The objective of the article is to assess the impact of economic growth on employment mediated by international trade and regulation, considering the gender-, age- and educational attainment levels of employed in the EU.

The literature studying the impact of international trade on employment and the impact of regulation on employment is ample, but there is a scarcity of research analysing the joint effect of both on employment reaction to output changes, especially in the context of the EU. The novelty of the article lies in investigating how the regulation together with international trade affects the output-employment relationship within the EU since various macroeconomic characteristics can simultaneously affect this relationship. Another contribution is the analysis of the heterogeneous impact of economic and regulatory variables on the employment reaction of different worker cohorts to output growth. The two and three-way interaction models are used to assess the effects of international trade and regulation in 27 European Union countries over the period 2000 to 2020, utilizing an unbalanced panel dataset and applying the Pooled OLS estimator.

The rest of the article is organised as follows. Firstly, we will summarise theoretical and empirical aspects related to the mediating effect of international trade and regulation on heterogeneous output-employment relationship. Next, we will present the estimation strategy and the data. Subsequently, we will discuss the main findings. We will close the article with a conclusion, policy implications and suggestions for future work.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Extensive previous research has been conducted to investigate the influence of international trade separately on economic growth (Fetahi-Vehapi *et al.*, 2015; Keho, 2017; Oppong-Baah *et al.*, 2022) or employment (Alkhateeb *et al.*, 2017; Nwosa *et al.*, 2020; Ngouhouo & Nchofoung, 2021). However, the research investigating the impact of international trade on the relationship between economic growth and employment is scarce, especially in the context of the EU. Based on the literature that analyses the relationship between international trade, economic growth, and employment, several directions *i.e.* positive or negative impact of international trade on the response of employment to economic growth can be distinguished.

The scientific literature emphasizes the positive effect of international trade on employment when economic growth accelerates due to a more efficient allocation of resources and aggregate demand increases (Pilinkiene, 2016; Asaleye *et al.*, 2017; Van Ha & Tran, 2017). The negative effect occurs if exports and imports increase labour productivity, leading to decreased employment (Alkhateeb *et al.*, 2017; Rath & Ridhwan, 2020). On the other hand, increased productivity can stimulate firms' competitiveness, or as noted by Pilinkiene (2016), Asaleye *et al.* (2017), and Van Ha and Tran (2017), can increase the production scale of companies as well as the demand for labour. Alkhateeb *et al.* (2017) indicate that international trade can increase domestic consumption, but imports can also push local producers out of the market and thus increase unemployment.

The impact of international trade on employment is theoretically related to the Heckscher–Ohlin model, thus, the benefits of international trade are explained by comparative advantage (Keho, 2017; Asaleye *et al.*, 2017; Ghazali & Mouelhi, 2018). According to this model, a higher level of exports can increase employment in labour–abundant exporting countries, but it can also decrease if capital-intensive goods are produced and exported (Alkhateeb *et al.*, 2017; Nwosa *et al.*, 2020). As Ngouhouo and Nchofoung (2021) note, based on the Heckscher–Ohlin model, trade openness can be assumed to positively affect the employment of unskilled labour in developing countries with a relatively large volume of labour force. Such countries will specialize in labour-intensive products and import capital-intensive products.

To achieve cost-effective production of goods compared to other nations, employing a labour force with lower wages is crucial. Banerjee and Veeramani (2015) identify four main channels through which international trade can have gender-specific employment effects: the cost reduction effect, the resource reallocation effect, the technology effect and the scale effect. According to the comparative advantage, a higher degree of trade openness results in increased imports, consequently fostering greater competition within the domestic market. This competition encourages local companies to minimize their costs by employing women, whose wages are lower compared to men. Anderson and Braunstein (2013) emphasize that exports can be related to higher employment of women and import competition is more important to employment of men. However, the relative demand for women as a labour factor increases to the extent that international trade encourages the reallocation of labour resources to sectors in which they have a comparative advantage. Anderson (2016), Alkhateeb *et al.* (2017), and Nwosa *et al.* (2020) note that the results depend on the structure of the economy, *i.e.* depending on whether a country specializes in the production of labour- or capital-intensive goods. On the contrary, the technology channel is associated with a positive effect on male employment. As Banerjee and Veeramani (2015) stated, the augmented inflow of technology and capital goods facilitated by FDI can lead to an expansion in male employment, if male workers possess higher qualifications than females. The scale effect of production due to international trade should increase employment for both men and women.

Kapsos (2006), Furceri *et al.* (2012), Anderson and Braunstein (2013), Goaied and Sassi (2015), Slimane (2015), Anderson (2016), Ghazali and Mouelhi (2018), Ben-Salha and Zmami (2021) assessed the impact of international trade on the employment response to economic growth. Kapsos (2006) analysed the effect of economic openness on employment response to economic growth in 154 countries. The results confirmed the statistically insignificant effect of trade openness on the relationship between economic growth and employment. The results of the empirical study also

revealed that higher exports in countries are associated with a stronger response of female employment to economic growth. The author associates these results with relatively cheaper female labour. Based on panel data from 90 countries around the world, Slimane (2015) estimated the effect of trade openness on the employment reaction to economic growth. The study's results confirmed the negative effect of trade openness and the statistically insignificant impact of exports on output-employment elasticities. As the main reason for such results, Slimane identifies the opportunity for companies to acquire newer technologies that increase labour productivity.

Ben-Salha and Zmami (2021) assessed the impact of trade openness on employment reaction to economic growth in six GCC countries. The results confirmed the positive effect of trade openness (measured by the KOF trade openness index) on output-employment elasticities. Anderson (2016) found either a weak or statistically insignificant relationship between trade openness and the employment response to economic growth in 80 countries, depending on the model specification. Additionally, no significant differences in this effect between genders were found. Furceri *et al.* (2012) conducted a study based on data from 167 countries, confirming that trade openness is one of the factors that can explain the heterogeneous effect of economic growth on employment across countries. The study results lead to the conclusion that in more developed and closed economies, employment response to economic growth is stronger.

Anderson and Braunstein (2013) assessed the impact of international integration on the gender-specific employment response to economic growth in 145 countries from 1990 to 2010. The study results revealed that a deterioration in the terms of trade leads to a lower employment response to economic growth for both genders. No statistically significant differences in effects between genders were found in this study. Furthermore, Ghazali and Mouelhi (2018) included trade openness and import penetration ratio as additional variables to examine their potential impact on the relationship between output and employment in Tunisia. The study confirmed that both indicators are associated with a decline in employment in the country. Goaied and Sassi (2015) analysed changes in sectoral employment to output elasticities before and after joining the Free Trade Agreement. The study confirmed that trade liberalization in Tunisia strengthened the employment response to growth in the exporting sectors of the economy. Still, the job creation potential of these sectors remained limited.

The results of empirical studies provide ambiguous results. We may attribute the differences in the impact of trade openness on the relationship between output and employment to the unequal institutional contexts of different nations. As Agyei and Idan (2022) indicate, trade openness depends on the quality of institutions and political, legal, economic, and socio-cultural structures. According to Hadhek and Mrad (2015), a favourable institutional environment and good governance promote trade by reducing transaction costs and increasing trust. On the contrary, the low quality of governance, political instability, and corruption reduce international trade, because they increase the risk and uncertainty associated with international transactions. Researchers also emphasise that labour market institutions play an important role in coordinating the impact of trade liberalisation on labour market outcomes due to stricter labour market regulation which determines increased wage costs (Selwaness & Zaki, 2019).

Other researchers (Parcon, 2008; Radulescu & Robson, 2013; Ketteni & Kottaridi, 2019) emphasize that any restrictions lead to the inflexibility of the labour market. Due to the inflexibility of the labour market, companies incur higher costs, which leads to a decrease in the country's competitiveness. It can either directly affect international trade or approximate it through the technology channel, as FDI flows will be higher in countries with more flexible labour markets. As emphasized by Radulescu and Robson (2013), it is important for multinational companies to have the lowest possible employee dismissal costs and to make it easy to adapt to changes in aggregated demand. The results of empirical studies show that better institutional quality can lead to higher trade openness and, at the same time, economic growth (Hadhek & Mrad, 2015; Conteh *et al.*, 2021; Akinlo & Okunlola, 2021), so it can also have an impact on the relationship between output and employment.

The scientific literature analyses the impact of the institutional environment on the response of employment to economic growth (Kapsos, 2006; Furceri *et al.*, 2012; Anderson & Braunstein, 2013; Richter & Witkowski, 2014; Farole *et al.*, 2017; Ali *et al.*, 2018; Ben-Salha & Zmami, 2021; Görg *et al.*, 2023), but only the study by Adegboye *et al.* (2019) analysed how economic freedom

changes the impact of economic, structural and demographic factors on the relationship between output and employment in Sub-Saharan Africa. The study found that as economic freedom increases, the effect of the share of the service and industrial sectors on the relationship between output and employment becomes statistically insignificant. We may observe a similar situation for other indicators, such as FDI and trade openness.

Previous research has mainly analysed developing countries, with few studies examining the employment response to changes in output in developed countries. International trade and regulatory frameworks have a significant impact on the interplay between output and employment in both developed and developing countries. In developed countries, trade liberalisation can boost output and employment in sectors with comparative advantages, while potentially leading to job displacement, especially in less competitive industries. Strict labour regulations in developed countries can raise production costs, potentially leading to outsourcing and job losses, although they can also ensure better working conditions. Conversely, in developing countries, trade liberalisation offers opportunities for specialisation in labour-intensive industries, potentially increasing output and employment, but with challenges such as worker exploitation and vulnerability to external shocks. Weaker labour regulations may attract foreign investment but perpetuate low-wage cycles, while stronger standards may improve wages and conditions but hinder competitiveness. Trade imbalances and technological advances further shape employment patterns, highlighting the nuanced impact of international trade and regulation on output and employment, and balancing growth opportunities with challenges such as job displacement and economic vulnerability. Despite less research in developed countries, there is a need to analyse the relationship between employment and output as developed countries face the problem of 'jobless growth' and there is a need to analyse what determines this relationship and to draw appropriate policy implications.

Previous research has shown that international trade can have diverse effects on the relationship between economic growth and employment, with both positive and negative impacts depending on factors such as comparative advantage, gender-specific employment effects, and the institutional environment. The impact of trade on employment response to economic growth is influenced by variables like trade openness, terms of trade, and labour market institutions, and varies across countries. However, there is a gap in research analysing both international trade and regulation as mediating factors and this is addressed in our research by introducing multiplicative terms.

The analysis of prior empirical results allowed us to assume the following research hypotheses:

H1: Due to international trade, the reaction of employment to output growth in the EU decreases.

H2: International trade increases female employment outcomes as a response to output growth in the EU.

H3: Regulation simultaneously to international trade strengthens the impact of the output on employment in the EU.

RESEARCH METHODOLOGY

This article aims to analyse the impact of international trade on the output-employment relationship and follows the methodology developed by Islam and Nazara (2000), and applied by Kapsos (2006), Slimane (2015), Ali *et al.* (2018), Thuku *et al.* (2019), Mkhize (2019), *etc*. According to this methodology, output-employment elasticities can be estimated using the log-linear specification of the econometric model. The primary model to estimate employment to output elasticities for panel data is defined in Equation 1.

$$\Delta lnE_{i,t} = \alpha + \beta \cdot \Delta lnY_{i,t} + \theta_t + \Delta\varepsilon_{i,t} \quad (1)$$

In which:

$\Delta lnE_{i,t}$ - denotes the growth of employment, measured as a thousand persons employed;

$\Delta lnY_{i,t}$ - denotes the growth of real output, measured as GDP at constant 2015 prices, million euro, in country *i* at the year *t*.

The coefficient β is the output-employment elasticity. α is the intercept, θ_t represents time – fixed effects, $\Delta\varepsilon_{i,t}$ is the idiosyncratic error.

The dependent variable consists of different types of employment considering gender, age, and educational attainment levels. Employment by gender is divided into three groups *i.e.* total, males and females. By age, the employed are divided into four groups of working age population: 15-64 years, 15-24 years, 25-39 years, and 40-64 years old. Considering education, the employed are divided into four groups based on the International Standard Classification of Education (ISCED). ISCED0–8 covers all levels of education. The ISCED0–2 level represents less than primary, primary, and less than secondary education. The ISCED3–4 level represents secondary and other education not classified as higher education. ISCED5–8 represents higher education.

To analyse the impact of international trade on the output-employment relationship, we modify Equation 1 by including the multiplicative term between output growth and international trade variable (Equation 2). Following the idea that exports and imports may be differentially related to employment dynamics depending on gender (Anderson & Braunstein, 2013; Anderson, 2016), we used two different variables to approximate international trade instead of the trade openness (imports plus exports divided by GDP) indicator.

$$\Delta lnE_{i,t} = \alpha + \beta_1 \cdot \Delta lnY_{i,t} + \beta_2 \cdot ln\left(IT_{i,t}\right) + \delta_1 \cdot \Delta lnY_{i,t} \times ln\left(IT_{i,t}\right) + \theta_t + \Delta\varepsilon_{i,t} \quad (2)$$

In which:

$\Delta lnE_{i,t}$ - denotes the variable of international trade, *i.e.* exports and imports, measured as per cent of GDP, in country *i* at the year *t*. Other parameters were the same as in Equation 1.

The multiplicative term $\Delta lnY_{i,t} \times ln\left(IT_{i,t}\right)$ denotes the conditional output-employment relationship mediated by international trade. We constructed equation 3 following the equation suggested by Friedrich (1982) and used to estimate the conditional effect of economic growth on employment.

$$\Delta lnE_{i,t} = \alpha + \beta_2 \cdot lnIT_{i,t} + \left[\boldsymbol{\beta_1} + \boldsymbol{\delta_1} \cdot \boldsymbol{ln}\left(\boldsymbol{IT_{i,t}}\right)\right] \cdot \Delta lnY_{i,t} + \theta_t + \Delta\varepsilon_{i,t} \quad (3)$$

In which:

$\left[\beta_1 + \delta_1 \cdot ln\left(IT_{i,t}\right)\right]$ - is a slope coefficient that shows the conditional effect of economic growth on employment at the different levels of international trade variables.

Studies that analyse the impact of economic growth on employment take into account various institutional factors that reflect the quality of institutions (Anderson & Braunstein, 2013; Richter & Witkowski, 2014; Farole *et al.*, 2017; Ali *et al.*, 2018), labour market regulation (Kapsos, 2006; Furceri *et al.*, 2012; Richter & Witkowski, 2014; Farole *et al.*, 2017; Ali *et al.*, 2018; Ben-Salha & Zmami, 2021; Görg *et al.*, 2023), business regulation (Furceri *et al.*, 2012; Richter & Witkowski, 2014; Farole *et al.*, 2017), the size of the public sector (Furceri *et al.*, 2012; Seyfried, 2014; Richter & Witkowski, 2014), the tax system (Kapsos, 2006), the degree of participation in trade unions, and the prevalence of fixed-term contracts (Seyfried, 2014), the number of self-employed people (Farole *et al.*, 2017), economic freedom (Adegboye *et al.*, 2019), etc.

Moreover, we assumed that institutional factors can directly and indirectly affect the output-employment relationship through international trade. For that reason, we also assessed the conditional output-employment relationship mediated by both: international trade and regulation. To measure regulation, authors use the Organization for Economic Cooperation and Development (OECD) employment protection legislation index (Görg *et al.*, 2023), or labour market and product market regulation indexes proposed by the Fraser Institute (Furceri *et al.*, 2012; Richter & Witkowski, 2014; Farole *et al.*, 2017; Ali *et al.*, 2018; Adegboye *et al.*, 2019; Ben-Salha & Zmami, 2021). Since the OECD index does not estimate the index for all 27 EU countries, we chose indexes of labour market regulation and business regulation to approximate the regulatory framework. Both of these indicators directly affect the costs of firms related to hiring and firing employees and starting and maintaining the business.

The labour market regulation index includes such aspects as regulation of minimum wage, regulation of hiring and firing of employees, collective bargaining, regulation of working hours, mandatory expenses in case of dismissal of an employee, and military conscription. The business regulation index includes administrative requirements for companies, bureaucratic costs, time and

money costs for starting a new business, additional payments and bribes, licensing restrictions, and costs related to the payment of taxes. Both indices are sub-indexes of the Economic Freedom Index. The index values range from 0 to 10. A lower index value means a more rigid regulation of the labour market and business. We made the estimations using Equation 4.

$$\Delta lnE_{i,t} = \alpha + \beta_1 \cdot \Delta lnY_{i,t} + \beta_2 \cdot lnIT_{i,t} + \delta_1 \cdot \Delta lnY_{i,t} \times lnIT_{i,t} + \beta_3 \cdot lnIR_{i,t} + \delta_2 \cdot \Delta lnY_{i,t} \times lnIR_{i,t} + \delta_3 \cdot lnIT_{i,t} \times lnIR_{i,t} + \delta_4 \cdot \Delta lnY_{i,t} \times lnIT_{i,t} \times lnIR_{i,t} + \theta_t + \Delta\varepsilon_{i,t} \quad (4)$$

In which:

$lnIR_{i,t}$ - denotes the indicator of regulation (labour market regulation or business regulation index) in country *i* at the year *t*;

$\Delta lnY_{i,t} \times lnIT_{i,t}$ - denotes the conditional output-employment relationship mediated by international trade;

$lnIT_{i,t} \times lnIR_{i,t}$ - denotes the international trade impact on employment mediated by regulation;

$\Delta lnY_{i,t} \times lnIR_{i,t}$ - denotes the conditional output-employment relationship mediated by regulation;

$\Delta lnY_{i,t} \times lnIT_{i,t} \times lnIR_{i,t}$ - denotes the conditional output-employment relationship mediated by both international trade and regulation. Other parameters are the same as in Equation 1.

To estimate the conditional effect of economic growth on employment mediated by international trade and regulation, we applied the methodology used by Butkus *et al.* (2021). We estimated the slope coefficients using Equation 5.

$$\Delta lnE_{i,t} = \alpha + \beta_2 \cdot lnIT_{i,t} + \beta_3 \cdot lnIR_{i,t} + \delta_3 \cdot lnIT_{i,t} \times lnIR_{i,t} + [\boldsymbol{\beta_1} + \boldsymbol{\delta_1} \cdot \boldsymbol{lnIT_{i,t}} + \boldsymbol{\delta_2} \cdot \boldsymbol{lnIR_{i,t}} + \boldsymbol{\delta_4} \cdot \boldsymbol{lnIT_{i,t}} \times \boldsymbol{lnIR_{i,t}}] \cdot \Delta lnY_{i,t} + \theta_t + \Delta\varepsilon_{i,t} \quad (5)$$

In which:

$[\beta_1 + \delta_1 \cdot lnIT_{i,t} + \delta_2 \cdot lnIR_{i,t} + \delta_4 \cdot lnIT_{i,t} \times lnIR_{i,t}]$ – denotes the conditional effect of economic growth on employment at a certain combination of indicators reflecting international trade and regulation. Other parameters are the same as in Equation 4. Standard errors of the slope coefficients and student's t-statistics are estimated using the standard delta method.

Following Kapsos (2006), Furceri *et al.* (2012), Richter and Witkowski (2014), and Slimane (2015) to estimate the employment reaction to economic growth we used a pooled OLS estimator. The alternative fixed-effects (FE) estimator would produce rather different and probably inconsistent results. FE applied on a serially correlated output (in levels) data would mean that there is a very substantial, positive serial correlation in $\varepsilon_{i,t}$. In such a case the difference $\Delta\varepsilon_{i,t}$ is serially uncorrelated, and the first differencing along with OLS estimator is preferable. To overcome the shortcomings of this method we made some modifications to the regression model. The log-linear specification of the model transforms the relationship between variables into a linear one and deals with the possible heteroscedasticity in the data. Both the dependent and independent variables were expressed in the first differences. Using this specification, we expected to eliminate the unobserved time-invariant country-fixed effects from the model and deal with autocorrelation. Moreover, to test for the remaining autocorrelation, we used the Wooldridge autocorrelation test and the heteroscedasticity – Breusch Pagan (LM) test. Since autocorrelation, heteroscedasticity or both were detected, regression models were modified by including the heteroscedasticity and autocorrelation consistent Arellano standard errors. To test the crossectional dependance we use the Pesaran CD test. All of the regression models where crossectional dependence were detected were corrected by including the Driscoll-Kraay standard errors. Conditional output-employment elasticities were represented graphically in the ranges of observed values of indicators. We took data on output and employment – from Eurostat, data on imports and exports – from the World Bank, and data on labour market and business regulation indexes – from Fraser Institute. The panel covers data from 27 EU countries from 2000 to 2020. Appendix A (Tables A1 and A2) presents summary statistics of variables.

RESULTS AND DISCUSSION

Empirical results of estimations made using Equation 2 show that both indicators, *i.e.* imports and exports, tend to decrease the employment reaction to economic growth in most analysed cases (Appendix B, Tables B1, B2, B3, and B4). However, this impact lacks statistical significance. Such results are consistent with the results of studies conducted by Kapsos (2006), Slimane (2015), Anderson (2016), Ghazali and Mouelhi (2018), which confirmed a weak or insignificant relationship between trade openness and employment response to economic growth. As noted by Anderton *et al.* (2014), international trade relates to the capital-intensive production sector, so such results can be determined by the opportunity to acquire labour productivity-enhancing technologies through international trade (Slimane, 2015; Ghazali & Mouelhi, 2018).

The highest negative impact of imports is observed in the response of youth employment to economic growth. The conditional output-employment elasticities estimated using Equation 3 (Appendix C, Figure C1) show that economic growth has a statistically significant effect on the employment of youth when imports are lower than 85% of GDP for the entire sample, 96% of GDP for young men and 66% of GDP for young women. Almost the same conclusions can be made in the case of exports where results show that if exports are higher than 80% of GDP, the effect of economic growth on youth employment becomes statistically insignificant. These results indicate that in countries such as Ireland, Luxembourg or Malta, which are characterised by high levels of both, *i.e.* imports and exports (according to the data in 2020), further economic growth will not stimulate the growth of youth employment. Moreover, the results also revealed that both imports and exports decrease the employment reaction to output growth for young women with ISCED 3-4 levels of educational attainment. We may explain these results by the increasing possibilities to attract foreign direct investment (FDI) through trade openness. Previous research by Dargenyte-Kacileviciene *et al.* (2022) already revealed that the higher inward FDI level in a country is associated with a decreasing employment reaction to economic growth for youth. Since inward FDI is considered to bring new and more advanced technologies and managerial practices, it requires a more educated and experienced workforce to absorb these changes.

According to estimation results, for some demographic groups, international trade is a factor that positively affects employment reaction to economic growth. Estimation results show that imports and exports strengthen the employment response to the economic growth of 25-39-year-old men with ISCED3–4 educational attainment levels. The estimated conditional output-employment elasticities show that economic growth has a statistically significant effect on the employment growth of men this age and education only when the imports level is higher than 42% of GDP and the exports level higher than 31%. (Appendix C, Figure C3). Analysing the impact of international trade on employment to output elasticities in more detail, we found that due to higher import and export levels in the EU, the employment reaction of uneducated 40-64-year-old women tends to increase (positive slope of the curve) and this increase is statistically significant at 5% level. Despite that, estimated conditional output-employment elasticities revealed that economic growth impact on employment of uneducated 40-64-year-old women remains statistically insignificant at any level of imports or exports. The same conclusion can be made by analysing the output-employment elasticities of uneducated 40-64-year-old men (Appendix C, Figure C2).

Results also indicated that due to higher import levels, employment reaction to the economic growth of highly educated 40-64-year-old women tends to increase but remains statistically insignificant. In contrast to imports, exports tend to strengthen the employment response to economic growth, not only for 40-64-year-old highly educated women but also for men of the same age and education level. Nevertheless, the effect of economic growth on the employment of 40-64-year-old highly educated men remains statistically insignificant at any level of exports (Appendix C, Figure C4). These results support the theoretical assumption that trade openness, depending on the sectoral structure of the economy, through the technology channel increases the demand for a more skilled and experienced workforce. According to the results, we can reject the hypothesis proposed by Anderson and Braunstein (2013) that exports and imports can relate differently to employment dynamics, depending on gender. The results show that

the effect of exports and imports on the response of employment to economic growth is similar, both for the whole sample and considering the gender of the employed.

Following the idea that regulation can affect and boost the output-employment relationship through international trade, we assume that at a certain combination of international trade level and regulation, the output-employment relationship can turn statistically significant. Since we were interested in conditions where economic growth can boost employment outcomes, we distinguished 7 cases where empirical results revealed that higher exports or imports tend to increase the employment reaction to economic growth, but this impact remains statistically insignificant. Such tendencies were revealed only for 40-64-year-old males and females with 0-2 and 5-8 levels of educational attainment (except 40-64-year-old males with higher education in the case of imports). We made estimations using Equation 4 and results represented in Appendix D, Tables D1 and D2. Table 1 presents generalized information.

Table 1. Economic growth impact on employment mediated by international trade and regulation in the EU

Age	Gender	Educational attainment level	Moderator / Moderator	Labour market regulation	Business regulation
40-64	Males	0-2	Imports	No	Yes
	Females	0-2		No	Yes
		5-8		Yes	Yes
	Males	0-2	Exports	No	Yes
		5-8		No	Yes
	Females	0-2		No	Yes
		5-8		Yes	Yes

Note: 'No' in Table 1 means that there is no effect of international trade and regulation on output-employment relationship i.e. economic growth impact on employment remained statistically insignificant. 'Yes' means that at a certain combination of international trade and regulation, economic growth impact on employment turned to statistically significant.
Source: own study.

According to the results, we can state that the mediating effect of business regulation is more important compared to labour market regulation. We detected statistically significant effect of economic growth on employment in all 7 cases, while in the context of labour market regulation only in 2 cases. To evaluate the specific effect of economic growth on employment mediated by international trade and regulation, conditional output-employment elasticities were estimated using Equation 5 and represented in Figures 1 and 2. Figures are made only for cases where the impact of economic growth on employment mediated by international trade and regulation is statistically significant.

In countries with extremely liberal labour market regulation and high levels of imports, the effect of economic growth on the employment of highly educated 40-64-year-old women becomes statistically significant. The effect is positive, *i.e.* economic growth increases the employment of women in this age group and educational attainment level. We found the same situation when assessing the effect of economic growth on employment mediated by the level of imports and the degree of business regulation. In countries with very liberal business regulations and high levels of imports, economic growth had a statistically significant effect on the employment of highly educated 40-64 women, and this effect was positive.

We found the opposite situation in cases of uneducated 40-64-year-old women and men. In countries with extremely high levels of imports and extremely liberal business regulation, the effect of economic growth on employment also becomes statistically significant, but this effect is negative. This means that as the economy grows, the employment of uneducated 40-64-year-old women and men decreases. We also identified a negative impact at the combination of strict business regulation and low levels of imports. We observed that in the presence of strict business regulation, but extremely high levels of imports, the effect of economic growth on the employment of uneducated 40-64-year-old women and men was positive and statistically significant.

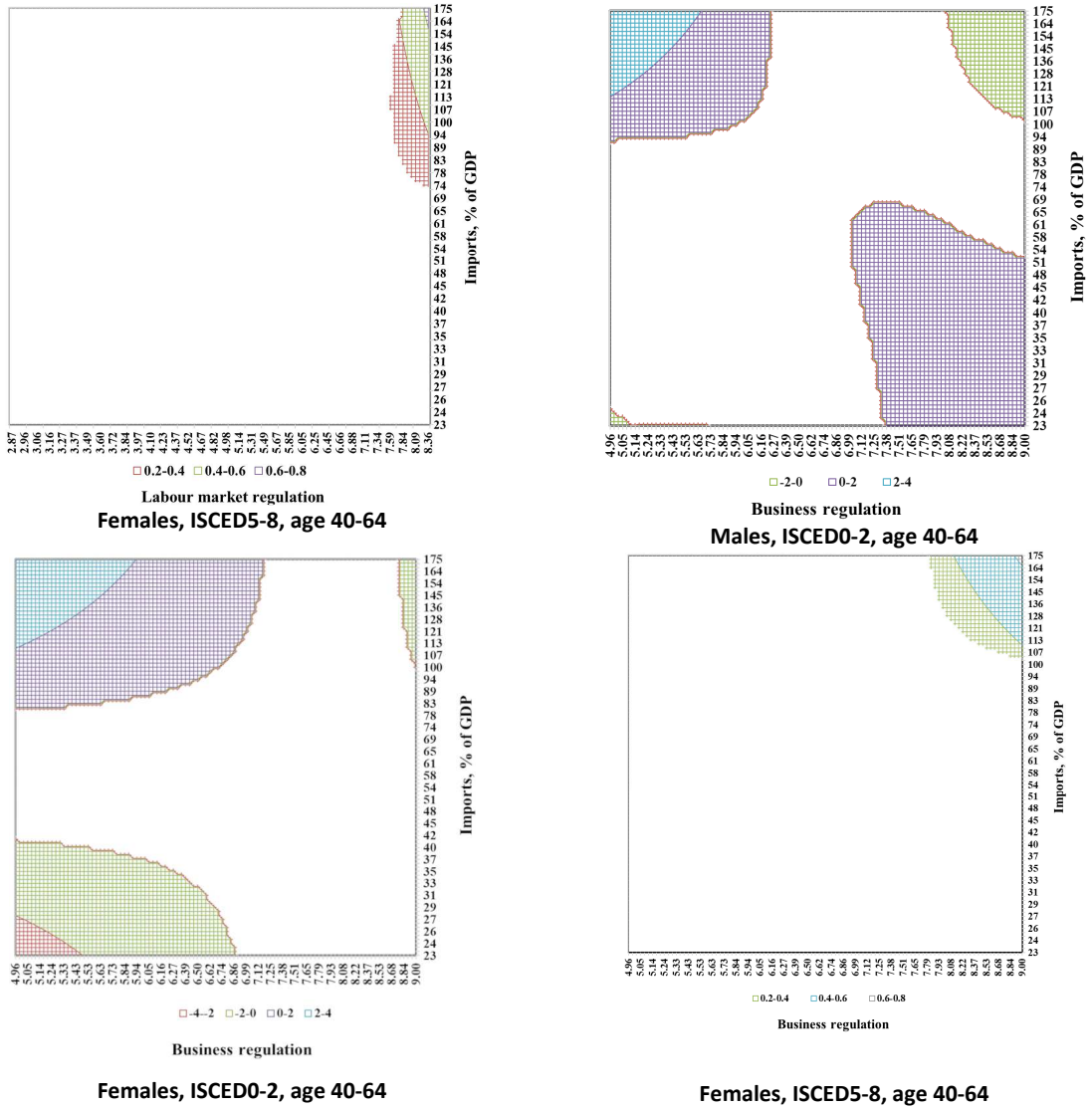

Figure 1. Economic growth impact on employment mediated by the level of imports (% of GDP) and regulation. White colour represents combinations of imports and degree of regulation for which the effect of economic growth on employment is not statistically significant

Source: own elaboration based on Eurostat, World Bank, and Fraser Institute data.

Such results revealed several trends. With strict business regulations and high levels of imports, economic growth is increasing employment growth for uneducated 40-64 women and men. As business becomes less regulated and import levels rise to high levels, the employment of uneducated 40-64 women and men falls, while for educated women – increases. We may also explain such results by comparative advantage. According to Banerjee and Veeramani (2015), Ngouhouo and Nchofoung (2021), trade openness increases imports, leading to increased domestic market competition. The greater competition encourages companies to cut costs by hiring women, who are still paid less than men, or unskilled but at least experienced labour, which is cheaper when compared to highly skilled. Stricter business regulation is also associated with higher costs for companies. For this reason, companies tend to hire cheaper, uneducated labour to save money in the face of strict business regulations. Meanwhile, the deregulation of business creates free funds for companies and the opportunity to hire a better-paid and educated workforce. Imports also related to FDI, *i.e.* as FDI grows, new technologies are imported, which are used not only for capital but also for labour-intensive sectors of the economy, about which women have a comparative advantage. As a result, the need for unskilled labour is decreasing, and for skilled labour – increasing.

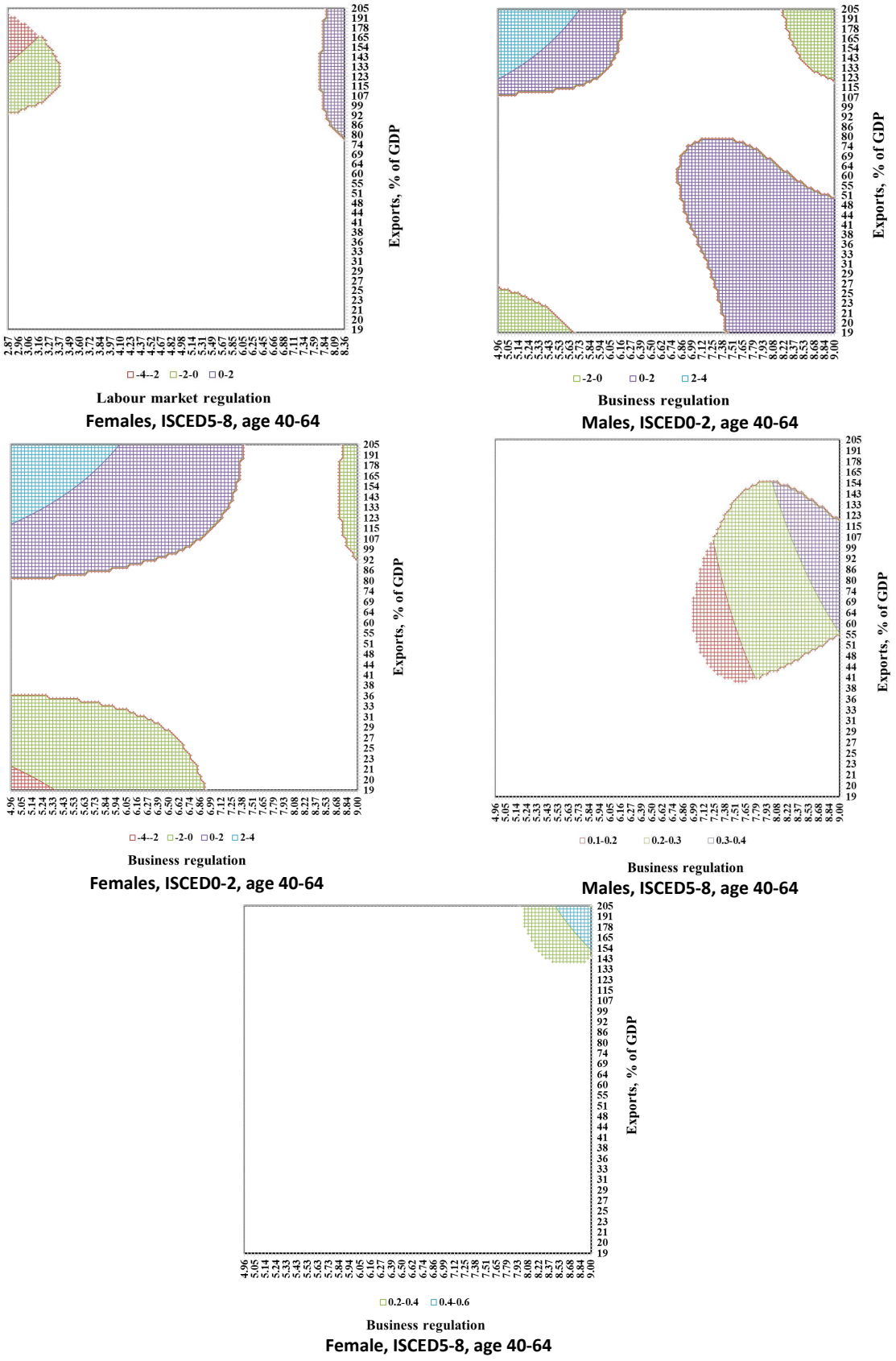

Figure 2. Economic growth impact on employment mediated by the level of exports (% of GDP) and regulation. White colour represents combinations of exports and degree of regulation for which the effect of economic growth on employment is not statistically significant

Source: own elaboration based on Eurostat, World Bank and Fraser Institute data.

In countries with very liberal labour and business regulation and high levels of exports, economic growth has a statistically significant effect on the employment of 40-64-year-old women with higher education and this effect is positive. Thus, the trends were similar to imports. In contrast to imports, we found that the combination of strict labour market regulation and the high level of exports, economic growth reduces the employment of 40-64-year-old highly educated women. Results also support the theoretical statement that when strict labour market regulation is imposed, companies incur higher costs and seek to save by hiring a less skilled and less paid labour force. Other results also confirmed that in the case of strict business regulation and extremely high export levels, the effect of economic growth on the employment of uneducated 40-64-year-old women and men was positive and statistically significant. Similarly, in the case of imports, we found that in countries with high exports and extremely liberal business regulations, the effect of economic growth on employment also becomes statistically significant but negative. This shows that as the economy grows, the employment of 40-64 uneducated women and men decreases.

The results also show that in the case of liberal business regulation and exports levels between 40% and 154% of GDP, economic growth boosts the employment of highly educated 40-64-year-old men, but when exports reach a high level, economic growth boosts the employment of the women instead of men. Thus, in the presence of liberal business regulation in the EU, due to the impact of imports, economic growth promotes the growth of the employment of 40-64-year-old highly educated women. Due to the effect of exports, economic growth increases the employment not only of women but also of 40-64-year-old educated men. We may explain these differences with the different distribution of women and men in the importing and exporting industries.

CONCLUSIONS

This article complements the limited literature where the employment reaction to economic growth in the EU is evaluated considering the age-, gender- and educational attainment levels of the employed. While previous research focused on the impact of international trade and regulation separately, this article analyses the output-employment elasticities mediated by international trade. Then, the output-employment elasticities mediated by international trade and regulation are assessed. This method allows for the evaluation of the employment reaction to economic growth at different levels of international trade volume and a certain combination of international trade and different kinds of regulation.

Empirical estimations indicated that imports and exports negatively related to output-employment relationship in most of the analysed cases but this impact was barely statistically significant. This implies that the H1 hypothesis was confirmed. The results also showed that due to international trade the employment reaction to output growth of uneducated and highly educated 40-64-year-old women tends to increase but this effect remains statistically insignificant at any level of imports and exports revealing that H2 hypothesis was rejected.

When examining how international trade and regulation mediate the relationship between output and employment, we revealed that business regulation's influence was more substantial than labour market regulation. The results also showed that when high import and export levels were present, going from rigid business regulation to liberal, results in a decreased demand for unskilled labour and increased demand for skilled labour, especially women. Our results confirmed hypothesis H3 which reflected that regulation simultaneously to international trade strengthens the impact of the output on employment in the EU.

The results of the article can be important for policymakers who develop specific strategies to address the employment challenges in the economy. First of all, our results suggest discussing international trade as the important factor which can explain the decreasing employment reaction of different demographic groups, especially youth. While creating adaptive regulatory frameworks policymakers should, first of all, focus on improving institutional quality, increasing labour market flexibility, and decreasing business regulations, especially those responsible for higher costs. Introducing targeted education and training programs for women in industries with high export potential, such as technology, manufacturing, and services has to be considered. Moreover, it is suggested to prioritize investments in

education and skills development programs, to ensure workers have the necessary skills to participate and benefit from international trade. This could include vocational training programs, STEM education initiatives, and support for lifelong learning opportunities. Develop trade and investment policies that promote economic diversification, value-added production, and the creation of high-quality jobs. This could involve targeted incentives for industries that have the potential to absorb both skilled and unskilled labour, as well as measures to address structural barriers to trade and investment.

The used methodology gives valuable information about the conditional output-employment relationship mediated by important economic and institutional factors. However, it has limited abilities to include interaction with more than three variables at the same time, meaning that is possible to analyse the employment reaction to economic growth only at a certain level of two other factors. Furthermore, by using this methodology we have limited abilities to include more multiplicative terms and other indicators due to possible multicollinearity. Estimation results showed that international trade with several exceptions tends to decrease the employment reaction to economic growth. Due to the higher exports and imports, employment reaction to economic growth becomes statistically insignificant. These results indicate that decreasing employment reaction to output changes can be determined by labour productivity growth. The evaluation of the mediating effect of total factor productivity on the output-employment relationship is under consideration in our future research.

REFERENCES

Adegboye, A.C., Egharevba, M.I., & Edafe, J. (2019). Economic regulation and employment intensity of output growth in Sub-Saharan Africa. In A.B. Elhiraika, G. Ibrahim, & W. Davis (Eds.) *Governance for structural transformation in Africa* (pp. 101-143). Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-030-03964-6_4

Agyei, S.K., & Idan, G.A. (2022). Trade openness, institutions, and inclusive growth in Sub-Saharan Africa. *Sage Open*, *12*(2), 1-12. https://doi.org/10.1177/21582440221099008

Akinlo, T., & Okunlola, C.O. (2021). Trade openness, institutions and economic growth in Sub-Saharan Africa. *Journal Perspektif Pembiayaan Dan Pembangunan Daerah*, *8*(6), 541-560. https://doi.org/10.22437/ppd.v8i6.10653

Ali, A.A., Ghazi, T., & Msadfa, Y. (2018). Manufacturing employment elasticity and its drivers in developing and emerging countries: Focus on Sub-Saharan Africa. *OCP Policy Center Research Paper,* 17/03, 1-36. Retrieved from https://www.policycenter.ma/sites/default/files/OCPPC-RP1703.pdf on May 2, 2023.

Alkhateeb, T., Yousef, T., Mahmood, H., Sultan, Z.A., & Ahmad, N. (2017). Trade Openness and Employment Nexus in Saudi Arabia. *International Journal of Economic Research, 14*, 59-66. Retrieved from https://mpra.ub.uni-muenchen.de/109451/1/MPRA_paper_109451.pdf on May 2, 2023.

Anderson, B. (2016). Do Macroeconomic Structures and Policies Shape the Employment Intensity of Growth Differently for Women and Men?. *Journal of Economic Issues*, *50*(4), 940-962. 2. https://doi.org/10.1080/00213624.2016.1249744

Anderson, B., & Braunstein, E. (2013). Economic growth and employment from 1990-2010: explaining elasticities by gender. *Review of Radical Political Economics*, *45*(3), 269-277. https://doi.org/10.1177/0486613413487158

Anderton, R., Aranki, T., Bonthuis, B., & Jarvis, V. (2014). Disaggregating Okun's law: decomposing the impact of the expenditure components of GDP on euro area unemployment. *ECB Working Paper*, 1747, 1-24. https://doi.org/10.2139/ssrn.2533387

Asaleye, A.J., Okodua, H., Oloni, E.F., & Ogunjobi, J.O. (2017). Trade Openness and Employment: Evidence from Nigeria. *Journal of Applied Economic Sciences*, *12*(4), 1194-1209. https://doi.org/10.1108/ijse-06-2018-0320

Banerjee, P., & Veeramani, C. (2015). Trade Liberalization and Women's Employment Intensity: Analysis of India's Manufacturing Industries. *Indira Gandhi Institute of Development Research Working Paper*, 2015-018, 1-45. Retrieved from http://www.igidr.ac.in/pdf/publication/WP-2015-018.pdf on May 2, 2023.

Ben-Salha, O., & Zmami, M. (2021). The effect of economic growth on employment in GCC countries. *Scientific Annals of Economics and Business*, *68*(1), 25-41. https://doi.org/10.47743/saeb-2021-0004

Burggraeve, K., de Walque, G., & Zimmer, H. (2015). The relationship between economic growth and employment. *Economic Review*, *(i),* 32-52. Retrieved https://www.nbb.be/doc/ts/publications/economicreview/2015/ecorevi2015_h2.pdf on May 10, 2023.

Butkus, M., Dargenytė-Kacilevičienė, L., Matuzevičiūtė, K., Ruplienė, D., & Šeputienė, J. (2022). Do Gender and Age Matter in Employment–Sectoral Growth Relationship Over the Recession and Expansion. *Ekonomika*, *101*(2), 38-51. https://doi.org/10.15388/Ekon.2022.101.2.3

Butkus, M., Dargenytė-Kacilevičienė, L., Matuzevičiūtė, K., Šeputienė, J., & Ruplienė, D. (2023). Age-and Gender-specific Output-employment Relationship across Economic Sectors 1. *Ekonomicky Casopis*, *71*(1), 3-22. https://doi.org/10.31577/ekoncas.2023.01.01

Butkus, M., Maciulyte-Sniukiene, A., Macaitiene, R., & Matuzeviciute, K. (2021). A new approach to examine non-linear and mediated growth and convergence outcomes of cohesion policy. *Economies*, *9*(3), 103. https://doi.org/10.3390/economies9030103

Conteh, S.B., Yijun, Y., & Sesay, B. (2021). Economic growth effects of the interaction of trade openness and institutions quality: empirical evidence from Sub-Saharan Africa. *International Journal of Economics and Financial Issues*, *11*(1), 34. https://doi.org/10.32479/ijefi.10098

Coşar, E.E., & Yavuz, A.A. (2019). Is There Asymmetry between GDP and Labor Market Variables in Turkey under Okuns Law?. *Working Papers* of Central Bank of the Republic of Turkey, *1927*, 1-24. https://doi.org/10.1016/j.cbrev.2021.03.002

Dahal, M.P., & Rai, H. (2019). Employment Intensity of Economic Growth: Evidence from Nepal. *Economic Journal of Development Issues*, 34-47, https://doi.org/10.3126/ejdi.v28i1-2.33195

Dargenyte-Kacileviciene, L., Butkus, M., & Matuzeviciute, K. (2022). Gender-, Age-and Educational Attainment Level-Specific Output–Employment Relationship and Its Dependence on Foreign Direct Investment. *Economies*, *10*(11), 265. https://doi.org/10.3390/economies10110265

Dauda, R.S., & Ajeigbe, O.M. (2021). Sectoral Analysis of Employment Intensity of Growth in Nigeria. *Global Business & Economics Anthology*, *1*, 87-99. https://doi.org/10.47341/GBEA.21037

Farole, T., Ferro, E., & Gutierrez, V.M. (2017). Job Creation in the Private Sector: An Exploratory Assessment of Patterns and Determinants at the Macro, Sector, and Firm Levels. *Jobs Working Paper 5*, 1-48. World Bank, Washington, DC. https://doi.org/10.1596/28370

Fetahi-Vehapi, M., Sadiku, L., & Petkovski, M. (2015). Empirical analysis of the effects of trade openness on economic growth: An evidence for South East European countries. *Procedia Economics and Finance*, *19*, 17-26. https://doi.org/10.1016/S2212-5671(15)00004-0

Furceri, D., Crivelli, E., & Toujas-Bernate, M.J. (2012). Can policies affect employment intensity of growth? A cross-country analysis. *International Monetary Fund Working Paper,* WP/12/218, 1-31. https://doi.org/10.5089/9781475505689.001

Ghazali, M., & Mouelhi, R. (2018). The employment intensity of growth: evidence from Tunisia. *Journal of Economic Development*, *43*(3), 85-117. https://doi.org/10.35866/caujed.2018.43.3.004

Goaied, M., & Sassi, S. (2015). Trade liberalisation and employment intensity of sectoral output growth: Lessons from Tunisia. *The Economic and Labour Relations Review*, *26*(2), 261-275. https://doi.org/10.1111/j.1564-913X.2015.00034.x

Görg, H., Hornok, C., Montagna, C., & Onwordi, G.E. (2023). Employment to output elasticities and reforms towards flexicurity: Evidence from OECD countries. *Bulletin of Economic Research*, *75*(3), 641-670. https://doi.org/10.1111/boer.12375

Hadhek, Z., & Mrad, F. (2015). Trade openness, institutions and economic growth. *European Journal of Economics, Finance and Administrative Sciences, 75*, 96-104. https://doi.org/10.4236/tel.2018.811127

Herman, E. (2011). The impact of economic growth process on employment in European Union countries. *The Romanian Economic Journal, 14*(42), 47-67. https://doi.org/10.19030/iber.v13i3.8596

Islam, I., & Nazara, S. (2000). Estimating Employment Elasticity for the Indonesian Economy. *Jakarta*, *Indonesia: International Labour Office*, 1-29. Retrieved from https://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/---ilo-jakarta/documents/publication/wcms_123743.pdf on May 10, 2023.

Kapsos, S. (2006). Employment intensity of growth: The trends and macroeconomic determinants. *Employment Strategy Papers* 2005/12, 1-55. https://doi.org/10.1057/9780230627383_4

Keho, Y. (2017). The impact of trade openness on economic growth: The case of Cote d'Ivoire. *Cogent Economics & Finance, 5*(1), 1-14. https://doi.org/10.1080/23322039.2017.1332820

Ketteni, E., & Kottaridi, C. (2019). The impact of regulation on the FDI-growth nexus within the institution-based view: A nonlinear specification with varying coefficients. *International Business Review*, *28*(3), 415-427. https://doi.org/10.1016/j.ibusrev.2018.11.001

Mihajlović, V., & Marjanović, G. (2021). Challenges of the Output-Employment Growth Imbalance in Transition Economies. *Naše gospodarstvo/Our economy*, *67*(2), 1-9. https://doi.org/10.2478/ngoe-2021-0007

Mkhize, N.I. (2019). The sectoral employment intensity of growth in South Africa. *Southern African Business Review, 23*(1), 1-24. https://doi.org/10.25159/1998-8125/4343

Ngouhouo, I., & Nchofoung, T.N. (2021). Does trade openness affects employment in Cameroon?. *Foreign Trade Review, 56*(1), 105-116. https://doi.org/10.1177/001573 2520961307

Nwosa, P., Keji, S., Adegboyo, S., & Fasina, O. (2020). Trade openness and unemployment rate in Nigeria. Oradea. *Journal of Business and Economics*, *5*(2), 52-62. https://doi.org/10.47535/1991ojbe111

Oppong-Baah, T., Bo, Y., Twi-Brempong, C., Amoah, E.O., Prempeh, N.A., & Addai, M. (2022). The Impact of Trade Openness on Economic Growth: The Case of Ghana and Nigeria. *Journal of Human Resource and Sustainability Studies, 10*(1), 142-160. https://doi.org/10.4236/jhrss.2022.101010

Parcon, H. (2008). Labor market flexibility as a determinant of FDI inflows. University of Hawaii at Manoa, Department of Economics. *Working Papers*, 08-07, 1-50. Retrieved from https://core.ac.uk/download/pdf/7163267.pdf on May 10, 2023.

Perugini, C. (2009). Employment Intensity of Growth in Italy: A Note Using Regional Data. *Regional and Sectoral Economic Studies*, *9*(1), 59-105.

Pilinkiene, V. (2016). Trade openness, economic growth and competitiveness. The case of the Central and Eastern European countries. *Inžinerinė Ekonomika*, *27*(2), 185-194. https://doi.org/10.5755/j01.ee.27.2.14013

Radulescu, R., & Robson, M. (2013). Does labour market flexibility matter for investment? A study of manufacturing in the EBPO. *Applied Economics*, *45*(5), 581-592. https://doi.org/10.1080/00036846.2011.607633

Rath, B.N., & Ridhwan, M.M. (2020). The Nexus Among Employment, Productivity And Trade Openness: Evidence From Brics And Indonesia. *Buletin Ekonomi Moneter Dan Perbankan*, *23*(4), 463-484. https://doi.org/10.21098/bemp.v23i4.1363

Richter, K., & Witkowski, B. (2014). Does growth generate jobs in Eastern Europe and Central Asia?. *World Bank Policy Research Working Paper*, 6759, 1-20. https://doi.org/10.1596/1813-9450-6759.

Seyfried, W. (2014). Examining the employment intensity of economic growth of the PIIGS. *International Business & Economics Research Journal (IBER)*, *13*(3), 593-598. https://doi.org/10.19030/iber.v13i3.8596

Selwaness, I., & Zaki, C. (2019). On the interaction between exports and labor market regulation: Evidence from the MENA countries. *The Quarterly Review of Economics and Finance*, *73*, 24-33. https://doi.org/10.1016/j.qref.2018.05.011

Slimane, S.B. (2015). The relationship between growth and employment intensity: evidence for developing countries. *Asian Economic and Financial Review*, 680-692. https://doi.org/10.18488/journal.aefr/2015.5.4/102.4.680.692

Thuku, G.K., Omolo, J., & Muniu, J. (2019). Employment Intensity of Output Growth in Kenya. *Journal of Economics and Finance*, *10*, 9-21.

Van Ha, H., & Tran, T.Q. (2017). International trade and employment: A quantile regression approach. *Journal of Economic Integration*, 531-557. https://doi.org/10.11130/jei.2017.32.3.531

Zaki, C., Alshyab, N., & Seleem, N. (2020). Employment intensity of growth and sectoral output growth: a comparative analysis of Egyptian and Jordanian economies. *Analysis of Egyptian and Jordanian Economies*, *19*(1), 35-54. https://doi.org/10.30682/nm2001c

Appendix A:

Table A1. Summary statistics of dependent variables

Education attainment level	Gender	Age	Mean	Min	Max	Standard deviation
Employment growth,%						
***ISCED* 0-8**	**Both**	15-64	0.66	-13.09	11.00	2.42
		15-24	-1.58	-29.28	58.68	7.68
		25-39	-0.05	-10.93	29.23	3.10
		40-64	1.61	-12.13	7.65	2.35
	Males	15-64	0.45	-17.18	13.34	2.69
		15-24	-1.51	-33.33	50.00	8.08
		25-39	-0.16	-14.26	27.71	3.27
		40-64	1.36	-14.71	11.09	2.57
	Females	15-64	0.97	-8.96	10.50	2.58
		15-24	-1.59	-23.83	70.91	8.62
		25-39	0.13	-12.26	31.17	3.50
		40-64	2.15	-12.85	19.17	2.92
***ISCED* 0-2**	**Both**	15-64	-2.67	-27.57	39.47	6.92
		15-24	-2.97	-57.58	83.33	14.89
		25-39	-2.70	-33.76	89.64	10.35
		40-64	-2.26	-37.50	45.61	7.79
	Males	15-64	-2.12	-31.93	48.26	7.55
		15-24	-2.59	-50.00	84.62	15.24
		25-39	-2.04	-32.20	105.92	11.46
		40-64	-1.77	-40.44	58.88	8.94
	Females	15-64	-2.99	-28.02	45.16	7.67
		15-24	-2.39	-51.85	157.14	20.22
		25-39	-3.45	-49.06	66.33	12.73
		40-64	-2.53	-42.05	65.48	9.18
***ISCED* 3-4**	**Both**	15-64	0.68	-20.21	37.56	4.42
		15-24	-0.91	-32.21	53.01	8.84
		25-39	-0.94	-18.36	32.96	4.93
		40-64	2.51	-40.00	57.26	5.58
	Males	15-64	0.77	-22.60	37.08	4.74
		15-24	-0.49	-32.14	60.00	10.33
		25-39	-0.54	-19.92	33.72	5.35
		40-64	2.32	-43.33	41.46	5.80
	Females	15-64	0.59	-17.12	44.72	4.88
		15-24	-1.11	-37.78	55.40	10.75
		25-39	-1.47	-23.02	32.16	5.88
		40-64	2.90	-38.46	78.23	6.97

Source: own study based on Eurostat, World Bank and Fraser Institute data.

Table A2. Summary statistics of the independent variable

Variable	Mean	Min	Max	Standard deviation
ΔY, %	2.09	-14.84	25.18	3.84
Exports, % of GDP	60.40	18.54	205.48	34.12
Imports, % of GDP	58.53	22.85	174.60	228.83
Labour market regulation index	6.26	2.90	8.40	1.08
Business regulation index	7.19	4.96	9.00	0.85

Source: own study based on Eurostat, World Bank and Fraser Institute data.

Appendix B:

Table B1. The impact of imports on the heterogeneous relationship between economic growth and employment (ISCED0–8 and ISCED 0-2) in the EU

Age	15-64			15-24			25-39			40-64		
Gender	**Both**	**Males**	**Females**	**Both**	**Males**	**Females**	**Both**	**Males**	**Females**	**Both**	**Males**	**Females**
ISCED	**0-8**											
β_1	0.5810 (0.4079) [0.3116]*	0.8796* (0.4332) [0.3767]**	0.1767 (0.4390) [0.2856]	2.8192*** (1.1920) [1.3479]**	2.7476** (1.1703) [1.5553]*	2.9239** (1.3655) [1.1268]**	0.9956** (0.4650) [0.3656]**	1.2016** (0.4551) [0.4107]***	0.7447 (0.5226) [0.3629]*	0.0809 (0.4349) [0.3006]	0.5221 (0.4510) [0.3210]	-0.6511 (0.4870) [0.4154]
δ_1	-0.0701 (0.0940) [0.0601]	-0.1211 (0.1003) [0.0751]	0.0066 (0.1028) [0.0598]	-0.5327* (0.2907) [0.2978]*	-0.4820* (0.2804) [0.3447]	-0.5968* (0.3388) [0.2468]**	-0.1739 (0.1139) [0.0770]**	-0.2043* (0.1116) [0.0887]**	-0.1368 (0.1258) [0.0782]*	0.0389 (0.0986) [0.0615]	-0.0484 (0.1050) [0.0617]	0.2022* (0.1125) [0.0999]*
n	538	538	538	538	538	538	538	538	538	538	538	538
Adj. R^2	0.41	0.45	0.28	0.27	0.27	0.21	0.31	0.36	0.19	0.24	0.28	0.15
Pesaran CD test p-value	0.0118	0.0325	0.0058	0.0143	0.0182	0.0098	0.0222	0.0124	0.0200	0.0175	0.0180	0.0128
ISCED	**0-2**											
β_1	0.1096 (0.8894)	0.9395 (1.0031)	−1.3021 (0.8214) [0.9023]	2.7260 (1.7396)	2.5998 (1.6950)	3.1048 (1.8492)	2.0320** (0.8062)	2.6451*** (0.9108)	0.8369 (0.8705)	-0.7925 (0.9498)	0.1837 (0.9819)	-2.2987** (1.0912)
δ_1	0.0632 (0.2073)	-0.1030 (0.2413)	0.3491* (0.1909) [0.2502]	-0.4361 (0.4124)	-0.4225 (0.4019)	-0.5717 (0.4196)	-0.3200 (0.2147)	-0.4301* (0.2434)	-0.1164 (0.2049)	0.2131 (0.2128)	0.0047 (0.2392)	0.5487** (0.2498)
n	538	538	538	538	538	504	538	538	533	538	538	538
Adj. R^2	0.16	0.16	0.11	0.13	0.12	0.09	0.12	0.12	0.04	0.08	0.07	0.06
Pesaran CD test p-value	0.2610	0.2880	0.0444	0.0998	0.0958	0.1260	0.0911	0.0617	0.0873	0.9490	0.9270	0.4510

Note: *,**, *** denotes statistical significance at 10%, 5% and 1% levels, respectively. Values in parentheses represent the Arellano HAC robust standard errors and values in brackets – Driscoll-Kraay standard errors.

Source: own study based on Eurostat, World Bank and Fraser Institute data.

Table B2. The impact of imports on the heterogeneous relationship between economic growth and employment (ISCED3–4 and ISCED 5-8) in the EU

Age	15-64			15-24			25-39			40-64		
Gender	**Both**	**Males**	**Females**	**Both**	**Males**	**Females**	**Both**	**Males**	**Females**	**Both**	**Males**	**Females**
ISCED	**3-4**											
β_1	0.4635 (0.6266) [0.3506]	0.1616 (0.6730)	0.8646 (0.6110) [0.4343]*	2.7212** (1.2017) [1.2226]**	2.6115** (1.2652) [1.5687]	2.8828** (1.3085) [1.1077]**	0.4856 (0.6600) [0.4915]	0.1765 (0.8057) [0.5286]	0.7852 (0.5925) [0.6045]	0.0247 (0.6845)	-0.3450 (0.7428)	0.6227 (0.6683)
δ_1	-0.0266 (0.1512) [0.0784]	0.0665 (0.1644)	-0.1487 (0.1445) [0.1255]	-0.5051* (0.2901) [0.2613]*	-0.4471 (0.3094) [0.3393]	-0.5828* (0.3121) [0.2413]**	-0.0539 (0.1565) [0.1097]	0.0395 (0.1965) [0.1130]	-0.1518 (0.1346) [0.1541]	0.0924 (0.1758)	0.2003 (0.1939)	-0.0727 (0.1592)
n	538	538	538	538	538	538	538	538	538	538	538	538
Adj. R^2	0.15	0.16	0.09	0.19	0.15	0.12	0.12	0.13	0.08	0.07	0.08	0.03
Pesaran CD test p-value	0.0239	0.1050	0.0217	0.0065	0.0155	0.0106	0.0044	0.0240	0.0069	0.1520	0.3600	0.1050
ISCED	**5-8**											
β_1	0.4046 (0.5304)	0.4749 (0.5448)	0.2853 (0.5632)	2.7270 (1.9212) [2.4139]	2.0798 (2.1420) [2.6069]	3.4454 (2.0359) [2.6689]	0.8520 (0.7723)	0.8668 (0.8150)	0.7273 (0.8471) [0.5991]	-0.1192 (0.5867)	0.1156 (0.5600)	-0.6901 (0.6592)
δ_1	-0.0955 (0.1124)	-0.1022 (0.1189)	-0.0734 (0.1185)	-0.6035 (0.4882) [0.5374]	-0.4487 (0.5293) [0.5548]	-0.8116 (0.5311) [0.6125]	-0.1957 (0.1642)	-0.2070 (0.1755)	-0.1622 (0.1824) [0.1483]	0.0171 (0.1413)	-0.0137 (0.1230)	0.1746 (0.1477)
n	538	538	538	533	485	519	538	538	538	538	538	537
Adj. R^2	0.03	0.04	0.03	0.01	0.002	-0.004	0.05	0.04	0.05	0.01	0.02	0.02
Pesaran CD test p-value	0.694	0.9610	0.1080	0.0186	0.0278	0.0075	0.1190	0.1230	0.0295	0.5830	0.4820	0.5540

Note: *, **, *** denotes statistical significance at 10%, 5% and 1% levels, respectively. Values in parentheses represent the Arellano HAC robust standard errors and values in brackets – Driscoll-Kraay standard errors.

Source: own study based on Eurostat, World Bank and Fraser Institute data.

Table B3. The impact of exports on the heterogeneous relationship between economic growth and employment (ISCED0–8 and ISCED 0-2) in the EU

Age	15-64			15-24			25-39			40-64		
Gender	**Both**	**Males**	**Females**	**Both**	**Males**	**Females**	**Both**	**Males**	**Females**	**Both**	**Males**	**Females**
ISCED	**0-8**											
β_1	0.4831 (0.3236) [0.2491]**	0.7301* (0.3620) [0.2875]**	0.1545 (0.3193) [0.2398]	2.2918** (1.0385) [1.0283]**	2.1941** (1.0121) [1.2019]*	2.3972 (1.1804) [0.8685]**	0.8391** (0.3287) [0.2836]***	1.0195*** (0.3499) [0.3117]***	0.6239* (0.3486) [0.2921]**	0.0607 (0.3524) [0.2384]	0.4294 (0.3725) [0.2606]	-0.5218 (0.3746) [0.2923]*
δ_1	-0.0465 (0.0748) [0.0507]	-0.0858 (0.0850) [0.0595]	0.0131 (0.0745) [0.0529]	-0.4149 (0.2557) [0.2251]	-0.3576 (0.2462) [0.2650]	-0.4794 (0.2940) [0.1860]**	-0.1332 (0.0807) [0.0638]**	-0.1580* (0.0860) [0.0721]**	-0.1037 (0.0841) [0.0658]	0.0435 (0.0802) [0.0467]	-0.0274 (0.0880) [0.0491]	0.1727* (0.0868) [0.0699]**
n	538	538	538	538	538	538	538	538	538	538	538	538
Adj. R^2	0.40	0.45	0.28	0.27	0.27	0.21	0.30	0.36	0.19	0.25	0.28	0.16
Pesaran CD test p-value	0.0127	0.0327	0.0067	0.0160	0.0192	0.0107	0.0206	0.0117	0.0183	0.0163	0.0186	0.0109
ISCED	**0-2**											
β_1	0.1083 (0.7832)	0.8166 (0.8803)	-1.1095 (0.6884) [0.8888]	2.2374 (1.5097)	1.9635 (1.4014)	2.0405 (1.6424)	2.0861*** (0.6980)	2.5997*** (0.8446)	1.0134 (0.6277)	-0.8172 (0.7917)	0.0012 (0.8220)	-2.0149** (0.8913)
δ_1	0.0618 (0.1854)	-0.0762 (0.2141)	0.3030* (0.1627) [0.2530]	-0.3311 (0.3658)	-0.2776 (0.3415)	-0.3231 (0.3769)	-0.3323* (0.1889)	-0.4204* (0.2246)	-0.1555 (0.1522)	0.2176 (0.1770)	0.0458 (0.1948)	0.4813** (0.2002)
n	538	538	538	538	536	504	538	538	533	538	538	538
Adj. R^2	0.16	0.16	0.11	0.13	0.12	0.09	0.12	0.12	0.04	0.08	0.07	0.08
Pesaran CD test p-value	0.2620	0.2890	0.0450	0.1000	0.0981	0.1220	0.0894	0.0601	0.0875	0.9400	0.9360	0.4570

Note: *,**,*** denotes statistical significance at 10%, 5% and 1% levels, respectively. Values in parentheses represent the Arellano HAC robust standard errors and values in brackets – Driscoll-Kraay standard errors.

Source: own study based on Eurostat, World Bank and Fraser Institute data.

Table B4. The impact of exports on the heterogeneous relationship between economic growth and employment (ISCED3–4 and ISCED 5-8) in the EU

Age	15-64			15-24			25-39			40-64		
Gender	**Both**	**Males**	**Females**	**Both**	**Males**	**Females**	**Both**	**Males**	**Females**	**Both**	**Males**	**Females**
ISCED	**3-4**											
β_1	0.3597 (0.4644) [0.2619]	0.1160 (0.5031)	0.6883 (0.4539) [0.3174]	2.2129** (0.9742) [0.9392]	2.0280 (1.0726) [1.1970]	2.4573** (1.0145) [0.9142]	0.3391 (0.4887) [0.3650]	0.0990 (0.6015) [0.3723]	0.5833 (0.4597) [0.4659]	0.0349 (0.5335)	-0.2202 (0.5893)	0.4592 (0.5419)
δ_1	-0.0000 (0.1138) [0.0587]	0.0791 (0.1260)	-0.1047 (0.1075) [0.0979]	-0.3914 (0.2387) [0.1947]*	-0.3149 (0.2673) [0.2495]	-0.4897 (0.2415) [0.1994]**	-0.0133 (0.1163) [0.0806]	0.0634 (0.1501) [0.0742]	-0.0978 (0.1012) [0.1223]	0.0913 (0.1410)	0.1712 (0.1605)	-0.0314 (0.1268)
n	538	538	538	538	538	538	538	538	538	538	538	538
Adj. R^2	0.15	0.16	0.09	0.19	0.15	0.12	0.12	0.13	0.07	0.07	0.08	0.03
Pesaran CD test p-value	0.0240	0.1030	0.0233	0.0042	0.0165	0.0069	0.0042	0.0233	0.0070	0.1460	0.3440	0.1080
ISCED	**5-8**											
β_1	0.3925 (0.4561)	0.4497 (0.4625)	0.2855 (0.4895)	2.7861 (1.6915) [2.0222]	2.4680 (1.7858) [2.5996]	2.8952 (1.8264) [1.9967]	0.8258 (0.6435)	0.8159 (0.6914)	0.7355 (0.7076) [0.3937]*	-0.1430 (0.5080)	0.0329 (0.4610)	-0.5799 (0.5631)
δ_1	-0.0874 (0.0965)	-0.0917 (0.1020)	-0.0677 (0.1014)	-0.6252 (0.4380) [0.4469]	-0.5485 (0.4436) [0.5617]	-0.6848 (0.4858) [0.4510]	-0.1821 (0.1341)	-0.1868 (0.1476)	-0.1571 (0.1496) [0.0961]	0.0271 (0.1210)	0.0087 (0.1111)	0.1511 (0.1238)
n	538	538	538	533	485	519	538	538	538	538	538	537
Adj. R^2	0.03	0.04	0.03	0.02	0.003	-0.004	0.05	0.04	0.05	0.01	0.02	0.02
Pesaran CD test p-value	0.6630	0.9320	0.1030	0.0178	0.0269	0.0073	0.1180	0.1220	0.0286	0.5700	0.4660	0.5530

Note: *,**,*** denotes statistical significance at 10%, 5% and 1% levels, respectively. Values in parentheses represent the Arellano HAC robust standard errors and values in brackets – Driscoll-Kraay standard errors.

Source: own study based on Eurostat, World Bank and Fraser Institute data.

Appendix C:

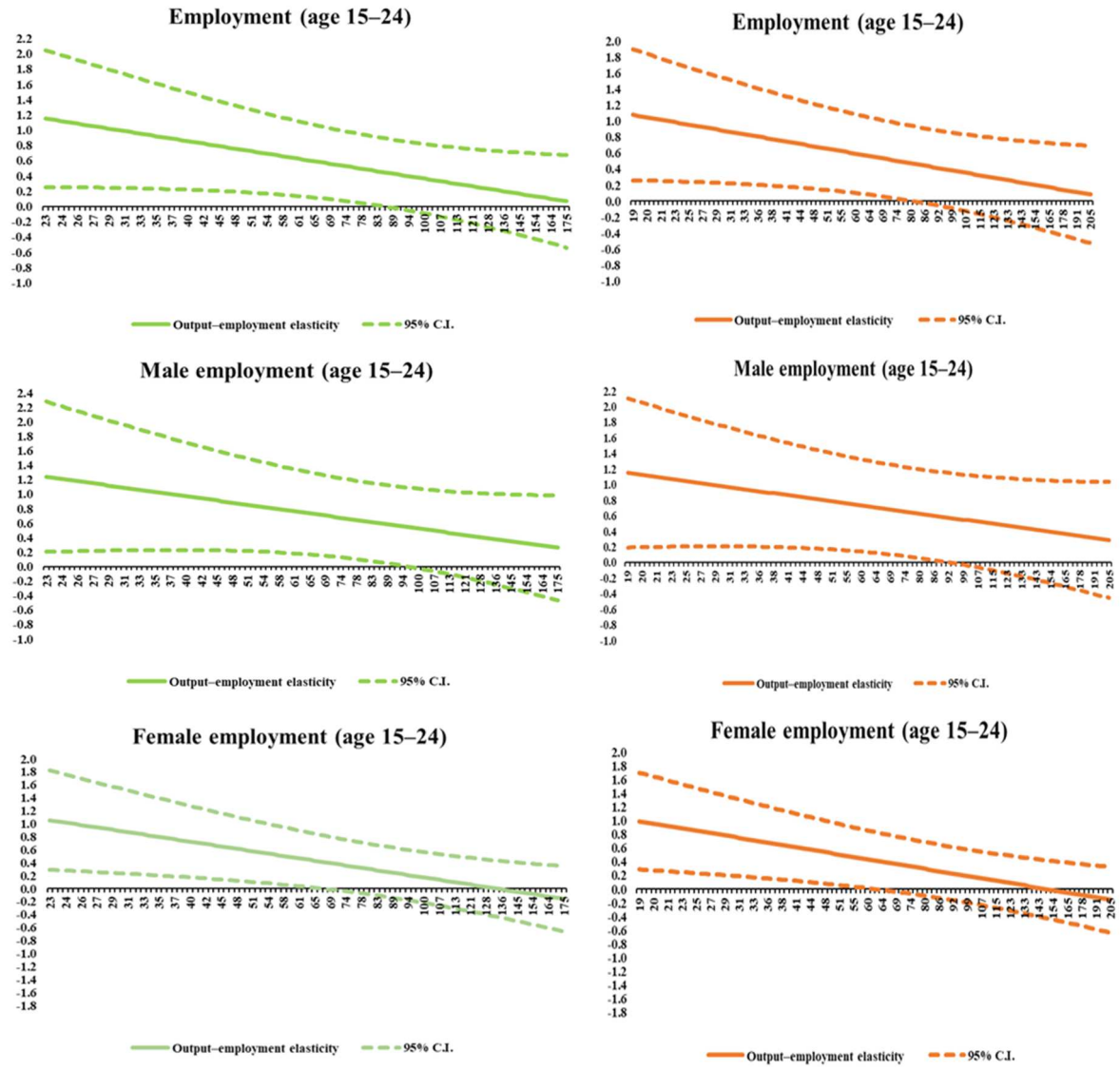

Figure C1. The impact of imports (green curves) and exports (orange curves) on the heterogeneous relationship between economic growth and youth employment by gender
Source: own elaboration based on Eurostat, World Bank and Fraser Institute data.

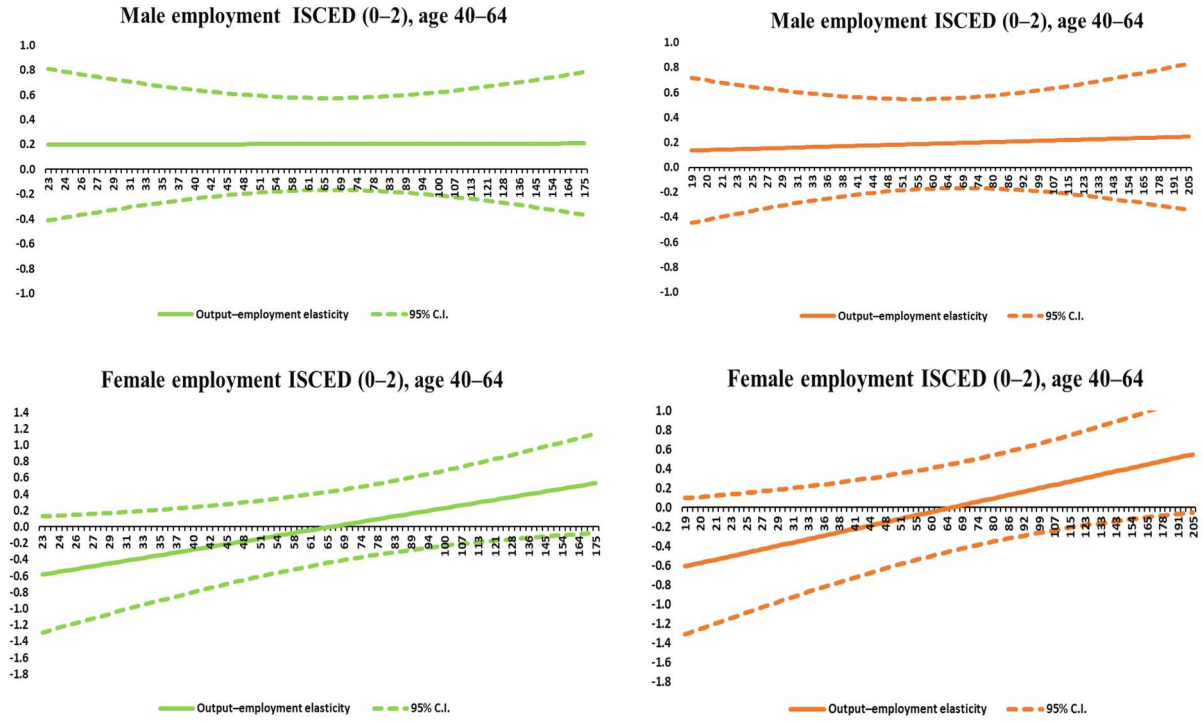

Figure C2. The impact of imports (green curves) and exports (orange curves) on the heterogeneous relationship between economic growth and employment by age, gender and education (ISCED0–2)

Source: own elaboration based on Eurostat, World Bank and Fraser Institute data.

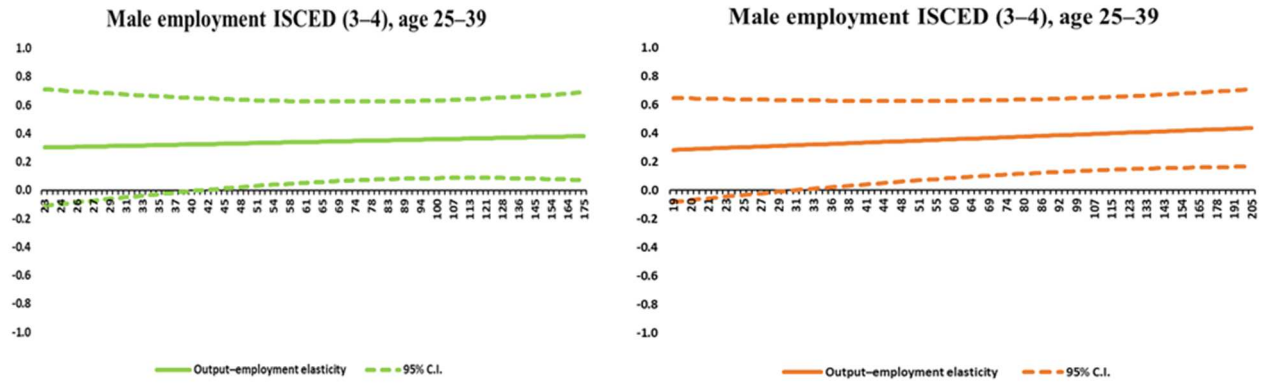

Figure C3. The impact of imports (green curves) and exports (orange curves) on the heterogeneous relationship between economic growth and employment of 25-39-year-old males with ISCED3–4 level of educational attainment

Source: own elaboration based on Eurostat, World Bank and Fraser Institute data

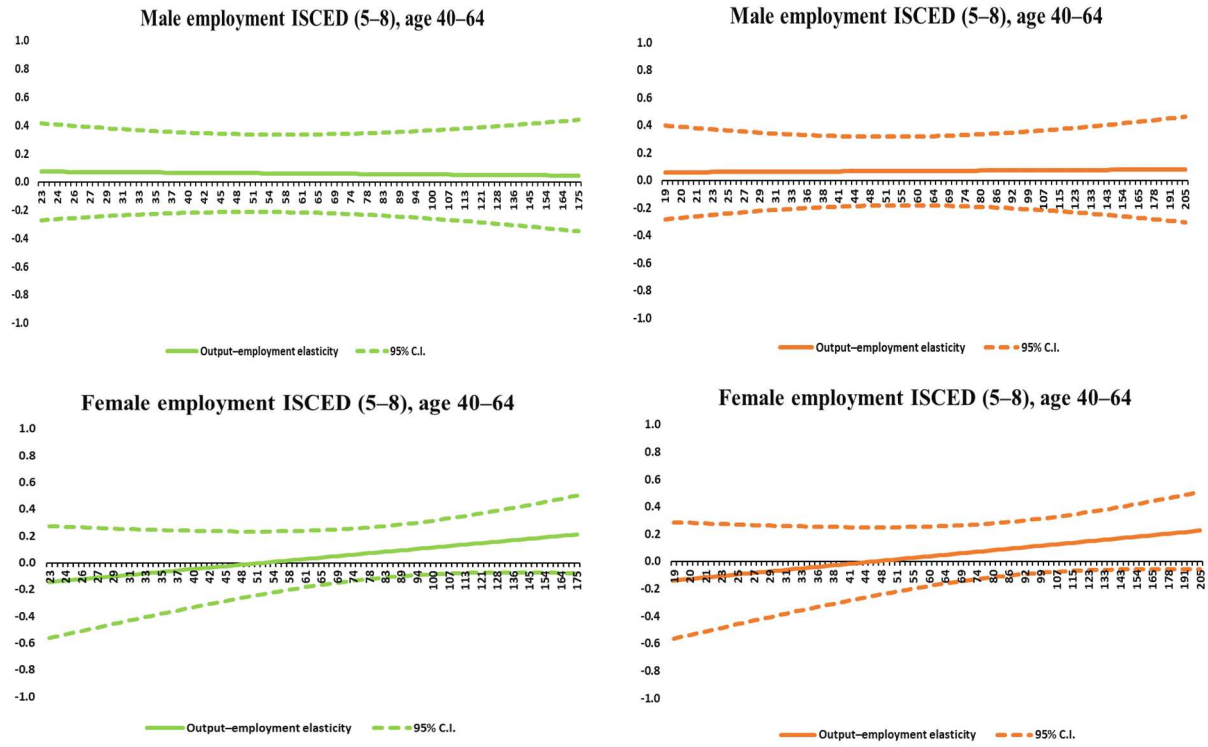

Figure C4. The impact of imports (green curves) and exports (orange curves) on the heterogeneous relationship between economic growth and employment by age, gender and education (ISCED5–8)

Note: the horizontal axis shows the level of imports and exports respectively, % of GDP, and the vertical axis shows the coefficient of employment to output elasticity.

Source: own elaboration based on Eurostat, World Bank and Fraser Institute data.

Appendix D:

Table D1. Economic growth impact on employment mediated by import and regulations in the EU

Moderator	Labour market regulation			Business regulation	
Imports	**Age**	**40-64**		**40-64**	
	Gender	**Males**	**Females**	**Males**	**Females**
	ISCED	**0-2**			
	β_1	-7.1602 (7.8800)	2.5703 (9.1891)	-46.5532*** (15.9375)	-54.4374*** (14.8657)
	δ_1	1.7906 (1.9108)	-0.6446 (2.2125)	11.7635*** (4.1008)	13.5000*** (3.7197)
	δ_2	4.0329 (4.4054)	-2.5257 (5.2175)	23.8560*** (7.8964)	26.6584*** (7.5946)
	δ_4	-0.9760 (1.0368)	0.6127 (1.2135)	-5.9817*** (2.0209)	-6.6051*** (1.8913)
	n	536	536	534	534
	Adj. R^2	0.07	0.06	0.08	0.07
	Pesaran CD test p-value	0.769	0.463	0.559	0.309
	ISCED	**5-8**			
	β_1	–	12.3052 (9.3761)	–	10.3912 (10.2387)
	δ_1	–	-3.5071 (2.3187)	–	-2.8227 (2.4641)
	δ_2	–	-6.4445 (4.9240)	–	-5.6124 (5.1614)
	δ_4	–	1.8358 (1.2112)	–	1.5112 (1.2382)
	n	–	535	–	534
	Adj. R^2	–	0.03	–	0.02
	Pesaran CD test p-value	–	0.262	–	0.276

Note: *, **,*** denotes statistical significance at 10%, 5% and 1% levels, respectively. The Arellano HAC robust standard errors are represented in parentheses.

Source: own study based on Eurostat, World Bank and Fraser Institute data.

Table D2. Economic growth impact on employment mediated by export and regulations in the EU

Moderator	Labour market regulation			Business regulation	
Exports	**Age**	**40-64**		**40-64**	
	Gender	**Males**	**Females**	**Males**	**Females**
	ISCED	**0-2**			
	β_1	-8.6077 (7.2968)	-4.8631 (8.1750)	-39.4038*** (12.2991)	-41.7386*** (10.6259)
	δ_1	2.2183 (1.6715)	1.3046 (1.8166)	10.0452*** (3.2985)	10.5940*** (2.7317)
	δ_2	4.6854 (4.1301)	1.5524 (4.7985)	20.0794*** (6.0363)	20.2192*** (5.4954)
	δ_4	-1.1733 (0.9170)	-0.4476 (1.0406)	-5.0700*** (1.6051)	-5.1277*** (1.3952)
	n	536	536	534	534
	Adj. R^2	0.07	0.07	0.09	0.08
	Pesaran CD test p-value	0.739	0.406	0.551	0.299
	ISCED	**5-8**			
	β_1	10.6246 (6.9819)	9.2197 (7.1115)	0.9925 (6.5046)	0.7748 (8.7775)
	δ_1	-3.3082 (1.9999)	-2.7783 (1.7735)	-0.4826 (1.5462)	-1.8919 (2.1106)
	δ_2	-5.1004 (3.5280)	-4.7766 (3.7346)	-0.4907 (3.2663)	-3.6968 (4.4366)
	δ_4	1.6214 (0.9867)	1.4407 (0.9222)	0.2633 (0.7749)	1.0219 (1.0579)
	n	536	535	534	534
	Adj. R^2	0.03	0.03	0.05	0.02
	Pesaran CD test p-value	0.419	0.259	0.499	0.285

Note: *, **,*** denotes statistical significance at 10%, 5% and 1% levels, respectively. The Arellano HAC robust standard errors are represented in parentheses.

Source: own study based on Eurostat, World Bank and Fraser Institute data.

Authors

The contribution share of authors is equal and amounted to ⅓ for each of them.
The contribution share of authors was equal. LDK, MB, KM – conceptualisation, LDK, MB – methodology, formal analysis and investigation. LDK - data curation. KM – literature review. LDK, MB, KM – writing—original draft preparation

Laura Dargenytė-Kacilevičienė
PhD candidate and junior assistant at Vilnius University Šiauliai Academy, Regional development institute. Her research interests include macroeconomic analysis, public finances, labour economics and organizational resilience.
Correspondence to: Vilnius University Šiauliai Academy, Institute of Regional Development, Vytauto str. 84, LT-76352 Šiauliai, Lithuania; e-mail: laura.dargenyte-kacileviciene@sa.vu.lt
ORCID http://orcid.org/0000-0002-8552-8829

Mindaugas Butkus
PhD in Economics (2012 Vytautas Magnus University, Lithuania). He is the Chief researcher and Professor at the Institute of Regional Development at Vilnius University Šiauliai Academy. His research interest include application of econometric models in the analysis of economic phenomena, assessment of regional convergence/divergence and modelling of regional convergence processes, analysis and assessment of regional policy effectiveness.
Correspondence to: Vilnius University Šiauliai Academy, Institute of Regional Development, Vytauto str. 84, LT-76352 Šiauliai, Lithuania; e-mail: mindaugas.butkus@sa.vu.lt
ORCID http://orcid.org/0000-0003-2381-5440

Kristina Matuzevičiūtė
PhD in Economics (2012 Vytautas Magnus University, Lithuania). She is an Associate Professor and Senior Researcher at the Institute of Regional Development at Vilnius University Šiauliai Academy. Her research interests include international relations, labour migration and its impact on the country's economy and assessment of the relationship between economic growth and unemployment / employment, analysis of regional policy effectiveness.
Correspondence to: Vilnius University Šiauliai Academy, Institute of Regional Development, Vytauto str. 84, LT-76352 Šiauliai, Lithuania; e-mail: kristina.matuzeviciute-balciuniene@sa.vu.lt
ORCID http://orcid.org/0000-0003-0573-0072

Acknowledgements and Financial Disclosure

The authors would like to thank the anonymous referees for their useful comments, which allowed to increase the value of this article.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright and License

Published by Krakow University of Economics – Krakow, Poland

Ministry of Education and Science
Republic of Poland

The journal is co-financed in the years 2022-2024 by the Ministry of Education and Science of the Republic of Poland in the framework of the ministerial programme "Development of Scientific Journals" (RCN) on the basis of contract no. RCN/SP/0583/2021/1 concluded on 13 October 2022 and being in force until 13 October 2024.

Entrepreneurial Business and Economics Review

2024, Vol. 12, No. 3

10.15678/EBER.2024.120308

A taxonomy of blockchain technology application and adoption by small and medium-sized enterprises

Deepak Kumar, B.V. Phani, Naveen Chilamkurti, Suman Saurabh, Vanessa Ratten

ABSTRACT

Objective: The objective of the article is to comprehensively examine the application and adoption of blockchain technology in SMEs. Recently, blockchain technology has garnered substantial attention owing to its transformative potential across diverse industries. Blockchain represents a decentralized and distributed ledger system that ensures data transparency, security, and immutability. This unique set of attributes has garnered attention from various sectors, ranging from finance and healthcare to supply chain and beyond. While predominant attention has been directed towards its impact on large corporations and financial institutions, the application and adoption of blockchain technology in small and medium-sized enterprises (SMEs) remains a relatively unexplored area.

Research Design & Methods: This research utilized a narrative and critical literature review of the existing literature on blockchain technology and SMEs.

Findings: We identified the key areas of application and drivers and barriers to SMEs' adoption of blockchain technology. Supply chain and finance have emerged as primary domains witnessing heightened blockchain implementation. The intricate nature of supply chain operations involving a multitude of stakeholders and the centralized nature of financing with inherent information asymmetry have propelled blockchain adoption within these sectors. However, the complex nature of technology, regulatory uncertainty, and lack of technological capabilities of SMEs have been the barriers inhibiting the widespread adoption of blockchain technology in SMEs.

Implications & Recommendations: The insights derived from this study can facilitate the successful design and implementation of blockchain-based solutions for SMEs. Blockchain solution providers must understand and tailor the solutions to SMEs. Blockchain-as-a-service (BaaS) can accelerate flexible application development, expediting blockchain integration in SMEs. Government, regulatory bodies, and SME groups are urged to collaborate in enhancing technological literacy among SMEs, facilitating their capacity to harness the advantages offered by blockchain technology.

Contribution & Value Added: This research contributes to the field by shedding light on the underexplored realm of blockchain technology in SMEs. The created taxonomy, examination of adoption drivers and barriers, and the formulated opportunities-challenges framework provide valuable tools for understanding and navigating blockchain technology's application and adoption-related challenges in SMEs. The identified gaps and proposed areas for future research further contribute to the ongoing discourse in this evolving field.

Article type:	research article
Keywords:	blockchain technology; small and medium-sized enterprises (SMEs); taxonomy; application; adoption
JEL codes:	O33, O35

Received: 25 November 2023 Revised: 14 February 2024 Accepted: 15 February 2024

Suggested citation:

Kumar, D., Phani B.V., Chilamkurti, N., Saurabh, S., & Ratten, V. (2024). A taxonomy of blockchain technology application and adoption in small and medium-sized enterprises. *Entrepreneurial Business and Economics Review,* 12(3), 141-160. https://doi.org/10.15678/EBER.2024.120308

INTRODUCTION

The global landscape of business operations and financial transactions has evolved in recent years. The catalyst driving this transformation is the integration of cutting-edge technologies with blockchain

technology being a prominent example. With its decentralized, transparent, and secure ledger, blockchain has emerged as a potential game-changer in various industries. Small and medium-sized enterprises (SMEs) can benefit significantly from blockchain technology, because it promises to revolutionize all domains of the SME business landscape. However, due to the newness of the technology and the inherent lack of technical expertise and resources in the SMEs, the application and adoption roadmap for Blockchain technology for SMEs is unclear.

Often called the lifeblood of most economies, SMEs occupy a pivotal position in the intricate chain of global business landscapes. They are engines of economic growth, innovation hotbeds, and employment generation stalwarts (Segers, 2016). SMEs exhibit a remarkable ability to adapt, innovate, and drive economic vitality, making them indispensable contributors to the prosperity of nations. The agility and resilience that characterize these enterprises underscore their importance as economic entities and social and technological change agents. In this era of rapid digital transformation, the adoption of cutting-edge technologies has become a distinguishing factor in the competitiveness and sustainability of SMEs (Pfister & Lehmann, 2023; Dana *et al.*, 2022). Among these transformative technologies, blockchain has emerged as a groundbreaking innovation with the potential to revolutionize the very foundations of business operations.

Blockchain's unique structure and functionalities characterized by its decentralized and tamper-resistant nature hold the potential to reshape the financial landscape for SMEs. By minimizing intermediaries, reducing transactional friction, and enhancing trust through transparent and auditable records, blockchain presents a compelling case for addressing some of the long-standing challenges SMEs face across their operations (Akpan *et al.,* 2022). Moreover, the technology's programmable smart contracts offer opportunities for automation and the creation of new financial instruments, potentially enabling innovative lending and investment models tailored to SMEs' needs.

This article embarks on an exploratory journey into the blockchain technology application and adoption in SMEs. Our primary objective was to create a taxonomy of application and adoption and provide an in-depth review of the associated drivers, barriers, opportunities, and challenges. We explored how to leverage blockchain technology to aid SMEs in enhancing financial inclusivity, operational efficiency, and access to new funding mechanisms. The identification of opportunities can lead to the development of SME-focused blockchain solutions. Analyzing associated risks accompanying blockchain integration, ranging from regulatory uncertainties and technical complexities, can help fix them and design clear roadmaps. Identifying drivers and barriers to blockchain adoption can help expedite the diffusion of the technology amongst SMEs.

In the following part, we will establish foundational definitions and key concepts pertinent to blockchain technology. Subsequently, we will provide a detailed overview of the materials and methodologies employed in the study. The ensuing discussion section presents the findings, focusing on the taxonomy of blockchain technology application and adoption in SMEs and presenting the opportunities and risks framework. Concluding, we will summarize its contributions, discuss implications derived from the study, and outline potential paths for future research.

LITERATURE REVIEW

Blockchain technology is a decentralized and distributed ledger system that records and verifies transactions securely across multiple nodes or computers (Casino *et al.,* 2019). Each transaction is encapsulated within a block and then added to a sequence of prior blocks, constituting a tamper-resistant and chronological record of all transactions (Crosby *et al.*, 2016). Blockchain operates within a peer-to-peer network, eliminating the need for a central authority. In this decentralized system, multiple participants, often called nodes, access and validate the same data. This collaborative approach fosters a distributed structure, ensuring no single entity controls the entire network. Figure 1 illustrates the transaction process in blockchain technology.

Blockchain relies on consensus mechanisms to validate and agree upon the ledger's state. These mechanisms play a crucial role in ensuring blockchain's integrity and security. Notable examples of consensus mechanisms include proof of work (PoW), proof of stake (PoS), and delegated proof of

stake (DPoS). Each mechanism has its unique approach to validating transactions and maintaining the blockchain, contributing to the system's robustness and efficiency. Smart contracts, a central innovation in blockchain technology, are self-executing agreements with predetermined rules encoded directly onto the blockchain (Philipp *et al.,* 2019). These contracts automatically enforce terms and execute actions once specific conditions are met. Smart contracts have diverse applications, from facilitating automated payments to managing complex business processes. They create a trustless multi-party business ecosystem involving tamper-proof transactions.

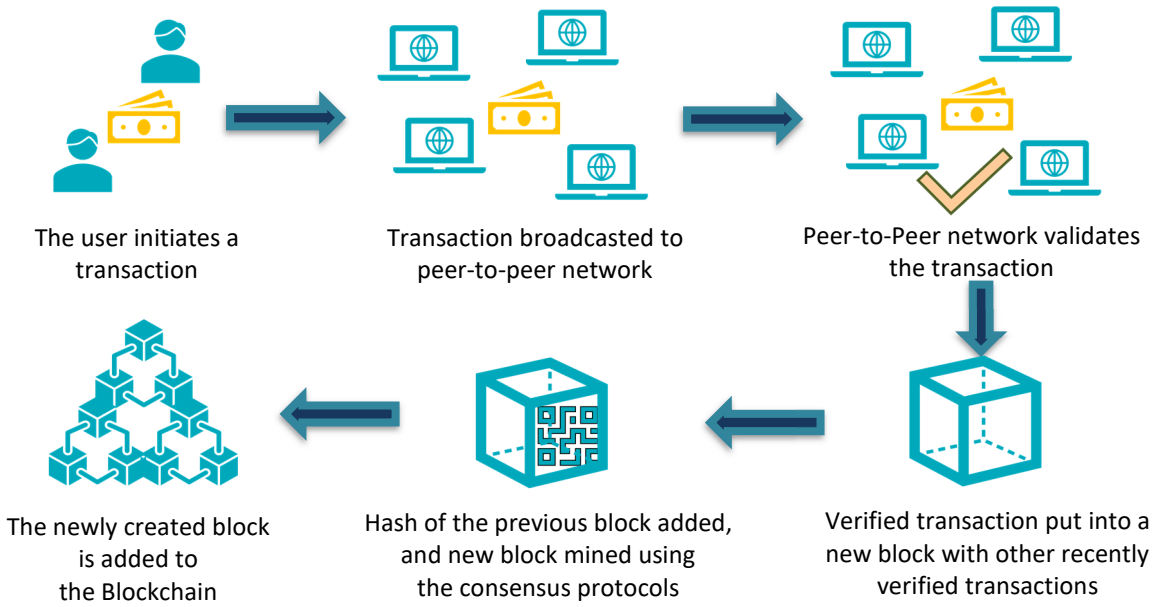

Figure 1. Blockchain transaction process
Source: own elaboration.

Another innovative feature is blockchain tokens, digital assets, or units of value created and managed on a blockchain. These tokens can represent various forms of value, including cryptocurrencies, utility tokens, or security tokens (Ante, 2020). They have become integral to blockchain ecosystems, enabling various use cases such as facilitating transactions, accessing specific services, or participating in decentralized applications (DApps). Tokens can be traded, exchanged, and utilized within the blockchain network and even beyond, incentivizing and governing participation within the blockchain community.

Blockchain technology encompasses various types, primarily classified into public, private, and Hybrid blockchains, each tailored to distinct requirements within the blockchain landscape (Crosby *et al.*, 2016). Public blockchains represent an open, permissionless paradigm, permitting widespread participation and fostering transparency. Prominent exemplars of public blockchains encompass the likes of Bitcoin and Ethereum, which excel in applications necessitating trust among potentially anonymous participants. In contrast, private blockchains manifest as exclusive and permissioned networks expressly designed for deployment within regulated and controlled environments. These networks impose limitations on participation, typically granted through invitations or established processes. Their utilization predominantly revolves around internal record-keeping, supply chain management, or collaborations among select entities.

Hybrid blockchains represent a dynamic fusion of public and private blockchain attributes, striking an equilibrium between transparency and privacy (Dutta & Saini, 2021). Within this framework, select components of the blockchain infrastructure are publicly accessible, while others remain private, confined to specific participants. Hybrid blockchains are especially well-suited for scenarios that demand varying degrees of data transparency, affording the flexibility to leverage the benefits of public blockchains while concurrently preserving the confidentiality and control of sensitive information. The selection among these diverse blockchain typologies is contingent upon the specific requirements, objectives, and gov-

ernance considerations intrinsic to the entities and applications under consideration. Such a discerning choice proves indispensable in facilitating the judicious implementation of blockchain technology.

Blockchain's core feature lies in its capacity to establish transparent and auditable transaction records. By creating tamper-proof ledgers that capture every transaction, blockchain fosters trust and accountability among its users. This transparency is particularly beneficial in scenarios requiring multiple parties to access and verify shared data, such as supply chain management and financial transactions. It is a shared source of truth, reducing conflicts and enhancing collaboration (Philipp *et al.*, 2019). The cryptographic foundation of blockchain forms a robust defence against data tampering and fraud. It ensures the integrity and immutability of data, rendering it resistant to unauthorized modifications. Employing security measures like digital signatures and encryption, blockchain engenders high trust in data authenticity. This attribute is especially vital in sensitive sectors like healthcare and finance, where data privacy and integrity are paramount.

One of blockchain's primary advantages is its potential to enhance operational efficiency significantly. Blockchain streamlines transactions by eliminating intermediaries and manual reconciliation processes, reducing time, costs, and error rates associated with traditional systems (Genta *et al.*, 2021). This newfound efficiency translates into faster, cost-effective operations, ultimately bolstering productivity and competitiveness across various industries, from cross-border payments to supply chain logistics. A central hallmark of blockchain is its decentralization, with no central authority in control. This empowers participants and diminishes the risk associated with single points of failure. Decentralized networks exhibit greater resilience with no singular entity capable of causing widespread disruption if compromised. This feature is especially pertinent in critical applications like voting systems and digital identities, where trust is paramount even without central control. Figure 2 provides an overview of Blockchain technology features and its resultant benefits.

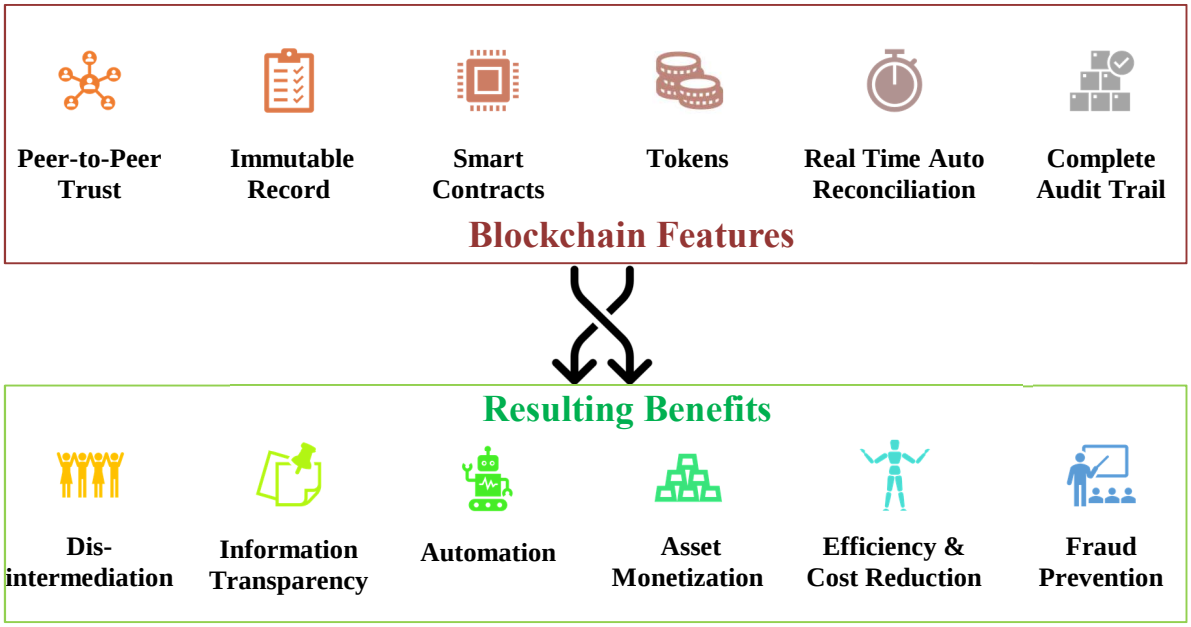

Figure 2. Blockchain features and resulting benefits
Source: own elaboration.

Blockchain relies on consensus mechanisms and cryptographic techniques for verifying and validating transactions, reducing the reliance on intermediaries for trust. This holds particular significance in industries where intermediaries traditionally play a pivotal role, such as the real estate and legal sectors. The blockchain simplifies complex processes, reduces dependency on third parties, and expedites transactions (Genta *et al.*, 2021). For SMEs, the potential for cost savings is particularly compelling. Blockchain optimization minimizes redundancy and overhead costs, leading to efficient resource allocation, reduced administrative expenditures, and an enhanced competitive edge for SMEs.

By streamlining operations and reducing the need for intermediaries, blockchain technology offers cost-effective solutions to help SMEs flourish in today's fiercely competitive business landscape. Combining these features and advantages underscores blockchain's transformative potential across diverse industries, redefining how businesses operate, collaborate, and manage their data. Understanding and harnessing these attributes can lead to more efficient and secure processes, benefiting organizations of all sizes.

RESEARCH METHODOLOGY

In this research article, we undertook a comprehensive examination of the application and adoption of blockchain technology in SMEs through a narrative and critical literature review following the approach outlined by Ratten (2023). Employing a methodology that builds upon existing research and prior literature, we explored the academic landscape of blockchain technology in SMEs. We used 'SME' and 'Blockchain' as keywords for the initial literature search and successively screened the result by title and abstract analysis followed by full-text screening. We classify the collected literature into different themes of blockchain technology application in SMEs to create the taxonomy and then analyze each of these themes to present and reflect on the trends therein.

The study also draws some methodological lessons from Korzynski *et al.* (2023). Through analyzing pertinent academic literature in the area, we crafted a taxonomy encompassing key themes related to the application and adoption of blockchain technology. The taxonomy developed through our analysis is an organizational tool to distil key themes, fostering a deeper understanding of the subject. We acknowledge and address inherent limitations through continuous reflexivity, ensuring transparency and credibility. The synthesis of findings contributes to the evolving knowledge base, offering valuable insights into the nuances, challenges, and future trajectories of blockchain technology adoption in the SME sector.

Through this article, we created a pivotal conceptual contribution, wherein an exhaustive literature review has led to formulating a detailed taxonomy of blockchain technology application and adoption in SMEs. Our exploration extended across diverse dimensions of blockchain technology applications in SMEs, culminating in developing a nuanced thematic taxonomy. The investigation further delved into various adoption theories and frameworks employed to analyze the adoption of blockchain technology in SMEs, resulting in conceptual frameworks delineating the enablers and barriers to adoption. Moreover, this comprehensive analysis unveiled the associated opportunities and challenges of blockchain adoption in SMEs. The conceptual framework presented herein is an invaluable guide for SMEs, blockchain solution providers, and researchers, offering direction for exploring and designing blockchain-based solutions tailored for SMEs.

RESULTS AND DISCUSSION

Blockchain Technology Applications in SMEs

Blockchain technology offers a wide array of applications for SMEs spanning various sectors, including finance, supply chain finance (SCF), supply chain management (SCM), manufacturing, IT infrastructure, collaboration, energy, human resource management (HRM), and marketing. This technology has the potential to play a pivotal role in addressing inefficiencies arising from the involvement of numerous intermediaries and conventional methods. In SCM, Blockchain fosters transparency, enhances traceability, and improves product quality (Casino *et al.*, 2019). It can also streamline manufacturing, promote collaboration, enhance energy trading, and improve HRM processes.

Blockchain is a transformative force within the supply chain finance sector, bolstering participant coordination and trust while reducing credit risk and providing transparency and traceability (Yang, 2021). These changes are particularly advantageous in sectors like the food industry, leading to improvements in product quality. Figure 3 provides a taxonomy of blockchain technology applications in SMEs based on analyzing available literature on SMEs and blockchain technology. Within the financial sector, blockchain's transformative influence extends to creating a financing paradigm characterized by enhanced transparency, security, and trust through its distributed ledger and cryptographic features. In

turn, this reduces information asymmetry and gives rise to a blockchain-based credit system capable of better distinguishing between varying risk profiles (Anwar, 2019).

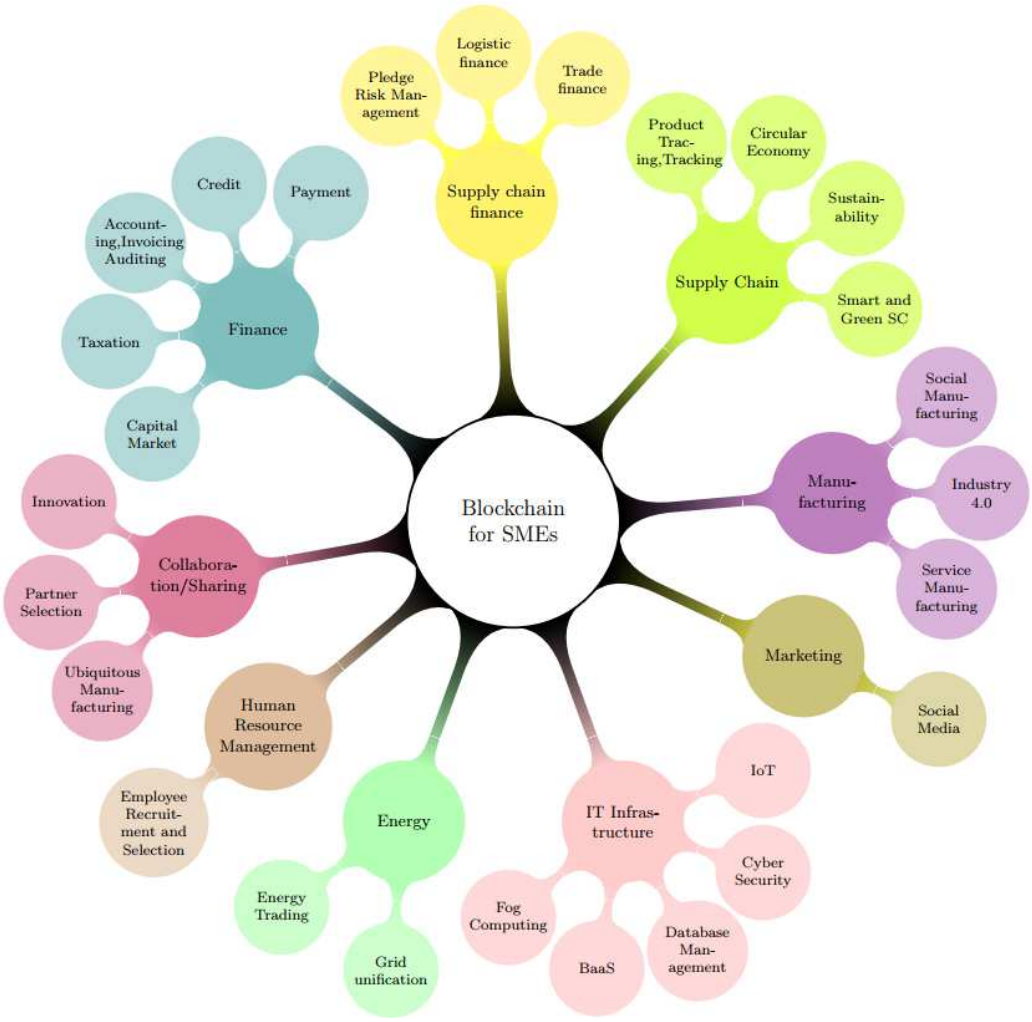

Figure 3. Taxonomy blockchain applications for small firms
Source: own elaboration.

Blockchain's positive impact extends to payment systems, taxation, and auditing. Automating financial processes and incorporating smart contracts alleviates administrative burdens for SMEs in obtaining timely capital. This technological innovation has the potential to substantially aid cost savings and increase access to essential financial tools, equipping SMEs to compete globally. The section below discusses the application of blockchain technology in SMEs across the domains depicted in Figure 3.

Finance

The financial system's inefficiencies, rooted in outdated practices, centralization, and exclusivity, can be transformed by blockchain technology, streamlining financial operations and making them more efficient and accessible (Kumar *et al.*, 2023). This transformation can be especially beneficial for SMEs as they often struggle to obtain timely and affordable capital during cash shortages (Dimitropoulos *et al.*, 2020). Prevalent information asymmetry and a lack of sufficient collateral block SMEs' access to finance, hindering their growth and expansion (Kumar & Rao, 2016). Blockchain technology addresses these issues by enhancing information availability and sharing among stakeholders. Distributed ledgers on the blockchain record and share data, mitigating original information asymmetry (Utkarsh *et al.*, 2022). This allows SMEs with a low-risk profile and strong performance metrics to demonstrate their creditworthiness and access loans without collateral.

Furthermore, blockchain can significantly improve the credit system by enhancing transparency, equalizing access to transaction and default records, and using smart contracts to automate loan processes. It enables users to instantly share default information with all lenders and corporations, which increases the cost of default for companies, acting as a screening method. This enables blockchain-based credit systems to distinguish between different risk classes, thus mitigating credit rationing issues (Wang *et al.*, 2019). For example, in a blockchain-based e-commerce platform for SMEs, the authenticity, transparency, and unforgeability of trading and logistical data serve as sources for data financing, with banks evaluating loan firms based on historical transaction and logistics data (Jiang & Chen, 2021). Moreover, blockchain can address the agency problem by reducing information asymmetry between matching agencies and network users, increasing transparency, and reducing transaction costs (Chang & He, 2018).

Blockchain technology can improve credit reporting systems for SMEs by utilizing big data and blockchain to create a comprehensive credit evaluation system (Sun *et al.*, 2021). Blockchain-based distributed credit evaluation architecture can offer a more accurate and complete evaluation of enterprise credit status. Smart contracts integrated with current systems can enhance the efficiency and transparency of microfinance institutions. Anwar (2019) notes that each entrepreneur or organization approaching the bank for microfinance can sign a unique smart contract, serving as an identity for loan issuance and transparency in loan records. This system reduces defaults and strengthens the role of central banks as regulatory bodies.

Besides credit, blockchain technology has applications in various financial areas, including banking, payments, taxation, and auditing. For example, it can improve transparency in the deposit market and streamline payment processes in industries with transaction delays (Giuda *et al.*, 2020). It also has the potential to revolutionize tax settlement, reducing administrative burdens on SMEs (Søgaard, 2021). Blockchain technology enhances trust in financial transactions, leading to lower financing costs for SMEs. The technology is poised to reinvent the financial ecosystem by reducing transaction costs and processing times and improving transaction security. This can benefit SMEs by making timely and affordable financing available.

Supply Chain Finance

Supply chain finance (SCF) is a banking service designed to streamline the flow of capital within supply chains. Conventional SCF models, including accounts receivable, prepayment, and inventory financing, often fail to meet SMEs' specific requirements due to their inherent inefficiencies. Blockchain technology presents a promising solution to address these challenges by providing a decentralized, transparent, and secure ledger of transactions. This innovative approach not only enhances the efficiency of supply chain finance but also significantly reduces transaction costs associated with information asymmetry (Feng & Wang, 2022). Moreover, the intricate nature of collaboration and coordination within supply chains involving financial institutions, core firms, and various supply chain entities mirrors the capabilities of blockchain technology. By fostering mutual trust among all supply chain entities, blockchain enhances coordination efficiency within SCF, allowing multiple institutions to cooperate while eliminating the risk of private collusion seen in traditional SCF models (Zhang *et al.*, 2021).

A blockchain-based architecture streamlines SCF using smart contracts to coordinate with different agents autonomously. The dynamic pledge management process, characterized by transparency, reliability, and cost-efficiency, reduces the need for third-party intermediaries, expediting transactions and minimizing errors in supply chain processes (Xu *et al.*, 2021). Blockchain also addresses information gaps in supply chains, particularly at the chain's margins, where companies face difficulties accessing financial support. By enhancing traceability, transparency, and authenticity, blockchain reduces attenuation in credit transmission, facilitating credit access for SMEs in SCF (Xu *et al.*, 2021). Furthermore, blockchain overcomes the information island challenge, where information concentration at core companies limits access for other supply chain participants. Blockchain bills ensure that information is certified by all participating nodes, allowing SMEs at the end of the supply chain to access low-cost finance and financing services (Zhang *et al.*, 2021).

Blockchain technology has revolutionized SCF in several ways, including platform development, innovative SCF models, and in-depth mechanism design. These blockchain-powered SCF platforms bring together stakeholders from different layers, introducing self-guarantee mechanisms that boost SMEs' credit access and overall SCF sustainability (Liu *et al.*, 2023). For instance, in the Kenyan retail trade industry, blockchain has simplified SMEs' access to financial products by implementing a three-party transaction model involving buyers, sellers, and intermediaries, supported by a hyperledger fabric blockchain backend (Kinai *et al.*, 2017). In trade financing, blockchain streamlines processes by reducing stages and verifications, improving information sharing, and increasing accessibility for SMEs. This transparent and interconnected approach benefits all parties, including buyers, sellers, banks, and shippers, leading to more favourable trade financing terms for SMEs.

Blockchain technology contributes to SCF risk management by improving supply chain information transparency and reducing credit, operational, and collateral risks while enabling real-time monitoring. Combining the internet of things (IoT) and blockchain further enhances risk management in SCF (Li *et al.*, 2019). Blockchain is also instrumental in developing sustainable SCF models by addressing legal and regulatory challenges, thereby improving the overall supply chain finance ecosystem (Nayak & Dhaigude, 2019). Notable platforms like we.trade and Linklogis harness blockchain to enhance supply chain visibility and credibility, facilitating bank financing for SMEs.

Supply Chain Management

There are two primary directions of blockchain applications in SCM: streamlining operations and ensuring the authenticity and provenance of materials and products. Blockchain has been deployed in supply chain management for various purposes, such as automation, improved integration across supply chain streams, enhanced traceability, tracking, restructuring agricultural commodity trading, and creating smart rural supply chains (Gerasimova *et al.*, 2021). It reduces administrative complexities and costs by facilitating secure data sharing among geographically dispersed parties, lowering transaction times and overheads.

Blockchain supports transparent, real-time tracking, enhancing product lifecycle management, and optimizing various supply chain functions through smart contracts. The technology also enhances product quality, customer relationships, and visibility for SMEs. By boosting transparency and trust through a distributed ledger, blockchain can help small firms establish good reputations. Innovative blockchain-based platforms that support fair trade, authenticity in documentation, and cost reduction can benefit SMEs (Nowiński & Kozma, 2017). Blockchain helps secure geographical indication (GI) tags for regional food products by ensuring traceability throughout the supply chain. The technology prevents identity fraud, ensures food safety, and provides origin information (Katsikouli *et al.*, 2021).

In the supply chain industry, blockchain can usher into smart agriculture and smart logistics (Gerasimova *et al.*, 2021). Digitization, IoT, big data, and blockchain enhance supply chain traceability and transparency, driving sustainability and efficiency (Desai *et al.*, 2019). They enable more accurate consumer reactions, demand forecasts, and reduced inventory. Blockchain's decentralization and tamper-proof records enhance security and transparency in the supply chain, particularly in geographically dispersed, small producer-heavy food chains (Adams *et al.*, 2021). Major players like Walmart, Maersk, and Nestle have adopted blockchain in the supply chain to improve efficiency, reduce costs, ensure product freshness, and verify product authenticity and origin.

Manufacturing

Blockchain technology can assist SMEs in improving demand and supply planning, reducing production costs, and fostering manufacturing collaboration. It can usher into Industry 4.0, empowering SMEs to digitalize and optimize their production processes (Rymarczyk, 2020; Karamchandani *et al.*, 2021). It can enable secure data sharing, access management, and remote maintenance among the SMEs. In the context of Industry 4.0, smart contracts bring self-enforcing capabilities, enabling cloud and ubiquitous manufacturing, enhancing demand and supply planning, reducing overproduction, and lowering costs (Barenji *et al.*, 2019). Blockchain is a pivotal enabler of the shared economy, especially for SMEs in social manufacturing (Liu & Jiang, 2020). Blockchain enhances cooperation and trust among geo-

graphically dispersed MSMEs, creating more efficient manufacturing communities. Service manufacturing, a shift from traditional product-centric models, leverages digitalization and customer-centric strategies. Blockchain digitizes manufacturing resources through a multi-layer secure digital twin platform, accelerating the transition to service-oriented manufacturing (Liu *et al.*, 2021).

Collaboration and Sharing

Small and medium-sized enterprises are adopting cloud and ubiquitous manufacturing to foster trustworthy collaboration and information sharing in a dynamic market (Barenji *et al.*, 2019). By automating data exchange and promoting connection among participants, blockchain technology aids decentralized business communities (Petek & Zajec, 2018). However, concerns arise about public data sharing, as some players, like SMEs in the food supply chain, are cautious about revealing proprietary knowledge (Ali *et al.*, 2021). Blockchain and smart contracts enhance cross-organizational collaboration, benefiting entrepreneurs and SMEs by reducing entry barriers and corporate dominance (Sciarelli *et al.*, 2021).

Decentralized autonomous organizations (DAOs) allow for the creation of distributed organizations driven by organizational entrepreneurship, many of which are based on blockchain technology (Poeschl, 2023). The DAO members' self-organization and entrepreneurial behaviour are crucial to the organization's development. Distributed ledger technology provides secure intellectual property protection, smart contract execution, and data privacy, fostering cooperation and regulatory compliance in manufacturing networks. Industry-University cooperation offers a path for SMEs to improve technological capabilities with partner selection being critical for success (Ran *et al.*, 2020).

IT Infrastructure

Blockchain ensures secure and decentralized data storage, reducing IT infrastructure costs and improving data security. It also supports decentralized applications (DApps), enhancing scalability and flexibility while lowering costs. In the digital transformation era, SMEs grapple with data dispersion that hinders effective utilization. Liu *et al.* (2020) proposed a blockchain-based platform that integrates decentralized identification to ensure data source authenticity and secure user data storage, aided by smart contracts and federated learning models to extract value from data. To combat the rising tide of cyber-attacks, particularly impacting small firms, Lopez *et al.* (2020) introduced an intelligent cybersecurity platform, combining machine learning and blockchain, which covers all phases of attacks, including prevention and recovery. Sadeq *et al.* (2021) advocate for blockchain to enhance data security, utilizing its intrinsic hash replication and mining algorithm to detect unauthorized data alterations.

Energy

Blockchain has found prominent applications for SMEs in the energy sector, from energy transmission to trading. Markakis *et al.* (2021) presented a groundbreaking solution that empowers small energy producers, like solar panel grids, to sell surplus energy via a blockchain-based energy brokerage, promoting peer-to-peer energy transactions. Leelasantitham (2020) offers a decentralized model for peer-to-peer electricity trading among Thai consumers and SME prosumers, aimed at saving on electricity costs. Extending this model to the mobility sector, Li *et al.* (2021) developed a blockchain network with smart contracts to bypass network congestion and enable electric vehicle peer-to-peer energy trading, incorporating a superconducting energy storage unit to enhance transaction reliability and user matching. This innovative approach enhances the success rate and demand consumption in electric vehicle peer-to-peer energy trading.

Human Resource Management (HRM)

Small and medium-sized enterprises encounter diverse challenges in attracting and retaining human resources (Koronios *et al.*, 2020). Blockchain provides a secure means to verify the authenticity of candidates' educational and employment history, aiding SMEs in more efficient recruitment. It enhances productivity by matching skills and performance with job requirements. Rhemananda *et al.* (2021) introduced a blockchain-based framework for human resource management in small firms, enhancing hiring by providing secure proof of candidates' educational and employment history, thus increasing productivity.

Marketing

Blockchain fosters trust and transparency in marketing by offering secure product tagging and verification, protecting brands from counterfeiting, and improving user experience. Small firms face marketing challenges due to limited resources, and the growing non-face-to-face e-commerce transactions pose moral hazard risks. Jiang and Chen (2021) developed an intelligent matching module to aid SMEs in connecting with relevant trading partners. Rotondi and Saltarella (2019) proposed a product tagging solution to protect SME brands, improve user experience, and combat counterfeit products.

Blockchain Technology Adoption in SMEs

The landscape of investment in blockchain-based business solutions is experiencing exponential growth. However, the broader adoption of blockchain technology by businesses, particularly small enterprises, remains notably subdued (Molati *et al.*, 2021). We may attribute this apparent restraint to several factors. Primarily, the novel nature of blockchain and its inherent complexity pose challenges, particularly for smaller firms with comparatively limited technical understanding. The transition from proof of concept to widespread applications has proven to be a formidable hurdle for numerous projects, resulting in fragmented utilization. Moreover, the financial constraints commonly faced by SMEs act as a barrier to embracing cutting-edge technology. In the above context, we explored the existing literature on blockchain adoption by SMEs to conceptualize the inherent drivers, barriers, opportunities, and challenges of blockchain adoption in SMEs.

A Brief Overview of Technology Adoption Frameworks and Perspectives

To comprehend the intricate process of technology adoption, researchers and practitioners have developed a range of frameworks and perspectives that offer insights into the factors influencing the acceptance, diffusion, and integration of innovative technologies. These frameworks encapsulate the multidimensional nature of technology adoption, accounting for individual beliefs, social dynamics, organizational structures, and contextual factors. Table 1 presents a concise overview of prominent technology adoption frameworks and perspectives contributing to our understanding of blockchain adoption in SMEs.

Frameworks Used to Study Blockchain Adoption in SMEs

The decision-making process for technology adoption within firms is inherently complex, influenced by an intricate interplay of factors spanning technical, social, environmental, cultural, and behavioural domains. This decision becomes even more arduous for small businesses due to their limited resources and technical capabilities. Researchers conducted an academic exploration of blockchain adoption using diverse frameworks and theories as depicted in Figure 4. These frameworks illuminate the multidimensional considerations that influence SMEs' choices when it comes to the integration of blockchain technology. By examining these varied lenses, we can understand the challenges and opportunities underpinning the adoption journey for SMEs in the blockchain landscape.

Factors Influencing Blockchain Technology Adoption in SMEs

Despite the promising potential of blockchain technology, widespread adoption remains in its early stages. Based on the studies listed in Figure 4, we compiled the factors that affect blockchain technology adoption in SMEs into enablers, barriers, moderators, and insignificant ones. Enablers serve as catalysts, expediting the acceptance and utilization of new technology, while barriers represent the impediments that slow down or obstruct the adoption process. On the other hand, moderators influence the strength and direction of the effect of enablers and barriers. They can either amplify or mitigate the impact of these enablers and barriers based on the unique context and characteristics of the adopters. Insignificant factors denote elements that have minimal influence on the overall technology adoption process. Figure 5 provides a concise synthesis of the determinants governing the adoption of blockchain technology in SMEs. As these factors intersect and evolve, they shape the trajectory of blockchain integration among small businesses, guiding their decisions and highlighting the strategic considerations that pave the way forward.

Table 1. Technology adoption frameworks and perspectives summary

Technology acceptance model (TAM)	Proposed by Davis (1986), TAM focuses on individual attitudes and behaviours toward technology adoption. It posits that perceived usefulness and perceived ease of use are pivotal determinants that influence an individual's acceptance and eventual use of technology.
Unified theory of acceptance and use of technology (UTAUT)	Developed by Venkatesh *et al.* (2003), UTAUT integrates several preceding models to identify four core determinants of technology adoption: performance expectancy, effort expectancy, social influence, and facilitating conditions.
Technology-organization-environment (TOE) framework	TOE Framework recognizes the interaction between technological factors, organizational dynamics, and environmental influences in shaping technology adoption. This framework emphasizes variables like organizational size, top management support, external pressures, and technological complexity.
Post-acceptance model (PAM)	Extending TAM, PAM delves into post-adoption behaviour, encompassing variables like user satisfaction, continued usage, and word-of-mouth communication.
Diffusion of innovations (DOI) theory	Introduced by Rogers (1962), DOI offers a comprehensive framework for understanding how new technologies spread across social systems. This theory classifies adopters into distinct categories and emphasizes the role of communication channels, social networks, and the perceived attributes of innovations in the adoption process.
Innovation diffusion in networks (IDN) model	The IDN model focuses on the network's social structure and its role in driving innovation diffusion. It considers factors such as network node characteristics and the nature of ties between nodes to elucidate how innovations spread through interconnected relationships.
Social cognitive theory (SCT)	Developed by Bandura, SCT suggests that personal cognition, environmental factors, and behaviour influence individual behaviour. It underscores the significance of self-efficacy, observational learning, and outcome expectations in technology adoption.
Innovation theory perspective (ITP)	The innovation theory perspective focuses on the attributes of innovations, such as novelty, complexity, and compatibility, and their impact on adoption and diffusion. It underscores innovation management strategies and their role in fostering adoption.
Socio-technical perspective (STP)	The socio-technical perspective underscores the interplay between social and technical components in technology adoption. It emphasizes aligning technical and social systems for successful adoption and effective utilization.
Knowledge management perspective (KMP)	The knowledge management perspective focuses on how organizations create, share, and apply knowledge while adopting technology. It highlights the importance of knowledge sharing, learning processes, and transfer mechanisms in facilitating adoption.
Extended complexity theory (ECT)	The extended complexity theory applies complexity theory principles to technology adoption. It acknowledges adoption's intricate, nonlinear nature influenced by interconnected factors, feedback loops, and emergent behaviour.

Source: own study.

Among the myriad factors that impact blockchain adoption in SMEs, several stand out as pivotal for small firms. Notably, the steadfast support of top management, the comparative advantage offered by the new technology over its predecessors, technological compatibility, and competitive pressures have emerged as the most pronounced catalysts driving blockchain integration in SMEs (Molati *et al.*, 2021; Bhardwaj *et al.*, 2021). Conversely, the formidable hurdles that inhibit such adoption primarily encompass the cost implications and the intricate nature of the technology itself. The lack of management vision and cultural disparities among supply chain partners are other key inhibitors (Bag *et al.*, 2021; Kaur *et al.*, 2022). These formidable barriers obstruct initial progress and can cascade into other obstacles within the system, further impeding the integration of blockchain technology.

The adoption of blockchain technology is still in its early stages, as researchers continue to explore its complexities and potential applications. A striking observation is the role of regulatory support, which, thus far, has shown to be an insubstantial determinant of blockchain adoption across small firms (Bhardwaj *et al.*, 2021; Molati *et al.*, 2021). The crux of this assertion is that despite its promise, the technology has yet to materialize in extensive real-world implementations. The advent of supportive standards and laws to bolster SME engagement with blockchain technology is still in progress, creating uncertainty among SMEs regarding the technology's regulatory landscape. Therefore, the pressing need to establish norms and regulations becomes more apparent.

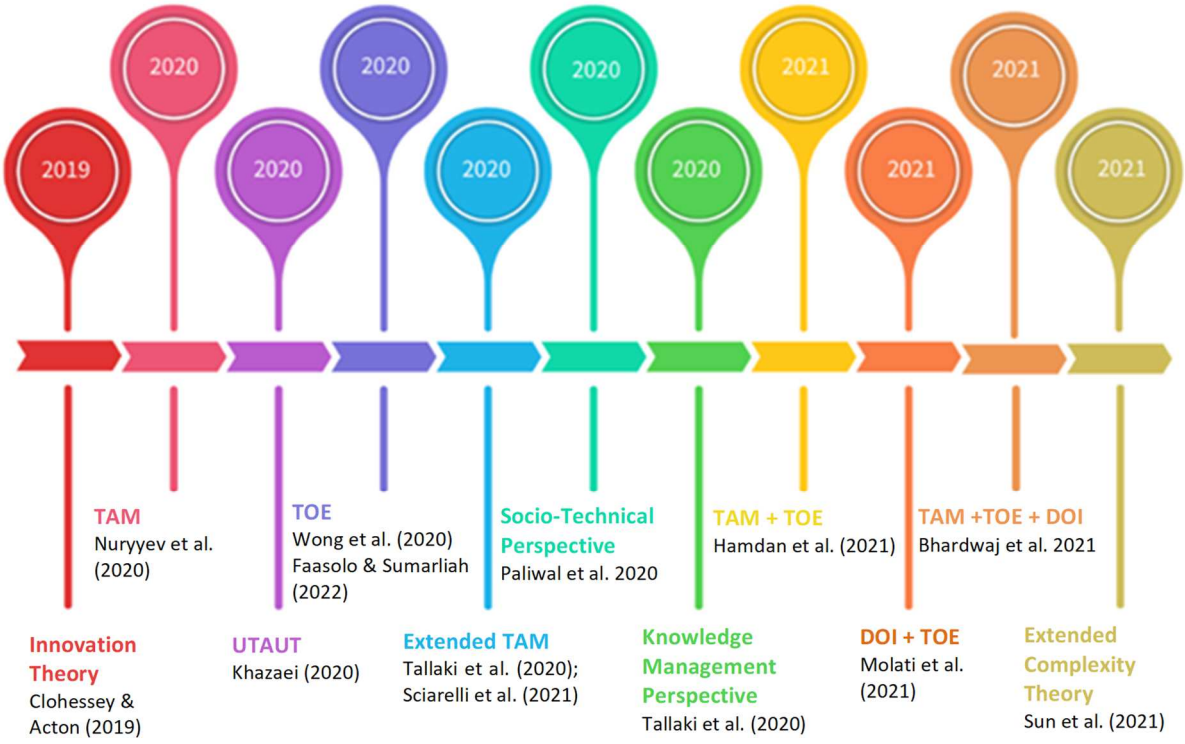

Figure 4. Adoption frameworks used in blockchain-SME literature
Source: own elaboration.

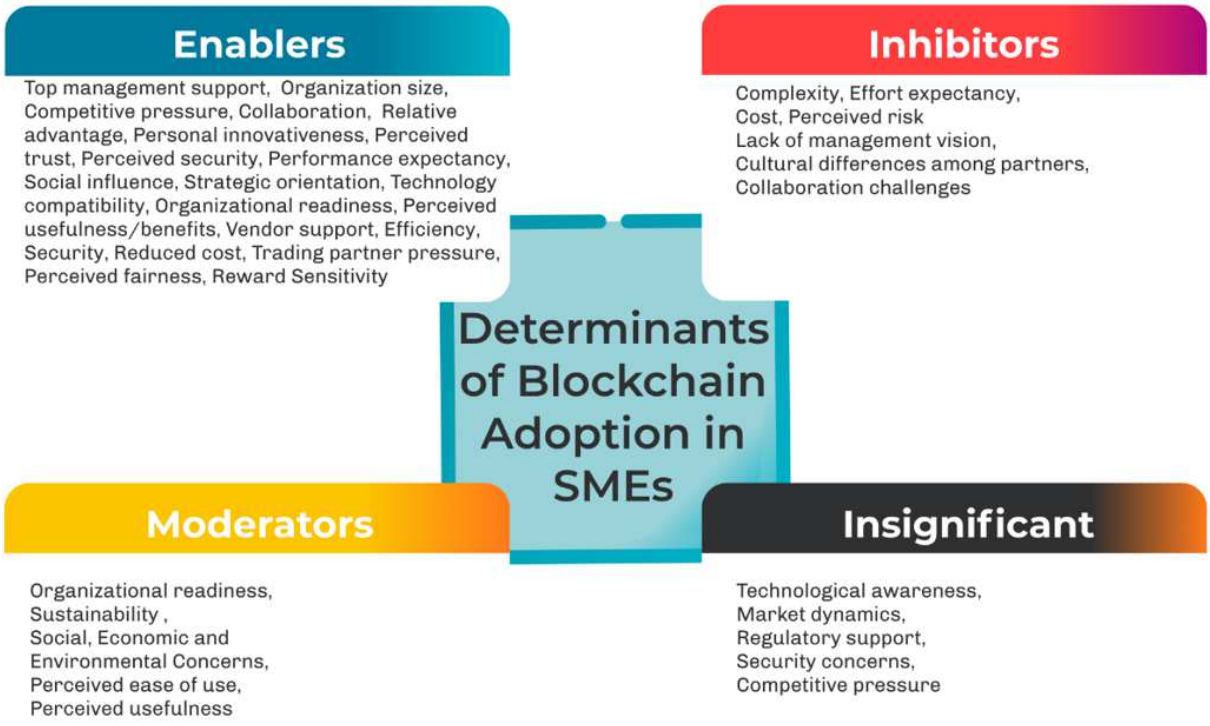

Figure 5. Determinants of SME blockchain adoption
Source: own elaboration.

Addressing the twin cost and complexity concerns is paramount to achieving widespread adoption. This concern has found potential relief through the emergence of Blockchain-as-a-Service (BaaS) solutions (Yu, 2021). This approach offers a managed blockchain platform, allowing businesses to construct applications on a distributed network while the vendor provides the necessary infrastructure and development tools. Analogous to the software-as-a-service model, BaaS accelerates application deployment, providing enhanced flexibility and expediting blockchain integration in SMEs. Chabani *et al.* (2021) proposed a flexible adoption approach that prioritizes upgradability, scalability, and interoperability to accommodate the evolving needs of SMEs and enhance the chances of a successful adoption.

Other primary concerns include a substantial knowledge gap and a lack of education about blockchain technology in SMEs. Furthermore, businesses hesitate to adopt the technology without a standardized collaborative effort backed by national or international norms and regulations. It becomes evident that education and establishing standardized frameworks are pivotal to propelling blockchain technology's widespread adoption in SMEs. Developing SME-focused applications and laying out a clear adoption roadmap backed by established standards and regulatory support is key to promoting SMEs' adoption of blockchain technology.

Opportunities and Challenges of Blockchain Technology Adoption in SMEs

Blockchain technology offers SMEs a multitude of opportunities across their business domain. It enhances transparency by providing a transparent and immutable ledger that reduces the risk of fraud and errors, thus fostering trust among stakeholders (Wang *et al.*, 2018). Moreover, SMEs can leverage blockchain for improved supply chain management, allowing real-time tracking and transparency in the supply chain's movement of goods and materials. This optimization leads to streamlined processes, ultimately reducing operational costs. Blockchain also opens doors to alternative funding sources, such as initial coin offerings (ICOs) and security token offerings (STOs), making it easier for SMEs to raise capital (Block *et al.*, 2021).

The cryptographic security of blockchain safeguards sensitive data and transactions, fortifying the system against malicious actors. Smart contracts are another game-changer, enabling SMEs to automate various business processes like payments and contract execution, significantly reducing manual intervention and operational costs (Giuda *et al.*, 2020). Blockchain facilitates global expansion by enabling trade and collaboration on an international scale. Its decentralized nature ensures no single points of failure, enhancing resilience in the face of system disruptions.

Moreover, blockchain is instrumental in sectors like food production, where it offers traceability to monitor and enhance product quality (Petek & Zajec, 2018). Finally, it gives SMEs more control over their data and digital assets, reducing their reliance on third parties. These opportunities collectively redefine how SMEs operate, collaborate, and manage data in a dynamic and competitive business environment. Figure 6 provides an overview of opportunities and challenges associated with SMEs' adoption of blockchain technology.

Alongside the opportunities, blockchain adoption by SMEs comes with its share of challenges. The lack of regulatory clarity within the blockchain landscape presents a notable challenge, as the technology and regulations are still evolving (Chang & He, 2018). Small and medium-sized enterprises may encounter difficulties in navigating compliance and legal issues. Furthermore, the initial costs associated with implementing blockchain technology can be substantial, encompassing investments in infrastructure and expertise. This financial barrier may prove challenging for smaller businesses. Integrating blockchain with existing systems and processes can be complex, potentially causing operational disruptions. Scalability concerns in some blockchain networks may limit their capacity to handle a growing volume of transactions, posing scalability concerns.

Despite its robust security features, blockchain is not entirely immune to all cyber threats, and privacy concerns can arise when sensitive data is stored on a public blockchain (Bhardwaj *et al.,* 2021). Moreover, if SMEs employ cryptocurrencies within their blockchain applications, they may become exposed to the inherent volatility of these digital assets. Finding and retaining talent with blockchain expertise can be challenging, especially for SMEs with limited resources, giving rise to a skills and ex-

pertise gap. Another formidable challenge is ensuring seamless interoperability among different blockchain networks and applications, particularly in a multi-blockchain environment (Casino *et al.,* 2019). Convincing all stakeholders, including customers and partners, to adopt blockchain technology can be met with resistance, resulting in adoption barriers (Zhang *et al.*, 2021). Small and medium-sized enterprises must know the technical complexities, scalability challenges, regulatory dynamics, cybersecurity risks, and market volatility associated with this disruptive technology. A balanced understanding of these opportunities and risks is crucial as SMEs embark on the journey to harness the power of blockchain and drive innovation in their financial operations.

Figure 6. Opportunity and risk framework for blockchain-based SME finance literature
Source: own elaboration.

CONCLUSIONS

Paving the Path for Future Exploration

Blockchain technology is considered the next tectonic shift in the world of the web. It has shown immense potential to reshape industries and revolutionize the business ecosystem. Small and medium-sized enterprises, which suffer due to their small size and lack of resources, can leverage this technological shift to propel their business to newer heights (Nowiński & Kozma, 2017). We explored the application and adoption of blockchain technology in SMEs, illuminating the application areas and adoption factors. Examining the opportunities and challenges of blockchain adoption for SMEs highlights its transformative potential while necessitating careful consideration from SMEs. Blockchain offers several advantages, from unlocking expanded access to capital and enhancing transparency to fostering trust and efficiency in financial operations (Anwar, 2019). However, the path forward is not devoid of challenges. Technical intricacies, scalability concerns, evolving regulatory landscapes, and awareness deficits are among the concerns that SMEs have as they venture into this evolving landscape (Chang & He, 2018).

This study significantly advances the discourse on blockchain technology by shedding light on its application within SMEs, a realm often overlooked in favour of discussions centred around larger corporations and financial institutions. In addressing this gap, our research contributes a vital perspective to the burgeoning field of blockchain. The thorough examination of the application and adoption of blockchain in SMEs, conducted through a narrative and critical literature review, extends the understanding of the transformative potential of this technology.

Establishing a comprehensive framework delineating opportunities and challenges for blockchain adoption in SMEs is a significant contribution. This framework not only enriches the theoretical underpinnings of blockchain technology, but also serves as a practical guide for designing and implementing tailored solutions to meet the unique needs of SMEs. The developed taxonomy and insights into adoption-related dynamics equip practitioners and researchers with valuable tools for comprehending and navigating challenges specific to SMEs in the blockchain landscape.

Moreover, by pinpointing existing gaps in the current literature and proposing future research avenues, this study contributes to the ongoing discourse, fostering continued exploration and innovation

in the field. The identified gaps signify opportunities for further scholarly inquiry and provide direction for practitioners seeking to address unmet needs and challenges in integrating blockchain within SMEs. This dual contribution, blending theoretical insights with practical applicability, underscores the broader implications of our research, encouraging sustained engagement and advancement in the dynamic intersection of blockchain technology and SMEs.

While this review encapsulates a diverse array of studies, frameworks, and perspectives, it is imperative to acknowledge the limitations inherent in such an exploration. The dynamic nature of technology and the rapidly evolving landscape of blockchain adoption necessitate continuous vigilance. Moreover, while we have endeavoured to comprehensively understand the opportunities and challenges, implementation specifics can vary greatly across industries, regions, and even individual SMEs (Chabani *et al.*, 2021). Therefore, readers should consider our insights as a foundation upon which further research can be built.

The path ahead requires a multifaceted approach characterized by collaboration, research, and strategic foresight. To address the challenges, partnerships between SMEs, technology providers, and policymakers become pivotal, enabling an ecosystem that nurtures blockchain-based solutions for SMEs. Robust educational initiatives will empower SMEs to navigate the complexities with confidence. Moreover, regulatory bodies must proactively dialogue to establish frameworks that foster innovation while ensuring security and compliance.

In terms of future research, the landscape remains ripe for exploration. In-depth case studies across diverse industries can illuminate the nuanced strategies and adaptations that SMEs undertake to leverage blockchain's potential. Comparative analyses across different countries and regions can provide insights into the impact of regulatory variations on adoption trends. Furthermore, longitudinal studies tracking the evolution of SMEs that embrace blockchain can offer a dynamic perspective on the long-term benefits and challenges.

Emphasizing a forward-looking approach, future research endeavours could delve deeper into the contextual factors influencing blockchain adoption in specific industries or geographical locations. Moreover, focusing on the socio-economic implications, ethical considerations, and the role of emerging technologies in shaping the trajectory of blockchain adoption by SMEs could further enrich the understanding of this dynamic phenomenon. Incorporating mixed-methods research designs could offer a more comprehensive view, combining qualitative insights from case studies with quantitative data to identify patterns and correlations. By embracing a multifaceted research agenda, scholars can contribute to a holistic understanding of the evolving role of blockchain in SMEs and foster a more informed and resilient business ecosystem.

This review serves as a stepping stone towards a future where blockchain technology intertwines seamlessly with the fabric of SME business operations. Furthermore, SMEs can navigate the challenges and harness blockchain's transformative potential by cultivating a holistic understanding of the opportunities, risks, and strategic considerations. With collective efforts, unyielding curiosity, and a strategic mindset, SMEs can position themselves at the forefront of a financial landscape redefined by blockchain innovation.

REFERENCES

Adams, D., Donovan, J., & Topple, C. (2021). Achieving sustainability in food manufacturing operations and their supply chains: Key insights from a systematic literature review. *Sustainable Production and Consumption, 28*, 1491-1499. https://doi.org/10.1016/J.SPC.2021.08.019

Akpan, I.J., Udoh, E.A.P., & Adebisi, B. (2022). Small business awareness and adoption of state-of-the-art technologies in emerging and developing markets, and lessons from the COVID-19 pandemic. *Journal of Small Business & Entrepreneurship*, *34*(2), 123-140. https://doi.org/10.1080/08276331.2020.1820185

Ali, M.H., Chung, L., Kumar, A., Zailani, S., & Tan, K.H. (2021). A sustainable Blockchain framework for the halal food supply chain: Lessons from Malaysia. *Technological Forecasting and Social Change*, *170*, 120870. https://doi.org/10.1016/J.TECHFORE.2021.120870

Ante, L. (2020). Blockchain-based tokens as financing instruments: Capital market access for SMEs? In *Fostering Innovation and Competitiveness with FinTech, RegTech, and SupTech* (pp. 129-141). https://doi.org/10.4018/978-1-7998-4390-0.ch007

Anwar, S. (2019). Use of blockchain technology (Smart contract) for small and medium enterprises sector to increase transparency and reduce default rates. *Journal of Advanced Research in Dynamical and Control Systems*, *11*(6 Special Issue), 1730-1737.

Bag, S., Viktorovich, D.A., Sahu, A.K., & Sahu, A.K. (2021). Barriers to adoption of blockchain technology in green supply chain management. *Journal of Global Operations and Strategic Sourcing*, *14*(1). https://doi.org/10.1108/JGOSS-06-2020-0027

Barenji, A.V., Li, Z., Wang, W.M., Huang, G.Q., & Guerra-Zubiaga, D.A. (2019). Blockchain-based ubiquitous manufacturing: a secure and reliable cyber-physical system. *Journal of Manufacturing Science and Engineering*, *58*(7), 2200-2221. https://doi.org/10.1080/00207543.2019.1680899

Bhardwaj, A.K., Garg, A., & Gajpal, Y. (2021). Determinants of Blockchain Technology Adoption in Supply Chains by Small and Medium Enterprises (SMEs) in India. *Mathematical Problems in Engineering*, 2021. https://doi.org/10.1155/2021/5537395

Block, J.H., Groh, A., Hornuf, L., Vanacker, T., & Vismara, S. (2021). The entrepreneurial finance markets of the future: A comparison of crowdfunding and initial coin offerings. *Small Business Economics*, *57*(2). https://doi.org/10.1007/s11187-020-00330-2

Casino, F., Dasaklis, T.K., & Patsakis, C. (2019). A systematic literature review of blockchain-based applications: Current status, classification and open issues. *Telematics and Informatics*, *36*, 55-81. https://doi.org/10.1016/J.TELE.2018.11.006

Chabani, Z., Hamouche, S., & Said, R. (2021). Is Blockchain Technology Applicable in Small and Medium-Sized Enterprises?. *Lecture Notes in Networks and Systems*, *211*, 505-514. https://doi.org/10.1007/978-3-030-73882-2_46

Chang, S.E., & He, S.Y. (2018). Exploring blockchain technology for capital markets: a case of angel fund. In *Proceedings of the IEEE 2018 International Congress on Cybermatics* (pp. 1941-1948). https://doi.org/10.1109/Cybermatics_2018.2018.00321

Clohessy, T., & Acton, T. (2019). Investigating the influence of organizational factors on blockchain adoption: An innovation theory perspective. *Industrial Management. Data Systems, 119*(7), 1457-1491. https://doi.org/10.1108/IMDS-08-2018-0365

Crosby, N., Pradan, P., Pattanayak, S., Verma, M., & Kalyanaraman, V. (2016). *BlockChain Technology: Beyond Bitcoin*.

Dana, L.-P., Salamzadeh, A., Mortazavi, S., & Hadizadeh, M. (2022). Investigating the Impact of International Markets and New Digital Technologies on Business Innovation in Emerging Markets. *Sustainability*, *14*(2), 983. https://doi.org/10.3390/su14020983

Davis, F.D. (1986). *A Technology Acceptance Model for Empirically Testing New End-User Information Systems: Theory and Results*. Sloan School of Management, Massachusetts Institute of Technology.

Desai, S., Deng, Q., Wellsandt, S., & Thoben, K.D. (2019). An Architecture of IoT-Based Product Tracking with Blockchain in Multi-sided B2B Platform. *IFIP Advances in Information and Communication Technology*, 566. https://doi.org/10.1007/978-3-030-30000-5_57

Di Giuda, G.M., Giana, P.E., & Pattini, G. (2020). The shortening and the automation of payments: The potentiality of smart contract in the aeco sector. *Proceedings of International Structural Engineering and Construction*, *7*(2), CON-12-1-CON-12-6. https://doi.org/10.14455/ISEC.2020.7(2).CON-12

Dimitropoulos, P., Koronios, K., Thrassou, A., & Vrontis, D. (2020). Cash holdings, corporate performance and viability of Greek SMEs: Implications for stakeholder relationship management. *EuroMed Journal of Business*, *15*(3), 333-348. https://doi.org/10.1108/EMJB-08-2019-0104

Dutta, S., & Saini, K. (2021). Statistical Assessment of Hybrid Blockchain for SME Sector. https://doi.org/10.37394/23203.2021.16.6

Faasolo, M.B., & Sumarliah, E. (2022). An Artificial Neural Network Examination of the Intention to Implement Blockchain in the Supply Chains of SMEs in Tonga. *Information Resources Management Journal*, *35*(1). https://doi.org/10.4018/IRMJ.287907

Feng, Y., & Wang, Y. (2022). Easing effect of supply chain finance constraints based on blockchain technology. *In Proceedings of the International Conference on Business Process Management (BPM*), *12008*, 560-570. https://doi.org/10.1007/978-3-030-89508-2_41

Genta, G., Villa, A., & Perrone, G.P. (2021). Supply Chain Management by Blockchain. In IFIP Advances in *Information and Communication Technology*, *632* IFIP, 480-488. https://doi.org/10.1007/978-3-030-85906-0_53

Gerasimova, V., Philipp, R., & Prause, G. (2021). Service Design for Trans-National Smart Supply Chains. L*ecture Notes in Networks and Systems*, *195*, 377-388. https://doi.org/10.1007/978-3-030-68476-1_35

Hamdan, I.K.A., Aziguli, W., Zhang, D., Sumarliah, E., & Fauziyah, F. (2021). A machine learning method to predict the technology adoption of Blockchain in Palestinian firms. *International Journal of Emerging Markets.* https://doi.org/10.1108/IJOEM-05-2021-0769

Jiang, J., & Chen, J. (2021). Framework of blockchain-supported e-commerce platform for small and medium enterprises. *Sustainability*, *13*(15), 8158. https://doi.org/10.3390/SU13158158

Karamchandani, A., Srivastava, S.K., Kumar, S., & Srivastava, A. (2021). Analysing perceived role of blockchain technology in SCM context for the manufacturing industry. *International Journal of Production Research*, *59*(11), 3398-3429. https://doi.org/10.1080/00207543.2021.1883761

Katsikouli, P., Wilde, A.S., Dragoni, N., & Høgh-Jensen, H. (2021). On the benefits and challenges of blockchains for managing food supply chains. *Journal of Science Food and Agriculture*, *101*(6), 2175-2181. https://doi.org/10.1002/JSFA.10883

Kaur, J., Kumar, S., Narkhede, B.E., Dabić, M., Rathore, A.P.S., & Joshi, R. (2022). Barriers to blockchain adoption for supply chain finance: The case of Indian SMEs. *Electronic Commerce Research*. https://doi.org/10.1007/s10660-022-09566-4

Khazaei, H. (2020). Integrating cognitive antecedents to utaut model to explain adoption of blockchain technology among Malaysian SMEs. *International. Journal of Informatics Visuals*, *4*(2), 85-90. https://doi.org/10.30630/joiv.4.2.362

Kinai, A., Markus, I., Oduor, E., & Diriye, A. (2017). Asset-based lending via a secure distributed platform*. ACM International Conference Proceeding Series*, Part F132087. https://doi.org/10.1145/3136560.3136594

Koronios, K., Dimitropoulos, P., Kriemadis, A., Douvis, J., Papaloukas, M., & Ratten, V. (2020). Empowerment and Performance in SMEs: Examining the Effect of Employees' Ethical Values and Emotional Intelligence, In Leitão, J., Ratten, V., & Barroca, J. (Eds.), *A Guide to Planning and Managing Open Innovative Ecosystems* (pp. 83-98). Emerald Publishing Limited, Leeds. https://doi.org/10.1108/978-1-78973-409-620201007

Korzynski, P., Mazurek, G., Krzypkowska, P., & Kurasniski, A. (2023). Artificial intelligence prompt engineering as a new digital competence: Analysis of generative AI technologies such as ChatGPT. *Entrepreneurial Business and Economics Review, 11*(3), 25-37. https://doi.org/10.15678/EBER.2023.110302

Kumar, D., Phani, B.V., Chilamkurti, N., Saurabh, S., & Ratten, V. (2023). Filling the SME credit gap: a systematic review of blockchain-based SME finance literature. *Journal of Trade Science*, ahead-of-print. https://doi.org/10.1108/JTS-06-2023-0003

Kumar, S., & Rao, P. (2016). Financing patterns of SMEs in India during 2006 to 2013 – an empirical analysis. *Journal of Small Business & Entrepreneurship*, *28*(2), 97-131. https://doi.org/10.1080/08276331.2015.1132513

Leelasantitham, A. (2020). A Business Model Guideline of Electricity Utility Systems Based on Blockchain Technology in Thailand: A Case Study of Consumers, Prosumers, and SMEs. *Wireless Personal Communications*, *115*(4), 3123-3136. https://doi.org/10.1007/S11277-020-07202-8

Li, J., Wang, Y., Li, Y., & Li, Q. (2019). A simple survey for supply chain finance risk management with applications of blockchain. In *International Conference on Advanced Computer Science and Information Systems*, (pp. 39-49). https://doi.org/10.1007/978-981-15-0864-6_5

Liu, J., & Jiang, P. (2020). Consortium blockchain-driven decentralized organization and operation for manufacturing community in social manufacturing. *IEEE International Conference on Automation Science and Engineering*, 2020-August, 576-581. https://doi.org/10.1109/CASE48305.2020.9216738

Liu, J., Liu, P., Ou, Z., Zhang, G., & Song, M. (2020). An Inclusive Finance Consortium Blockchain Platform for Secure Data Storage and Value Analysis for Small and Medium-Sized Enterprises. *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), 12634 LNCS*, 419-429. https://doi.org/10.1007/978-3-030-70626-5_44

Li, Z., Chen, S., & Zhou, B. (2021). Electric Vehicle Peer-to-Peer Energy Trading Model Based on SMES and Blockchain. *IEEE Transactions on Applied Superconductivity, 31*(8). https://doi.org/10.1109/TASC.2021.3091074

Liu, L., Li, Y., & Jiang, T. (2023). Optimal strategies for financing a three-level supply chain through blockchain platform finance. *International Journal of Production Research, 61*(11), 3564-3581. https://doi.org/10.1080/00207543.2021.2001601

Liu, X., Jiang, Y., Wang, Z., Zhong, R.Y., Cheung, H.H., & Huang, G.Q. (2021). imseStudio: blockchain-enabled secure digital twin platform for service manufacturing. *Journal of Manufacturing Science and Engineering, 143*(1). https://doi.org/10.1080/00207543.2021.2003462

Lopez, M.A., Lombardo, J.M., López, M., Alba, C.M., Velasco, S., Braojos, M.A., & Fuentes-García, M. (2020). Intelligent Detection and Recovery from Cyberattacks for Small and Medium-Sized Enterprises. *International Journal of Interactive Multimedia and Artificial Intelligence, 6*(3), 55. https://doi.org/10.9781/IJIMAI.2020.08.003

Markakis, E.K., Nikoloudakis, Y., Lapidaki, K., Fiorentzis, K., & Karapidakis, E. (2021). Unification of Edge Energy Grids for Empowering Small Energy Producers. *Sustainability 2021*, *13*(15), 8487. https://doi.org/10.3390/SU13158487

Molati, K., Ilorah, A.I., & Moeti, M.N. (2021). Determinant Factors Influencing the Adoption of Blockchain Across SMEs in South Africa. 2021 *15th International Conference on Advanced Technologies, Systems, and Services*. https://doi.org/10.1109/TELSIKS52058.2021.9606343

Nayak, G., & Dhaigude, A.S. (2019). A conceptual model of sustainable supply chain management in small and medium enterprises using blockchain technology. *Cogent Economics and Finance, 7*(1). https://doi.org/10.1080/23322039.2019.1667184

Nowiński, W., & Kozma, M. (2017). How Can Blockchain Technology Disrupt the Existing Business Models?. *Entrepreneurial Business and Economics Review*, *5*(3), 173-188. https://doi.org/10.15678/EBER.2017.050309

Nuryyev, G. *et al.* (2020). Blockchain technology adoption behavior and sustainability of the business in tourism and hospitality SMEs: An empirical study. *Sustainability*, *12*(3). https://doi.org/10.3390/SU12031256

Paliwal, V., Chandra, S., & Sharma, S. (2020). Indian MSME's Sustainable Adoption of Blockchain Technology for Supply Chain Management: A Socio-Technical Perspective. *IFIP Advances in Information and Communication Technology, 617*, 159-165 https://doi.org/10.1007/978-3-030-64849-7_15

Petek, I., & Zajec, N. (2018). Collaborative intelligence and decentralized business community building-potentials in food/nutrition sector. *Proceedings - IEEE 34th International Conference on Data Engineering Workshops, ICDEW 2018*, 150-153. https://doi.org/10.1109/ICDEW.2018.00031

Pfister, P., & Lehmann, C. (2023). Returns on digitization in SMEs—a systematic literature review. *Journal of Small Business & Entrepreneurship, 35*(4), 574-598. https://doi.org/10.1080/08276331.2021.1980680

Philipp, R., Prause, G., & Gerlitz, L. (2019). Blockchain and smart contracts for entrepreneurial collaboration in maritime supply chains. *Transport and Telecommunication, 20*(4), 1019. https://doi.org/10.2478/ttj-2019-0030

Poeschl, A. (2023). Longitudinal evidence of entrepreneurial behaviour in a blockchain-based decentralized autonomous organization: Case study of the Nano cryptocurrency. *Entrepreneurial Business and Economics Review, 11*(4), 171-185. https://doi.org/10.15678/EBER.2023.110411

Ran, C., Song, K., & Yang, L. (2020). An improved solution for partner selection of industry-university cooperation. *Technology Analysis and Strategic Management, 32*(12), 1478-1493. https://doi.org/10.1080/09537325.2020.1786044

Ratten, V. (2023). *Research Methodologies for Business Management* (1st ed.). Routledge. https://doi.org/10.4324/9781003314516

Rhemananda, H., Roulina Simbolon, D., & Fachrunnisa, O. (2021). Blockchain Technology to Support Employee Recruitment and Selection in Industrial Revolution 4.0. *Lecture Notes in Networks and Systems*, *149*. https://doi.org/10.1007/978-981-15-7990-5_30

Rogers, E.M. (1962). *Diffusion of Innovations.* Free Press, New York.

Rotondi, D., & Saltarella, M. (2019). Facing parallel market and counterfeit issues by the combined use of Blockchain and CP-ABE encryption technologies. *Global IoT Summit, GIoTS 2019 - Proceedings*. https://doi.org/10.1109/GIOTS.2019.8766369

Rymarczyk, J. (2020). Technologies, Opportunities and Challenges of the Industrial Revolution 4.0: Theoretical Considerations. *Entrepreneurial Business and Economics Review*, *8*(1), 185–198. https://doi.org/10.15678/EBER.2020.080110

Sadeq, M.J., Rayhan Kabir, S., Akter, M., Forhat, R., Haque, R., & Akhtaruzzaman, M. (2021). Integration of blockchain and remote database access protocol-based database. *Advances in Intelligent Systems and Computing*, *1184*, 533-539. https://doi.org/10.1007/978-981-15-5859-7_53

Salamzadeh, A., Hadizadeh, M., Rastgoo, N., Rahman, M.M., & Radfard, S. (2022). Sustainability-Oriented Innovation Foresight in International New Technology Based Firms. *Sustainability*, *14*(20), 13501. https://doi.org/10.3390/su142013501

Sciarelli, M., Prisco, A., Gheith, M.H., & Muto, V. (2021). Factors affecting the adoption of blockchain technology in innovative Italian companies: an extended TAM approach. *Journal of Strategic Management.* https://doi.org/10.1108/JSMA-02-2021-0054

Segers, J.P. (2016). Regional systems of innovation: lessons from the biotechnology clusters in Belgium and Germany. *Journal of Small Business & Entrepreneurship, 28*(2), 133-149. https://doi.org/10.1080/08276331.2015.1128256

Søgaard, J.S. (2021). A blockchain-enabled platform for VAT settlement. *International Journal of Accounting Information Systems*, *40*. https://doi.org/10.1016/J.ACCINF.2021.100502

Sun, W., Dedahanov, A.T., Shin, H.Y., & Li, W.P. (2021). Using extended complexity theory to test SMEs' adoption of Blockchain-based loan system. *PLoS One, 16*(2), 1-19. https://doi.org/10.1371/JOURNAL.PONE.0245964

Sun, Y., Zeng, X., Cui, X., Zhang, G., & Bie, R. (2021). An active and dynamic credit reporting system for SMEs in China. *Personal and Ubiquitous Computing*, *25*(6), 989-1000. https://doi.org/10.1007/s00779-019-01275-4

Tallaki, M., Bracci, E., Ievoli, R., & Diplotti, S. (2020). Knowledge, diffusion, and interest towards blockchain technology in SMEs. 2*020 IEEE International Conference on Technology Management, Operation and Decision*. https://doi.org/10.1109/ICTMOD49425.2020.9380582

Utkarsh, P., Saran, H., & Vetrivelan, P. (2022). Loan origination system in the housing sector using blockchain. In A. Sivasubramanian, P.N. Shastry, & P.C. Hong (Eds.), *Futuristic Communication and Network Technologies* (Vol. 792, pp. 91-105). Springer. https://doi.org/10.1007/978-981-16-4625-6_91

Venkatesh, V., Morris, M.G., Davis, G.B., & Davis, F.D. (2003). User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly, 27*(3), 425-478. https://doi.org/10.2307/30036540

Wang, H., Zheng, Z., Xie, S., Dai, H.N., & Chen, X. (2018). Blockchain challenges and opportunities: a survey. International *Journal of Web and Grid Services, 14*(4) 352-375. https://doi.org/10.1504/IJWGS.2018.10016848

Wang, R., Lin, Z., & Luo, H. (2019). Blockchain, bank credit and SME financing. *Quality and Quantity*, *53*(3), 1127-1140. https://doi.org/10.1007/s11135-018-0806-6

Xu, L., Yang, Y., & Chu, X. (2021). Research on the influence mechanism of blockchain on the credit of transportation capacity supply chain finance. *Mathematical Problems in Engineering*, 1812096. https://doi.org/10.1155/2021/1812096

Yang, X. (2021). Blockchain-Based Supply Chain Finance Design Pattern. In Proceedings - 2021 *13th International Conference on Intelligent Human-Machine Systems and Cybernetics, IHMSC 2021*, 200-203. https://doi.org/10.1109/IHMSC52134.2021.00053

Yu, X. (2021). Blockchain-based supply chain financial services using smart contracts. *ACM International Conference Proceeding Series.* 63-69 https://doi.org/10.1145/3510487.3510497

Zhang, T., Li, J., & Jiang, X. (2021). Analysis of supply chain finance based on blockchain. *Procedia Computer Science*, *187*(1) 1-6. https://doi.org/10.1016/j.procs.2021.04.025

Authors

The contribution share of authors is equal across all the segments of the article.

Deepak Kumar

Joint PhD student from Department of Management Sciences, Indian Institute of Technology Kanpur, India and Department of Computer Science and Information technology, Latrobe University, Australia. His research interests include Blockchain technology, Small and Medium Enterprises (SMEs), SME Finance, Fintech and Entrepreneurship.

Correspondence to: Deepak Kumar, PS1 217, Department of Computer Science and Information technology, Latrobe University, Australia (3083). e-mail: D.Kumar@latrobe.edu.au

ORCID http://orcid.org/0000-0001-5674-8358

B. V. Phani

Head of Department & Professor, Finance, ICT Innovation and Entrepreneurship, Ram Tiwari Chair Professor Department of Management Sciences, Indian Institute of Technology Kanpur, India. Chief Investigator: E&ICT Academy, IIT Kanpur. Principal Investigator: SBERT Center, IIT Kanpur. His research interests include Finance, ICT Innovation & Entrepreneurship.

Correspondence to: R.No: 100/200, DoMS Building, IIT Kanpur, Kanpur, 208016, Uttar Pradesh, India. e-mail: bvphani@iitk.ac.in

ORCID http://orcid.org/0000-0001-5674-8358

Naveen Chilamkurti

Professor and Director, La Trobe Cybersecurity Research Hub, Department of Computer Science and Information technology, Latrobe University, Australia. His research interests include Blockchain technology, Computer communications, Computer networks, Internet of Things and Wireless networks.

Correspondence to: Prof. Naveen Chilamkurti, PS1 218, Department of Computer Science and Information technology, Latrobe University, Australia (3083). e-mail: N.Chilamkurti@latrobe.edu.au

ORCID http://orcid.org/0000-0002-5396-8897

Suman Saurabh

Assistant Professor, Department of Management Sciences, Indian Institute of Technology Kanpur. His research interests include Corporate Finance, Asset Pricing, Behavioral Finance, Mergers and Acquisitions and Financial Derivatives.

Correspondence to: R. No. – 312, Department of Management Sciences, IIT Kanpur, Uttar Pradesh, India, 208016. e-mail: sumans@iitk.ac.in

ORCID http://orcid.org/0000-0001-9939-4115

Vanessa Ratten

Associate Professor, Entrepreneurship Innovation & Marketing, Department of Management, La Trobe Business School at La Trobe University, Melbourne, Australia. Her research interests Entrepreneurship, Innovation, Marketing, and Tourism.

Correspondence to: Vanessa Ratten, Department of Management, La Trobe Business School, La Trobe University, Melbourne, Australia (3083). e-mail: V.Ratten@latrobe.edu.au

ORCID http://orcid.org/0000-0002-2534-4550

Acknowledgements and Financial Disclosure

No funding has been availed for this research.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Ministry of Education and Science
Republic of Poland

The journal is co-financed in the years 2022-2024 by the Ministry of Education and Science of the Republic of Poland in the framework of the ministerial programme "Development of Scientific Journals" (RCN) on the basis of contract no. RCN/SP/0583/2021/1 concluded on 13 October 2022 and being in force until 13 October 2024.

Entrepreneurial Business and Economics Review

2024, Vol. 12, No. 3

10.15678/EBER.2024.120309

Firm's innovation culture and external collaboration: Mapping the state of research

Aleksandra Zygmunt, Ondřej Dvouletý

ABSTRACT

Objective: The objective of the article is to systematically review the existing research on the linkages between the firm's innovation culture and external collaboration.

Research Design & Methods: This study employed a systematic literature review approach. For the review, we adapted the systematic review protocol advanced by Tranfield *et al*. (2003) and Snyder (2019). The review covers articles published between 2000 and 2022 and indexed in the Scopus and Web of Science databases.

Findings: The results show that the research in the area is still relatively limited but the interest in the field is growing. The review indicates that the research that has been done so far is not homogeneous and addresses various aspects of the relationships between the firm's innovation culture and collaboration with research organisations, customers, competitors, suppliers, clusters, retailers, distributors, and government institutions.

Implications & Recommendations: Although researchers have shed light on the topic, there is a need for an in-depth understanding of the relationship between the firm's innovation culture and external cooperation. The article provides implications for scholars by offering, among others, insights into future research directions including more research on large firms to compare whether the obtained results also apply to the size of firms and more longitudinal studies to increase the number of repeated observations in the field. Moreover, the study suggests the need for practitioners and policymakers to promote the strengthening of the firm's innovation culture and to reduce the potential mismatch of expectations between the innovation culture of the firm and collaboration with external partners.

Contribution & Value Added: The article extends the current knowledge on the drivers of firms' innovation activities by providing further findings on the connections between firms' innovation performance and knowledge diffusion. The study contributes to the field by providing a systematic review that specifically gives attention to the relationship between the firm's innovation culture and external collaboration.

Article type:	literature review
Keywords:	firm's innovation culture; external collaboration; firms' innovation activities; systematic literature review; descriptive analysis; thematic analysis
JEL codes:	O30, O50

Received: 1 December 2023 Revised: 8 May 2024 Accepted: 10 May 2024

Suggested citation:

Zygmunt, A., & Dvouletý, O. (2024). Firm's innovation culture and external collaboration: Mapping the state of research. *Entrepreneurial Business and Economics Review,* 12(3), 161-184. https://doi.org/10.15678/EBER.2024.120309

INTRODUCTION

There has long been academic interest in firms' innovation activities among the scholarly community (Knight, 1967; Becker & Dietz, 2004; Audretsch & Belitski, 2020; Heider *et al*., 2022). This stems from the perception that innovation performance affects many aspects of firms and contributes to their competitiveness (Stelmaszczyk, 2020; Yoon & Kwon, 2023). There are also strong theoretical and empirical reasons to believe that firms' innovation activities affect the competitiveness of regions and countries (Fritsch *et al*., 2020; Hervás-Oliver *et al.*, 2021). Thus, a large body of the literature focuses extensively on the drivers and sources of innovation performance (Edler & Fagerberg, 2017; Zygmunt, 2017; Vokoun

& Dvouletý, 2022; Zygmunt, 2022). In this regard, there is a growing interest in the relationship between knowledge diffusion and innovation processes in particular (Wang & Hu, 2020; Puślecki, 2023). This line of research is based on the assumption that knowledge sources play a crucial role in firms' innovation performance, enabling the enhancement of their competitive advantage (Soniewicki, 2022) and hence the development of regions and countries (Grillitsch *et al*., 2019; Audretsch & Belitski, 2024). This is coherent with theories of endogenous growth and knowledge spillovers, which offer a relevant ground for our study, pointing to the need to combine knowledge from different sources in firms' innovation processes. In response to the need for firms to adapt to changing environments, such a combination of knowledge from different sources becomes an increasingly important part of firms' innovation activities. Particular attention is paid here to external knowledge networks and external collaboration as the providing resources when internal knowledge sources are insufficient (Brettel & Cleven, 2011). In this context, theories of endogenous growth and knowledge spillovers emphasise the importance of efficient knowledge diffusion between external actors (Fritsch *et al*., 2020) highlighting the triple helix, as knowledge interactions between firms and, among others, other firms, research organisations and government institutions (Thomas *et al*., 2020). In this regard, many empirical studies provide evidence of the crucial role of external cooperation with other firms (*e.g.* competitors, suppliers, customers) as providers of key knowledge necessary for the continuous development of innovative ideas, products and services (Santos-Vijande *et al*., 2013). Moreover, many empirical studies also point to the pivotal contribution of research organisations to firms' innovation processes through the provision of highly skilled human resources and R&D research results (Thomas *et al.*, 2020; Audretsch & Belitski, 2020). Furthermore, a considerable number of empirical studies indicate the significant importance of government institutions for firms' innovation activities by creating conditions to promote firms' innovation performance and by supporting firms' innovative attitudes through policy instruments (Frangenheim *et al*., 2020).

Given the rising relevance of the relationship between firms' innovation performance and knowledge diffusion from external actors for both academics and practitioners, this area of research has been studied from different perspectives in recent years providing a set of valuable discussions. This is reflected in numerous literature reviews, which point to the complexity of the issues in the field and the need for further development. In this regard, for example, Pittaway *et al.* (2004) reviewed 163 studies on the linkages between the networking behaviour of firms and their innovative capacity, indicating the importance of firms' collaboration with external partners. Zahoor and Al-Tabbaa (2020) focused their review of 113 articles on small and medium-sized enterprises (SMEs) and their inter-organisational collaboration to enhance innovation activities, while Macpherson and Holt (2007) reviewed 152 articles that focused on small firms. Thorpe *et al.* (2006) also reviewed 69 studies in this area on SMEs, pointing to, among others, firms' ability to use and develop external knowledge resources for innovation processes. The impact of network resources, firm size, and spatial proximity on knowledge flow across inter-firm networks for innovation has been reviewed by Huggins and Johnston (2010). Inter-organizational collaboration in the context of eco-innovation was an area of interest in the review of 35 articles by Pereira *et al.* (2020). Greer and Lei (2012) focused their review on the relationship between innovation processes and customer collaboration, highlighting an openness to external knowledge and open innovation. Open innovation was also the focus of the review of 151 articles by West and Bogers (2013), who have considered external sources of firms' innovation. Castaneda and Cuellar (2020) have provided a comprehensive review of the 20 seminal articles on the development of knowledge sharing and innovation concepts in terms of their relationship, highlighting the growing interest in internalising external knowledge to increase firms' innovation performance.

These studies provide a comprehensive insight into the connections between innovation processes and knowledge diffusion between external actors indicating the complexity of the issues in the field and raising new research questions. In particular, the issues of collaboration with external partners together with the internalisation of external knowledge to enhance firms' innovation activities have attracted our attention as a need to strengthen internal capabilities for innovation processes to be more resilient to changes in the environment (Netz *et al.*, 2022). In this context, the issues related to the internal innovation capabilities of firms by leveraging the effects of external collaboration are particularly important. This is addressed by the resource-based view theory (Huggins & Johnston, 2010).

Considering this, we found that the resource-based view theory additionally complements the ground of our study by referring to our understanding of the mechanism of firms' internal capabilities to generate and absorb knowledge from external knowledge networks and external collaboration to increase competitive advantage (Martínez-Costa *et al*., 2018; Cooper *et al.*, 2023).

On this basis, we found that in recent years, the firm's innovation culture has emerged as a prominent area in the debate on knowledge from external actors and firms' innovation activities. This is because innovation culture is seen as a driver of firms' innovation performance, which is oriented towards the acquisition, transformation, and use of knowledge for innovation processes (Naranjo-Valencia & Calderon-Hernández, 2018; Gui *et al.*, 2024). The systematic literature review of 61 articles in this area provided by Tian *et al.* (2018) highlights this. The review indicates that culture plays an important role in firms' innovation processes. Notably, due to its multi-faced nature, the literature provides various definitions of the firm's innovation culture (Olmos-Peñuela *et al*., 2017). This is also a consequence of the intangible nature of the firm's innovation culture, which is difficult to measure directly (Brettel & Cleven, 2011). Thus, the firm's innovation culture can be seen as a multidimensional context that promotes the intention to innovate, the environment to introduce innovation, the orientation towards external partners and the infrastructure to support innovation (Dobni, 2008).

Over the years, many scholars have attracted interest in the firm's innovation culture and innovation performance, but the studies have mostly focused on external knowledge networks rather than external collaboration. For instance, Nowak (2019) has considered the joint efforts of the heterogeneity of external networks and the firm's innovation culture. Arsawan *et al*. (2022) have explored the sustainable competitive advantage of SMEs through the prism of knowledge sharing and the firm's innovation culture, indicating the rank of external knowledge networks in leveraging innovation culture. Gabaldón-Estevan and Ybarra (2017) reported on the interactions between networking (especially with customers and suppliers), innovation culture and firms' innovation activities in selected European SMEs. However, we have noticed that in recent years there has been a growing interest in the firm's innovation culture in relation to external collaboration. The origin of this lies in the consideration of how collaboration with different external partners contributes to the firm's innovation culture (Olmos-Peñuela *et al*., 2017). This is because the involvement of external partners in firms' innovation processes is considered crucial for enhancing firms' competitive advantage (Brettel & Cleven, 2011; Martínez-Costa *et al*., 2018). From this point of view, the linkages between the firm's innovation culture and external collaboration can be an important contribution to strengthening internal capabilities for innovation processes in order to be more resilient to changes in the environment (such as financial or pandemic crises). In this sense, external collaboration can lead to the firm's openness to new ideas and solutions which can shift the attitude towards innovation (Bader *et al.*, 2014). Thus, this area of research is worthy of further investigation. We have noted that despite the growing interest in the relationship between the firm's innovation culture and external collaboration, the existing literature exploring this area lacks a comprehensive review of this emerging phenomenon. Therefore, a systematic literature review is needed to provide, among others, a synthesis of methodological approaches, main findings of the field and ideas for future research. Our study was motivated by this gap in the literature and the need to understand better how the firm's innovation culture is related to external collaboration. Thus, we aimed to provide a systematic review of the existing research on the linkages between the firm's innovation culture and external collaboration.

Therefore, we asked the following research questions*:*

RQ1: How have scholars analysed the linkages between the firm's innovation culture and external collaboration?

RQ2: What are the main findings in the literature that link external collaboration with the firm's innovation culture?

To answer these research questions, we have applied a systematic review protocol developed by Tranfield *et al*. (2003) and Snyder (2019) to guide our literature review. On this basis, we have selected, analysed, and systematically reviewed a final set of 25 articles that focus on the relationship between the firm's innovation culture and cooperation with external partners. In the review,

we have considered the English language peer-reviewed academic articles with full-text availability selected from Scopus and Web of Science and published between the years 2000 and 2022.

This study contributes to the growing literature on the drivers of firms' innovation activities. Our research extends the existing research on the connections between firms' innovation performance and knowledge diffusion. In this regard, we provide a comprehensive overview of the published articles on the linkages between the firm's innovation culture and external collaboration by analysing the main characteristics of the studies in the field: information on the time evolution and geography of the studies, the methodological profile of the articles and the main findings of the scholars. Our study also provides insights into future research avenues on the topic.

The rest of the article is structured as follows. The next section will present the methodological approach that guided the systematic selection and review of the literature on the linkages between the firm's innovation culture and external collaboration. In this respect, we will present a search strategy and a process of selecting the articles to be reviewed. In the next section, we will report the results of our analysis through descriptive and thematic analyses. The descriptive analysis includes publications over time, journals, and the geography of the articles reviewed. We also considered geographical areas, sectors of analysis, and types of research. The thematic analysis will focus on the view of the firm's innovation culture and the linkages between the firm's innovation culture and external collaboration in the reviewed articles. Next, we will describe implications for researchers and practitioners and avenues for future research. The final section will conclude the article.

MATERIAL AND METHODS

Following the research questions, we have applied a systematic literature review method to understand how the linkages between the firm's innovation culture and external cooperation have been studied in the literature. Thanks to a transparent protocol, this method allows for the identification, evaluation, and synthesis of the existing body of knowledge relevant to a particular subject (Kraus *et al*., 2020). Therefore, it allows for the identification of research trends and future research avenues (Pittaway *et al*., 2014). Notably, this method has received growing attention in the innovation literature (West & Bogers, 2013; Tian *et al*., 2018). For this article, we have adapted the systematic review protocol advanced by Tranfield *et al*. (2003) and Snyder (2019) as widely used for systematic literature reviews (Cordero & Ferreira, 2018). Accordingly, we have specified the search strategy and a selection of articles, which provide the basis for descriptive and thematic analyses of the articles selected for review, as well as for setting future research avenues. The search strategy includes the identification of databases for the articles selections, the determination of keywords to build a search string and the identification of inclusion and exclusion criteria, while the selection of articles includes the categorisation of the literature. We focused on Scopus and Web of Science as the two main scientific indexing platforms (Cordero & Ferreira, 2018). Following the relevant works in the firm's innovation culture and external cooperation, we have identified keywords to build a search string. We then sent the initial string to five leading scholars in the field of business, innovation, and entrepreneurship (Malte Brettel, Julia Olmos-Peñuela, Luke Pittaway, Joel West, and Mu Tian) with a kind request for feedback on the string and our research approach. We have received many valuable comments from Luke Pittaway, Joel West and Mu Tian, which we used to improve our original string. Hence, in relation to the firm's innovation culture, the final search includes the following keywords: 'innovat* cultur*', 'cultur* of innovat*' 'cultur* to innovat*,' 'cultur* and innovat*,' 'pro-innovat* cultur*'. With regard to external cooperation, the final search incorporates the keywords as follows: 'external* knowledge*,' 'external learning,' 'external linkage*,' 'external* environment,' 'exterior environment,' 'outer environment,' 'external relationship*,' 'external relation*,' 'external collaborat*,' 'collaborat*,' 'cooperat* with,' 'network*,' 'external partner*,' 'external expert*,' 'expert*,' 'external agent*,' 'customer*,' 'supplier*,' 'competitor*,' 'university*,' 'research institute*,' 'research organisation*,' 'research centre*'. In order to include as many studies as possible, an asterisk (*) was used. Thus, the final string was as follows:

((‘innovat cultur*’ OR ‘cultur* of innovat*’ OR ‘cultur* to innovat*’ OR ‘cultur* and innovat*’ OR ‘pro-innovat* cultur*’) AND (’external* knowledge*’ OR ‘external learning’ OR ‘external linkage*’ OR ‘external* environment’ OR ‘exterior environment’ OR ‘outer environment’ OR ‘external relationship*’ OR ‘external relation*’ OR ‘external collaborat*’ OR ‘collaborat*’ OR ‘cooperat* with’ OR ‘network*’ OR ‘external partner*’ OR ‘external expert*’ OR ‘expert*’ OR ‘external agent*’ OR ‘customer*’ OR ‘supplier*’ OR ‘competitor*’ OR ‘university*’ OR ‘research institute*’ OR ‘research organisation*’ OR ‘research centre*’)).*

We conducted the search using the titles, abstracts, and keywords to retrieve the most relevant articles. The analysis period was set from 2000 to the beginning of 2022 (when the data collection took place). We collected data collected between 4 April and 13 May 2022. Inclusion criteria included English-language peer-reviewed academic articles with full-text availability, while exclusion criteria comprised book chapters, conference articles, editorials, research notes, and commentaries. Exclusion criteria also included duplicates and articles irrelevant to the review questions

As a result of the data collection, we retrieved a total of 643 articles using the final string: 359 articles from Scopus and 284 from Web of Science. For further analysis, we exported the collected data into an Excel document. We then removed from the dataset the duplicates resulting from the interlinking of the scientific indexing platforms (196 articles). Next, we examined the titles, abstracts, and keywords of the remaining 447 articles to determine the relevance of each article to the aim of our research. To do this, we assigned values from 1 (least relevant) to 5 (most relevant). Consequently, we decided to select the articles that we gave a score of 4 and 5 for further review. Therefore, 103 articles remained in the study as potentially relevant. We gained full access to 86 of these articles, and we have consulted in-debt the content of the remaining articles to finally eliminate articles that were unrelated to the field under study. This was due to the fact that a number of abstracts did not lucidly indicate whether they met the scope of our study. For this purpose, we examined the full text of the articles, and assigned values (from 1 to 5). This process led to the exclusion of 61 articles that did not fit our analysis. Therefore, we have identified 25 eligible articles for our final sample (Figure 1. summarizes the search process). This number of relevant articles for further analysis (compared to the initial search) is consistent with other systematic literature reviews in the area of business and management including those by Sindakis *et al*. (2020), Sanni and Verdolini (2022), and Garcia-Martinez *et al*. (2023).

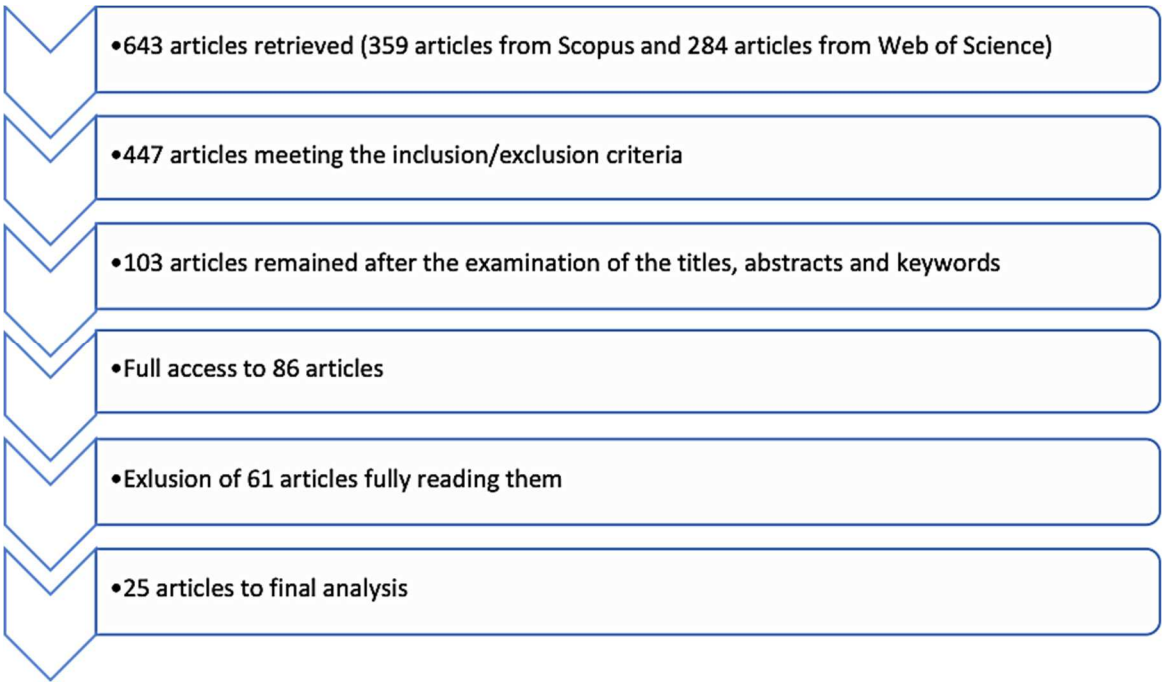

Figure 1. Overview of the search process
Source: own elaboration.

This number of articles in the final sample also confirms the findings of Tian's *et al.* (2018) that the literature on innovation and culture is still fragmented and disconnected (Tian *et al.*, 2018) as this is still a relatively new study area. Nerveless, Tian *et al.* (2018) encourage systematic literature reviews in this area to find key research and to provide future studies avenues. We then followed this approach supported by the systematic literature review by Cordero and Ferreira (2018) of 30 articles provided for a new field of study.

The identification of the final sample allowed us to extract the information from the relevant articles necessary for descriptive and thematic analyses and to indicate future research avenues. In this regard, we analysed each article to identify the study methodology, the publication over time, the journal, and the geography of the article. We also extracted geographical areas and sectors of analysis from each article. We also analysed each article to identify emerging main themes.

LITERATURE REVIEW

Following the recommendation of Tranfield *et al*. (2003) and Snyder (2019) for a systematic literature review, we will present the results of our review in two parts: a descriptive analysis and a thematic analysis. The descriptive analysis allowed us to identify an interest in the topic as a source of research. We focused on publications over time, journals, and the geography of the articles. Moreover, we have also analysed geographical areas, sectors of analysis, and types of research. We conducted the thematic analysis to provide a comprehensive view of the published articles on the linkages between the firm's innovation culture and external collaboration and to identify the emerging key themes.

Descriptive Analysis

Considering publications over time, we indicated that the linkages between the firm's innovation culture and external collaboration are a relatively new theme in the literature. As presented in Figure 2, the attention over the research interest in the field went slow but continuously grew.

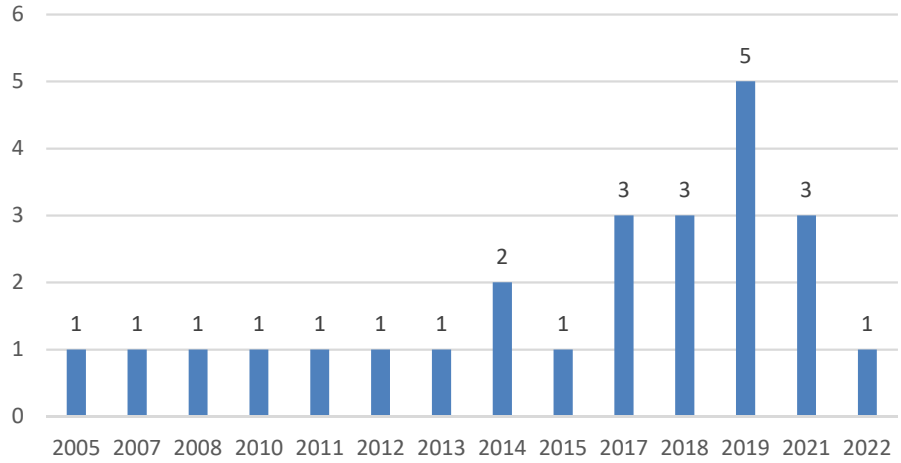

Figure 2. Distributions of publications over the timeframe between 2000 and 2022
Note: The analysis was conducted in early 2022 and did not include articles that appeared after that time.
Source: own elaboration.

From 2000 to 2016, research on the relationship between the firm's innovation culture and external collaboration was scant, with at most only one article per year, starting in 2005. A turning point, after which the number of publications increased, occurred in 2017. A closer analysis shows that in that year, Olmos-Peñuela *et al*. (2017) published an article on improving the innovation culture of small and medium-sized enterprises by collaborating with public research institutions. During the 2017-2022 period, over 60% of the articles were published, indicating that although the number of publications in the field is still relatively limited, a positive trend in publications over time is noticeable.

The articles that address this research topic were published in 23 different journals. Table 1 provides the list of journals, including the number of published articles.

Table 1. Articles distribution by journals

Article distribution by journals	Number of articles
Journal of Small Business and Enterprise Development	2
Technological Forecasting and Social Change	2
Asian Journal of Business Research	1
Creativity and Innovation Management	1
Entrepreneurship Research Journal	1
European Journal of Innovation Management	1
European Planning Studies	1
Global Journal Al-Thaqafah	1
International Journal of Engineering And Technology (Uae)	1
International Journal of Entrepreneurship And Innovation Management	1
International Journal of Innovation And Learning	1
International Small Business Journal	1
Journal of Business & Industrial Marketing	1
Journal of Business Ethics	1
Journal of Global Scholars of Marketing Science	1
Journal of Political Marketing	1
Journal of Services Marketing	1
Journal of Technology Transfer	1
Knowledge Management Research & Practice	1
Logforum	1
Management Research Review	1
Opcion	1
Technology Analysis & Strategic Management	1

Source: own study.

According to our analysis, research on the linkages between the firm's innovation culture and external cooperation has been published in journals of different fields (concerning, among others, entrepreneurship, innovation, technological forecasting, spatial development processes and policies). This may suggest the relevance of the theme and its multithreading character. We have noted that the majority of journals published only one article related to the theme, whereas only two journals published two articles on the topic (*Journal of Small Business and Enterprise Development, Technological Forecasting and Social Change*). Moreover, the review highlighted that although the number of publications related to the linkages between innovation culture and external collaboration was still relatively limited, research activity in the field was widely distributed. Scholars working on research on the topic were located in 24 countries, as illustrated in Figure 3.

A large number of the articles were written by authors from Europe (44% of the articles – especially from Germany and Spain) and Asia (40% of the articles – particularly from Malaysia). Concerning authors, only one author published three articles (in co-authorship): Hasliza Abdul Halim, and only two authors published two articles (in co-authorship): Noor Hazlina Ahmad, Dirk Meissner. In relation to the country's focus of studies, we noticed a considerable geographical dispersion, which allowed us to identify interest in the field at a global level (Table 2).

The majority of studies referred to a single country (84% of the articles). The geographical focus of the studies was: Spain (N=4), Malaysia (N=3), Canada (N=2), Germany (N=2), and Russia (N=2). The remaining articles focused on Australia, Cyprus, France, South Korea, Sri Lanka, Switzerland, Tunisia, and Turkey. As for cross-country studies, we identified four studies involving: two countries (India, United States of America), four countries (Austria, Poland, Germany, Denmark), twenty-four countries (primarily in Asia, Europe and North America) and one study that addressed several countries (from Asia, Africa, Europe, North America and South America).

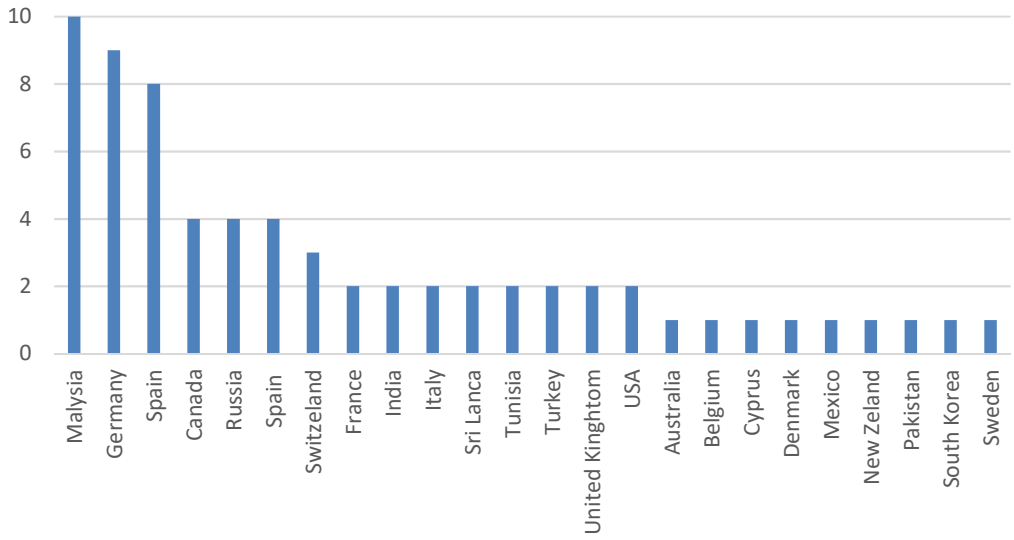

Figure 3. Authors' location
Source: own elaboration.

Table 2. Country of analysis

Country of analysis	Author(s)
Australia	Hyland & Beckett (2005)
Canada	Dobni (2008), Bourdeau *et al.* (2021)
Cyprus	Hadjimanolis (2010)
France	Jouny-Rivier *et al.* (2017)
Germany	Brettel & Cleven (2011), Nestle *et al.* (2019)
Malaysia	Abdul Halim *et al.* (2019a), Abdul Halim *et al*. (2019b), Hanifah *et al*. (2022)
Russia	Kratzer *et al*. (2017), Meissner & Shmatko (2019)
South Korea	Lee (2018)
Spain	Morcillo *et al.* (2007), Santos-Vijande *et al*. (2013), Olmos-Peñuela *et al*. (2017), Martínez-Costa *et al*. (2018)
Sri Lanka	Raisal *et al*. (2019)
Switzerland	Wolf *et al*. (2012)
Tunisia	El Harbi *et al*. (2014)
Turkey	Duygulu *et al.* (2015)
India, United States	Sai Manohar & Pandit (2014)
Austria, Poland, Germany, Denmark	Batz *et al.* (2018)
24 countries	Raajpoot & Sharma (2021)
Various countries	Bashir & Malik (2021)

Source: own study.

Considering the sector of analysis, we noticed a predominance of studies relating to a single sector (52%), as illustrated in Table 3.

The outcome of the review indicates research interest in manufacturing (28%) and services (24%), with a particular focus on highly innovative firms. Empirical investigations also cover two or more sectors (manufacturing, services, agriculture, mining and construction). We also identified studies for sectors described as public and private and several research without clearly stated analysis sectors. Most of the studies involved small and medium-sized enterprises.

Regarding the type of research adopted by scholars dealing with the linkages between the firm's innovation culture and external cooperation, we observed only empirical studies in our final sample (Table 4).

Table 3. Sector of analysis

Sector of analysis	Author(s)
manufacturing	Brettel & Cleven (2011), Kratzer *et al.* (2017), Olmos-Peñuela *et al.* (2017), Martínez-Costa *et al*. (2018), Meissner & Shmatko (2019), Nestle *et al.* (2019), Bashir & Malik (2021)
service	Dobni (2008), Santos-Vijande *et al*. (2013), El Harbi *et al*. (2014), Jouny-Rivier *et al.* (2017), Lee (2018), Raajpoot & Sharma (2021)
service, manufacturing	Hyland & Beckett (2005), Wolf *et al.* (2012)
service, manufacturing, agriculture	Abdul Halim *et al.* (2019a), Abdul Halim *et al.* (2019b)
service, manufacturing, mining and construction	Hanifah *et al*. (2022)
variety of sectors	Sai Manohar & Pandit (2014), Duygulu *et al.* (2015)
not specified	Morcillo *et al.* (2007), Hadjimanolis (2010), Batz *et al.* (2018), Raisal *et al.* (2019), Bourdeau *et al*. (2021)

Source: own study.

Table 4. Type of research

Study method	Author(s)
Qualitative study	Hyland & Beckett (2005), Wolf *et al.* (2012), El Harbi *et al*. (2014), Duygulu *et al*. (2015), Bashir & Malik (2021)
Quantitative study	Morcillo *et al.* (2007), Dobni (2008), Hadjimanolis (2010), Brettel & Cleven (2011), Santos-Vijande *et al.* (2013), Sai Manohar & Pandit (2014), Jouny-Rivier *et al.* (2017), Kratzer *et al.* (2017), Olmos-Peñuela *et al.* (2017), Batz *et al*. (2018), Lee (2018), Martínez-Costa *et al.* (2018), Abdul Halim *et al.* (2019a), Abdul Halim *et al.* (2019b), Meissner & Shmatko (2019), Nestle *et al.* (2019), Raisal *et al.* (2019), Bourdeau *et al*. (2021), Raajpoot & Sharma (2021), Hanifah *et al.* (2022)

Source: own study.

The review's outcome reveals that the authors mostly employed quantitative studies (76%) using questionnaire surveys with multi-item scales (*e.g.* Jouny-Rivier *et al*., 2017; Abdul Halim *et al*., 2019). We found that four of them additionally used the structural equation model to analyse structural relationships over the research interest in the field (Santos-Vijande *et al*., 2013; Nestle *et al*., 2019; Raisal *et al*., 2019; Raajpoot & Sharma, 2021). As for qualitative studies, we noticed that this type of research is less commonly used in the studied publications. We indicated four research designs entailing interviews (Wolf *et al*., 2012; Duygulu *et al*., 2015; Meissner & Shmatko, 2019; Bashir & Malik, 2021), two studies applying case studies (Hyland & Beckett, 2005; El Harbi *et al*., 2014) and one study using the process of observation (Hadjimanolis, 2010). To sum up, the application of different research types suggests that although the linkages between the firm's innovation culture and external collaboration are a relatively new theme in literature, the authors apply various research methods to investigate processes in the field from different perspectives. We found 92% of cross-sectional studies (23 articles) among the final sample. Only two articles adopted a longitudinal research design (Wolf *et al*., 2012; Olmos-Peñuela *et al*., 2017). This may indicate that research in the field is developing, and a rise of articles that cover multiple time periods is desirable.

Overall, the descriptive analysis shows that although studies relevant to the area of investigation are still relatively limited, the importance of the theme is noticeable.

Thematic Analysis

The in-depth analysis of our final sample reveals considerable differences in the scope of the articles. This corresponds to the fact that the linkages between the firm's innovation culture and external collaboration are a relatively new topic in the literature. Despite the limited comparability of the previously published studies, we tried to identify the emerging main themes. In this context, we followed the approach of Kraus *et al*. (2005) for a literature review with insufficiently differentiated research and we identified

interesting partial results. Thus, the following key themes were defined, in line with the stated research questions: the view of the firm's innovation culture, the focus on one or more specific external partners for collaboration, the support of the linkages between the firm's innovation culture and external cooperation, innovation under consideration, and the firm's size. The first of them arises from a noticeable lack of a unified approach to describing the firm's innovation culture, while the others originate from the need to understand how the firm's innovation culture is linked to external collaboration. Table 5 presents the main findings of 25 empirical studies that address this research topic.

Table 5. The main findings of the reviewed articles

Number	Author(s)	Main findings
1.	Hyland & Beckett (2005)	Harvest Company cooperates with suppliers, independent experts and universities to improve knowledge flow to foster the firm's innovation culture. Broens Industries, for enhancing the firm's innovation culture, cooperates with the university and customers.
2.	Morcillo *et al.* (2007)	Government technological policy support is needed for the innovation culture of the firm.
3.	Dobni (2008)	The firm's proactive interactions with others in the value chain (retailers, distributors, suppliers) and co-defining value with customers are important for firm's innovation culture.
4.	Hadjimanolis (2010)	Political marketing promotes and strengthens the firm's innovation culture through cooperation between the public and private sectors.
5.	Brettel & Cleven (2011)	A positive connection with the firm's orientation towards technological innovation and the firm's cooperation with universities, independent experts and customers (negative relationship for competitors and suppliers). A positive association between the learning orientation and the predisposition to take risks by the firm in cooperation with independent experts and customers (negative association with suppliers, universities, and competitors). A positive association between the firm's orientation towards the future market and cooperation with universities, independent experts and suppliers (negative for customers and competitors.
6.	Wolf *et al.* (2012)	Collaboration with external partners differs in SMEs with a distinct innovation culture. While SMEs with an innovation culture concentrate on network base profit from external collaboration but innovate incrementally, SMEs with an innovation culture with a holistic innovation profile for long-term cooperation are careful in their choice of excellent international partners. Moreover, SMEs featuring innovation culture with a do-it-yourself innovation profile are more likely to reject external collaboration but do not lose their innovativeness
7.	Santos-Vijande *et al.* (2013)	The firm's innovation culture strongly determines cooperation with customers in new services co-creation.
8.	El Harbi *et al.* (2014)	The innovation culture of the firm suffers from a lack of developed cooperation with universities, technology parks, and competitors. This can affect firm's isolation.
9.	Sai Manohar & Pandit (2014)	Highly innovative firms are distinguished by an innovation culture that focuses on effective collaboration with external R&D centres for the development of new technologies, services, and products to respond quickly to environmental changes.
10.	Duygulu *et al.* (2015)	Firms with R&D employees strengthen their innovation culture by cooperating with universities, R&D centres, and competitors. Collaboration with universities may face problems due to a mismatch of expectations between both parties.
11.	Jouny-Rivier *et al.* (2017)	Firms distinguished by the strong culture of innovation are not concerned about cooperating with customers due to owning the essential resources and capacities for innovation.
12.	Kratzer *et al.* (2017)	As an essential feature of proactive innovation, the firm's innovation culture increases external openness through external collaboration.
13.	Olmos-Peñuela *et al.* (2017)	There are differences in the capacity of SMEs to foster a culture of innovation through cooperation with research organisations. SMEs with formal innovation plans distinguish the greater ability to enhance their innovation culture by coop-

Number	Author(s)	Main findings
		erating with research organisations. Search strategy indirectly strengthens collaboration with research organisations. Innovation culture of smaller SMEs benefits more from collaboration with research organisations.
14.	Batz *et al.* (2018)	Insufficient cooperation between firms and clusters for innovation does not facilitate the firm's innovation culture due to communication problems. Cluster organisations are unable to provide accurate offers to change innovation culture of the firm.
15.	Lee (2018)	External technology cooperation positively affects the firm's innovation culture.
16.	Martínez-Costa *et al.* (2018)	A positive link between a firm's innovation culture and inter-organisational collaboration.
17.	Abdul Halim *et al.* (2019a)	Competitor orientation (cooperation with competitors) positively impacts the firm's innovation culture, while customer orientation (customers' commitment to value creation) does not.
18.	Abdul Halim e*t al.* (2019b)	No positive effect of customer orientation (customer commitment in value creation) on the firm's innovation culture as the effect of lack of priority assessment on the demand of SMEs' customers. Competitor orientation (cooperation with competitors) supports the firm's innovation culture.
19.	Meissner & Shmatko (2019)	Firms rarely pay attention to the skills of young researchers and engineers in interacting with external cooperation. This can hamper firm's innovation culture.
20.	Nestle *et al.* (2019)	Information asymmetries reduce the ability of clustered firms to foster their innovation culture. Agglomeration effect and trust positively impact the intensity of cooperation between cluster members and encourage their innovation culture.
21.	Raisal *et al*. (2019)	The firm's innovation culture is treated as a mediator between cooperation with customers, suppliers, competitors, and product innovation.
22.	Bashir & Malik (2021)	Using social media to collaborate on external knowledge fosters the firm's innovation culture.
23.	Bourdeau *et al*. (2021)	Externally focused information technology together with innovation culture can help employees transfer knowledge and learn from external collaboration with customers and suppliers.
24.	Raajpoot & Sharma (2021)	External collaboration is essential for new services success but does not influence the firm's innovation culture.
25.	Hanifah *et al.* (2022)	The mediating role of government support between a firm's innovation culture and innovation activities.

Source: own study.

The View of the Firm's Innovation Culture

The reviewed literature has demonstrated a substantial interest in the firm's innovation culture, its definition and operationalisations, discussing the number, type of dimensions and content of the dimensions. In this context, many studies in our final sample indicate that the firm's innovation culture as an intangible resource leads to an increase in the firm's innovativeness while indicating difficulties in defining its dimensions (Hadjimanolis, 2010; El Harbi *et al*., 2014). We found that several authors propose their own approach to identify the dimensions of the firm's innovation culture, while others rely on previously developed approaches. In this vein, Hadjimanolis (2010) identifies numerous dimensions of the firm's innovation culture that express creativity, knowledge sharing, and openness to change. For instance, attitudes towards change, learning, risk, and creativity. Jouny-Rivier *et al*. (2017) use two dimensions to describe the firms' innovation culture (organisational innovativeness, and organisational perception orientations toward change), while Meissner and Shmatko (2019) focus on dimensions, which reflect employees' 'soft' skills (*e.g.* communication skills, social skills). For Duygulu *et al*. (2015), the firm's innovation culture is expressed by eight dimensions. Among them, it can be indicated knowledge sharing and open communication, learning and development, social networks and external cooperation, free time allocation, tolerance of mistakes, and reward and incentive systems. On the other hand, Batz *et al*. (2018) highlight the following issues related to innovation culture: the benefits of innovation processes knowledge acquisition, knowledge transformation and work organisation. Sai Manohar and Pandit

(2014) highlight six dimensions of the firm's innovation culture such as organisational climate, customer focus, leadership, creativity, envisioning the future, and core values. El Harbi *et al*. (2014) focus on the knowledge exchange processes, leadership, and working climate for employees and relationships, while Santos-Vijande *et al*. (2013) emphasise market-oriented behaviour, openness to new ideas and front-line employees' behaviour towards innovation. For Wolf *et al*. (2012) the dimensions of the firm's innovation culture express holistic innovation, network-based innovation, 'do-it-yourself' innovation and innovation resistance. Meanwhile, Olmos-Peñuela *et al*. (2017) present another approach to the firm's innovation culture. They highlight the collaborative aspects. In this context, the innovation culture of the firm is regarded as a potential benefits of collaborating with public research organisations.

Regarding previously developed approaches to the firm's innovation culture, the reviewed literature shows that, for example, Martínez-Costa *et al*. (2018) follow the approach developed by Cameron and Quinn (1999), which includes an adhocracy culture oriented towards communication and collaboration between firms. On the other hand, Hanifah *et al*. (2022) apply the approach of Kim and Yoon (2015), specifying four items of the firm's innovation culture. These relate to being innovative and the ability to take risks, seize opportunities quickly, and take individual responsibility. A number of the reviewed articles apply Dobni's (2008) approach to define the firm's innovation culture (Abdul Halim *et al*., 2019a; Abdul Halim *et al*., 2019b; Raajpoot & Sharma, 2021). In this vein, the innovation culture of the firm is regarded as a multidimensional construct with four dimensions (Dobni, 2008): intention for innovation, infrastructure for innovation, the influence of market orientation for innovation, and innovation implementation. Following this approach, the firm's innovation culture comprises innovation readiness, organisational constituency, organisational learning, creativity and empowerment, market and value orientation, and implementation context (Dobni, 2008). The use of such an approach is based on incorporating multi-faced aspects of firms' innovation culture. Bourdeau *et al*. (2021) followed Brettel and Cleven's (2011) understanding of the firm's innovation culture, which identifies four dimensions of the firm's innovation culture with an emphasis on continuous learning and knowledge development to detect and fill discrepancies between market needs and the firm's offering. Thus, according to Brettel and Cleven (2011), the dimensions of the firm's innovation culture include a focus on technological innovation, learning orientation, risk-taking, and future market orientation. Nevertheless, in their empirical research, Bourdeau *et al*. (2021) applied two dimensions of the firm's innovation culture, identified as 'key dimensions,' which are being collaborative and entrepreneurial. In this context, the collaborative dimension refers to the collaborative working environment that requires collaboration between stakeholders, while the entrepreneurial dimension is associated with entrepreneurial behaviour and attitudes.

We have also noticed that some studies from our final sample emphasise the view of the firm's innovation culture as openness to employees' attitudes in the field of innovation and openness to external relationships to increase firms' innovation activities (Kratzer *et al*., 2017; Nestle *et al*., 2019). Here, the term 'open innovation culture of the firm' is proposed to emphasise the leveraging effect of external knowledge on the firm's innovativeness. Following this knowledge, Kratzer *et al*. (2017) address five dimensions of innovation culture, which are related to internal innovation capabilities, knowledge providers, outsourcing innovation capabilities, extramural innovation and internal and external openness. Thus, substantial attention is paid to proactive innovation behaviour. We notice the same feature in Lee's (2018) study, which indicates the following approach to the firm's open innovation culture: continuous communication with the outside, procedures and systems for external cooperation, and usage of external and internal technology for technology development. In their view of the firm's innovation culture, Bashir and Malik (2021) also stress the use of external technology to enhance firms' innovativeness. On the other hand, Nestle *et al*. (2019) emphasise the dimensions of open innovation culture developed by Herzog and Leker (2010). They paid attention to the not-invented-here syndrome, risk-taking, and management support (Herzog & Leker, 2010).

These results indicate heterogeneous views of the firm's innovation culture, which may be due to the intangible nature of the firm's innovation culture. Heterogeneous views of the firm's innovation culture may also be due to research in a different context, including differences in sector or country focus. It may also be due to the consideration of different types of innovation and relationships with a

particular external partner or partners. For this reason, our review revealed that the view and dimensions of the firm's innovation culture call for further development.

External Partner(s) for Collaboration

Our study revealed that the final articles highlight research topics involving different external partners demonstrating the importance of incorporating collaboration with different knowledge providers into the firm's innovation culture. Most of the reviewed articles focused on one or more specific external partners. However, we also identified articles that refer generally to 'external cooperation' or 'external partners,' without specifying a particular one. This suggests that although the linkages between the firm's innovation culture and external collaborations are a relatively new topic in the literature, there is particular interest in identifying and aligning relationships with a specific external partner or partners. In this respect, we noted the focus of the reviewed articles on such external partners as customers, competitors, suppliers, clusters, retailers, distributors, research organisations, and government institutions. Such a differentiation of the external partners studied illustrates the need for research to examine different aspects of the links between the firm's innovation culture and external collaboration. Noteworthy, although the number of publications in the field is still relatively limited, they do consider all external partners associated with triple helix.

In our final sample, the greatest number of the reviewed articles examine aspects related to the links between the firm's innovation culture and collaboration with customers. This is crucial, because customers play a key role in enhancing firms' innovation activities (Santos-Vijande *et al*., 2013) by providing knowledge about customers' attitudes towards changes in the environment. This has implications for the resources and capabilities required by the firm to innovate. Significantly, we may observe ambiguous results in this area. Five studies report a positive association between the firm's innovation culture and collaboration with customers (Hyland & Beckett, 2005; Dobni, 2008; Brettel & Cleven, 2011; Santos-Vijande *et al*., 2013; Raisal *et al*., 2019), while four provide the opposite results (Brettel & Cleven, 2011; Jouny-Rivier *et al*., 2017; Abdul Halim *et al*., 2019a; Abdul Halim *et al*., 2019b). For instance, Dobni (2008) provides evidence of the linkages between the firm's innovation culture and customers, emphasising the co-definition of value with customers. On the contrary, the study by Jouny-Rivier *et al*. (2017) suggests that firms with a strong innovation culture are not interested in cooperating with customers, because they possess the necessary resources and capabilities to innovate.

Moreover, extant studies found cooperation with competitors to be crucial for the continuous development of ideas, products, and services, leading to the improvement of firms' innovation activities. In this regard, five studies reported a positive relationship between the firm's innovation culture and collaboration with competitors (El Harbi, 2014; Duygulu *et al*., 2015; Abdul Halim *et al*., 2019a; Abdul Halim *et al*., 2019b; Raisal *et al*., 2019). In line with this, Abdul Halim *et al*. (2019a) argue that collaboration with competitors supports the firm's innovation culture by 'actively monitoring' existing and potential competitors, thus ensuring increased competitiveness. Another study by Abdul Halim *et al*. (2019b) also provides evidence that such linkages are crucial for enhancing the firms' innovation activities, especially in an unstable market. In contrast, one study highlights the negative relationship between the firm's innovation culture and cooperation with competitors. Here, Brettel and Cleven (2011) provide evidence of the negative impact of cooperation with competitors.

The articles from our final sample also paid substantial attention to the linkages between the firm's innovation culture and collaboration with research organisations as providers of knowledge, skills, and technology. We noted that researchers pay particular attention to collaboration with universities, independent researchers, technology parks and external research and development (R&D) centres. Regarding these external partners, the results are also ambiguous. Among four studies in this area, most of them claim that collaboration with research organisations ensures that the innovation culture of the firm is strengthened (Hyland & Beckett, 2005; Brettel & Cleven, 2011; Duygulu *et al*., 2015; Olmos-Peñuela *et al*., 2017). For example, Hyland and Beckett (2005) analyse two firms: Harvest Company and Broens Industries, stressing the importance of collaborating with the university and independent experts to improve the flow of knowledge to support the innovation culture of the firm. On the other hand, Brettel and Cleven (2011), find not only a positive relationship between the firm's orientation

towards technological innovation and the future market and collaboration with universities and independent experts as key sources of information but also a negative association between the firm's learning orientation and risk-taking and collaboration with universities. This points to the important implication that relationships within the same partner can be considered at different levels and produce different results in terms of links to the firm's innovation culture.

Four articles from our final sample raise the issue of the linkages between the firm's innovation culture and cooperation with suppliers (Dobni, 2008; Brettel & Cleven, 2011; Raisal *et al*., 2019; Bourdeau *et al*., 2021), as they are familiar with the firm's requirements and support the firm's development of new products. Among them, only one reported a negative relationship between the firm's innovation culture and collaboration with suppliers. In this regard, Brettel and Cleven (2011) found that such a negative relationship occurs with respect to the firm's risk-taking and learning orientation as well as with respect to the firm's orientation towards technological innovation. This argument is supported by the view of suppliers as information providers rather than contributors to innovation processes (Brettel & Cleven, 2011).

Three studies from our final sample examine the links between the firm's innovation culture and cooperation with government institutions (Morcillo *et al*., 2007; Hadjimanolis, 2010; Hanifah *et al*., 2022). Such cooperation appears to be crucial, as government institutions contribute to the promotion of innovation activities of firms and thus to the development of regions and countries. Significantly, all three articles point to the importance of cooperation with government institutions for the innovation culture of the firm. As reported by Hadjimanolis (2010), this is linked to cooperation between the public and private sectors.

In our final sample, only two articles referred to the interactions between the firm's innovation culture and clusters (Batz *et al*., 2018; Nestle *et al*., 2019). We noted that although only two articles addressed clusters in the context of the firm's innovation culture, there was a lack of consistent findings. In this sense, Batz *et al*. (2018) provide evidence about positive linkages in this area, while Nestle *et al*. (2019) provide opposite results. Considering the links between the firm's innovation culture and cooperation with retailers and distributors, from our final sample, only Dobni (2008) addresses this issue, suggesting that the firm's proactive interactions with retailers and distributors are important for the firm's innovation culture.

Regarding the reviewed articles that refer to 'external cooperation' or 'external partners' without specifying a particular one, we identified seven such articles. Four of them highlight a positive relationship between the firm's innovation culture and external collaboration (Kratzer *et al*., 2017; Lee, 2018; Martínez-Costa *et al*., 2018; Bashir & Malik, 2021), while the remaining articles point to opposite results (Wolf *et al*., 2012; Meissner & Shmatko, 2019; Raajpoot & Sharma, 2021). For example, Kratzer *et al*. (2017) report that the firm's innovation culture, as a core feature of proactive innovation, increases external openness through external collaboration. On the other hand, Raajpoot and Sharma (2021) show that cooperation with external partners affects the firm's innovativeness but does not affect the firm's innovation culture.

Our review shows heterogeneous results when examining the firm's innovation culture and cooperation with external partners. This may stem from the focus on, among others, the different aspects of this collaboration or the type of innovation. Such a differentiation of results indicates the diversity of research topics in this area and encourages further research.

Supporting the Linkages between the Firm's Innovation Culture and External Cooperation

The existing studies from our final sample highlight how to support the links to the firm's innovation culture and cooperation with external partners. We found that studies undertaken in this area are very diverse and cover a wide range of topics. This suggests that although the linkages between the firm's innovation culture and external collaborations are a relatively new topic in the literature, interest in the field is multifaceted. A substantial number of the articles reviewed raise the issue from the internal perspective of the firm. We also noted articles that consider how to support the link between the firm's innovation culture and cooperation with external partners from the firm's external perspective.

Focusing on the firm's internal perspective, we noted that researchers pay particular attention to technological support, the capabilities of the firm's human resources, and the firm's attitude towards innovation and external collaboration. Two of the reviewed studies address the issue of technology as a tool to support the links between the firm's innovation culture and cooperation with customers. In this respect, Bourdeau *et al*. (2021) show that externally focused information technology together with the firm's innovation culture can help employees transfer knowledge and learn from external collaboration with customers. In a similar vein, focusing on internet-based applications, Bashir and Malik (2021) suggest that the firm's innovation culture favours the use of social media for external collaboration. In our final sample, four articles raise the issue of the capabilities of the firm's human resources as supportive of the relationship between the firm's innovation culture and collaboration with external partners. Here, Meissner and Shmatko (2019) provide evidence that firms rarely pay attention to the skills of young researchers and engineers when dealing with external collaboration. In particular, such a characteristic may inhibit the firm's innovation culture (Meissner & Shmatko, 2019). Another study draws attention to the firm's R&D employees, suggesting that such employees strengthen the firm's innovation culture by collaborating with universities, external R&D centres and competitors, which contributes to innovation development (Duygulu *et al*., 2015). Santos-Vijande *et al*. (2013) emphasize first-line employees and suggest that the willingness to involve first-line employees and customers is crucial for the co-creation of new services. An interesting finding in this area is the one by Dobni (2008), who indicates that proactive interactions with suppliers, retailers, and distributors are important for the firm's innovation culture. We also found that the reviewed articles deal with the issue of the firm's attitude towards innovation and external collaboration as support for the link between the firm's innovation culture and external collaborations. In this regard, Olmos-Peñuela *et al*. (2017) suggest that firms with a formal innovation plan distinguish a more remarkable ability to improve innovation culture as an effect of collaboration with research organisations. They also find that the search strategy indirectly strengthens collaboration with research organisations (Olmos-Peñuela *et al*., 2017). Another study draws attention to the need for developed cooperation, indicating that the firm's innovation culture suffers from a lack of developed cooperation with competitors, which can lead to the isolation of the firm (El Harbi *et al*., 2014). In this vein, the study by Batz *et al*. (2018) also provides important evidence that insufficient cooperation between firms and clusters for innovation does not promote the innovation culture of the firm due to communication problems.

Regarding the firm's external perspective, we found that the reviewed articles mainly focus in this area on the relationships between the firm's innovation culture and cooperation with clusters and government institutions. In this regard, Batz *et al*. (2018) provide evidence that clusters are not able to provide precise offers to change the firm's innovation culture. In particular, information asymmetries, defined as hidden information and characteristics, reduce the promotion of the firm's innovation culture in a cluster (Nestle *et al*., 2019). On the other hand, Nestle *et al*. (2019) provide evidence that the agglomeration effect and trust positively influence the intensity of cooperation among cluster members and foster their innovation culture. Meanwhile, Hadjimanolis (2010) indicates the need for policy marketing to promote and enhance the innovation culture of the firm through, among other things, research subsidies, support for technological upgrading and competitive research. Morcillo *et al*. (2007) also provide evidence that government technological policy support is needed for the firm's innovation culture. Such support should lead to the strengthening of firms' innovation activities. Similarly, Hanifah *et al*. (2022) underline the mediating role of government support between the firm's innovation culture and firms' innovation activities. In this regard, Hanifah *et al*. (2022) particularly emphasise cooperation towards the firm's entrepreneurial attitude.

Innovation under Consideration

A relatively small number of the reviewed articles examine aspects related to the links between the firm's innovation culture and external collaboration from the perspective of innovation under consideration. We found that among the reviewed articles that address this issue, the greatest emphasis was on innovation related to technology and product development. In this context, Hyland and Beckett (2005) highlight the role of collaboration with customers in enhancing the innovation culture of the

firm, which scholars see as a 'meditative role' between external collaboration and product development success (Raisal *et al*., 2019). Lee (2018) also focuses on external technology collaboration, highlighting that such collaboration has a positive impact on the firm's innovation culture. Brettel and Cleven (2011) highlight the positive effect of cooperation with customers by referring to aspects of the firm's innovation culture, such as openness to the technological development of products. This study also shows that collaboration with universities and independent experts (as key sources of information) positively relates to the firm's orientation towards technological innovation (Brettel & Cleven, 2011). Furthermore, Brettel and Cleven (2011) provide evidence of the negative impact of cooperation with competitors on the firm's technological innovation orientation.

In our final sample, we noted two articles that refer to innovation related to service. In this regard, Santos-Vijande *et al*. (2013) found that collaboration with customers in the co-creation of new services is strongly determined by the firm's innovation culture. Another study, by Raajpoot and Sharma (2021) discusses the relationship between the firm's innovation culture and external collaboration in the success of new services, showing that such collaboration contributes to the success of new services but does not affect the firm's innovation culture.

We also noted a single study that focuses on the links between the firm's innovation culture and external collaboration through different innovation profiles. In this respect, Wolf *et al*. (2012) found that the firm with a network-centric innovation culture benefits from external collaboration but innovates incrementally. They also found that a firm with an innovation culture with a holistic innovation profile tends to select excellent international partners for long-term cooperation rather carefully (Wolf *et al*., 2012). Moreover, they highlight that a firm with an innovation culture with a do-it-yourself innovation profile tends to reject external cooperation but is no less innovative (Wolf *et al*., 2012).

These results indicate that there is relatively little interest among the reviewed articles in the topic of specific innovation. This may be due to the fact that the literature on the linkages between the firm's innovation culture and external collaboration is still fragmented and developing. Nevertheless, the heterogeneous results obtained so far encourage further research.

Firm Size

The analysis of our final sample provides evidence for the lack of a specified firm size in most of the reviewed studies on the relationship between the firm's innovation culture and external collaboration. Among those with a specified firm size, small and medium-sized enterprises predominate. Significantly, these studies report heterogeneous results indicating multidimensional aspects of the link on the firm's innovation culture and external collaboration. For example, Raisal *et al.* (2019) found that the SME's innovation culture is treated as a mediator between cooperation with customers, suppliers, competitors, and product innovation. In this vein, Martínez-Costa *et al.* (2018) provide evidence of a positive relationship between the innovation culture of the SMEs and inter-organisational collaboration. On the other hand, Abdul Halim *et al.* (2019a) and Abdul Halim *et al.* (2019b) show a negative effect of customer engagement in value creation on the firm's innovation culture as a result of the lack of prioritisation of the demand of SME's customers. Abdul Halim *et al.* (2019a) and Abdul Halim *et al.* (2019b) also report a positive effect of cooperation with competitors on the SME's innovation culture. Another study from our final sample focusing on SMEs suggests that there are differences in the SMEs' ability to foster a culture of innovation through cooperation with research organisations (Olmos-Peñuela *et al.*, 2017). In this context, SMEs with formal innovation plans distinguish the greater ability to enhance their innovation culture by cooperating with research organisations, while search strategy indirectly strengthens collaboration with research organisations (Olmos-Peñuela *et al.*, 2017). Batz *et al.* (2018) also focus on SMEs and provide evidence that insufficient cooperation between SMEs and clusters for innovation does not facilitate the SME's innovation culture due to communication problems. Another study, by Wolf *et al.* (2012), points to differences in collaboration with external partners in SMEs with a distinct innovation culture. In this context, SMEs with an innovation culture concentrated on network base profit from external collaboration but innovate incrementally, while SMEs with innovation culture with a holistic innovation profile for long-term cooperation are careful in their choice of excellent international partners (Wolf *et al.*, 2012).

Among the other studies from our final sample that specify the firm size, we noted that researchers pay attention also to micro and small firms. In this respect, analysing together micro, small, medium, and large firms, Jouny-Rivier *et al.* (2017) show that firms distinguished by a strong culture of innovation are not concerned with cooperating with customers due to owning the essential resources and capacities for innovation. On the other hand, analysing SMEs and large firms together, Brettel and Cleven (2011) provide evidence of a positive connection between the firm's orientation towards technological innovation and the firm's cooperation with universities, independent experts and customers (negative relationship for competitors and suppliers). They also suggest a positive association between the learning orientation and the predisposition to take risks by the firm in cooperation with independent experts and customers (negative association with suppliers, universities, and competitors (Brettel & Cleven, 2011).

These results point to the need for greater association of the link between the firm's innovation culture and external collaboration with the firm size. This could lead to the further development of the research results obtained so far and to better knowledge in the research area.

DISCUSSION

This study provides theoretical implications in the area of the drivers of firms' innovation activities by providing a comprehensive review of the existing research on the linkages between the firm's innovation culture and external collaboration. We contribute to the encouragement of Tian's *et al.* (2018) to provide systematic literature reviews on the connections between innovation and culture to find key research and to provide avenues for future studies. Our review revealed the growing interest in understanding how the firm's innovation culture is linked to external collaboration. We found that the link between the firm's innovation culture and external collaboration is a relatively new theme in the literature, but the interest in this research area is growing. We also found that although the studies relevant to the area of investigation are still relatively limited, many topics and research directions have emerged. In this context, our findings provide more insight into this relatively new theme in the literature. Our analysis revealed that the issues related to the relationship between the firm's innovation culture and external collaboration have been examined in various ways. The results show that the view of the firm's innovation culture and its dimension are important for understanding cooperation with external knowledge providers. However, the results suggest a heterogeneous view of the firm's innovation culture which may be due to the intangible nature of the firm's innovation culture or the specificity of the relationship with a particular external partner or partners. Our review provides also evidence of heterogeneous results on the link between the firm's innovation culture and cooperation with external partner or partners. It may vary according to the different aspects of this collaboration or the innovation type. It could also relate to the focus on different sectors of analysis or the firm size. We also noticed heterogeneous results from the perspective of innovation considered, although most of the studies do not consider a specific innovation. This may be due to the fact that the literature on the linkages between the firm's innovation culture and external collaboration is still fragmented and developing. The review also indicates heterogeneous results for the association of the link between the firm's innovation culture and external collaboration with the size of the firm, with a particular focus on SMEs. However, most of the studies do not consider a specific firm size in the research in this area. Our study also reviewed how to support the links to the firm's innovation culture and cooperation with external partners. The results reveal that researchers pay particular attention to, among others, technological support, the capabilities of the firm's human resources, and the firm's attitude towards innovation and external collaboration. Our findings show heterogeneous results in this area. This indicates that although the linkages between the firm's innovation culture and external collaborations are a relatively new topic in the literature, the interest in the field is diverse.

Considering the above, our review suggests that results related to the linkages between the firm's innovation culture and external collaborations are predominantly heterogeneous. We also found that many of the issues in the field remain fragmented and considerably unexplored. This provides an opportunity to pose several questions as future research avenues. Firstly, future re-

search might focus much more on cross-sectoral and cross-countries analysis to better capture different aspects of the linkages between the firm's innovation culture and external collaboration. Furthermore, as little is known about the association between the firm's size with occurrences related to the firm's innovation culture and external cooperation, it will be worth exploring the role of firm size more deeply. Future research could also provide more insights by investigating drivers and conditions that lead to the fruitful relationship between the firm's innovation culture and external collaboration. Furthermore, it would be valuable to shed more light on these issues concerning market stability, *i.e.* to reveal differences between stable and unstable markets. It would also be useful to extend the research in the area to consider the global economic situation and the ability of the firm to withstand changes in its environment. It would also be interesting to explore in more detail the relevance of the linkages between the firm's innovation culture and cooperation with external partners concerning the effects on the firm's innovativeness.

Hence, based on our results, we posed the following potential future research questions:

- How do sectors (manufacturing, services, agriculture, mining and construction) differ in the links between the firm's innovation culture and external cooperation? Which sectors are especially prone to the impact of collaboration with external partners on the firm's innovation culture?
- Do highly innovative sectors/firms benefit more than other sectors/firms from the linkages between the firm's innovation culture and collaboration with external partners?
- How does the innovativeness of countries/regions affect the establishment of a relationship between the innovation culture of the firm and external collaboration? Do firms from countries/regions with high innovation performance have more developed associations of innovation culture and better cooperation with external partners?
- How does firm size affect the linkages between the firm's innovation culture and external collaboration? Which firm size benefits more from such linkages? What is the difference between SMEs and large firms in this framework?
- What drivers lead to a fruitful relationship between the firm's innovation culture and external collaboration? Which of them should be considered as the key drivers? What is the role of firm's attitudes and human resources in creating an innovation culture focused on external cooperation? What conditions provoke the choice of cooperation with a particular external partner to foster the innovation culture of the firm? What is the role of external partners in these processes?
- How to reduce the potential mismatch of expectations in the linkages between the firm's innovation culture and collaboration with external partners?
- What is the difference between the innovativeness of firms with established linkages between innovation culture and cooperation with external partners concerning firms without innovation culture?
- What determines that some firms foster their innovation activities through the effective connection with the firm's innovation culture and external collaboration, and some do not, even if their innovation culture is oriented toward cooperation with external partners?
- What is the difference in the association between the firm's innovation culture with external cooperation in a stable and unstable market?

It would also be valuable to increase the number of longitudinal studies as most of the reviewed articles included cross-sectional studies (little is known about the long-term effects and maintenance of established relationships). Given the complexity of the firm's innovation culture and its dimensions, future studies should also include methodological considerations and working definitions. For example, it might be interesting to further develop the view of the firm's innovation culture, especially with regard to its particular dimensions. Furthermore, it would be interesting to conduct more research on open innovation culture and external collaboration to further exploit the effects of external knowledge on the firm's innovativeness. It also seems important to include eco-innovation issues in research in this area, as they are becoming increasingly important in enhancing the firms' innovative capacity.

This study is also relevant to practitioners by expanding the knowledge about the drivers of firms' innovation activities. Knowing that innovation culture is seen as a driver of firms' innovation performance, which is oriented towards the acquisition, transformation and use of knowledge for

innovation processes, can provide an increase in the firm's competitive advantage. In this context, our review provides a synthesis of research on the relationship between the firm's innovation culture and external collaboration that can be valuable to practitioners in strengthening the firm's internal capabilities for innovation processes. Firms should encourage external partners to contribute to innovation processes. Firms should also communicate their needs for external collaboration and create internal conditions to support the link between the firm's innovation culture and external collaboration. In this context, our study provides insight into technological support, the capabilities of the firm's human resources and the firm's attitude towards innovation and external collaboration, which can be implemented in the firm's policies. In this regard, the review provides evidence that practitioners should particularly consider externally focused information technology, the skills of the firm's human resources when dealing with external collaboration, the existence of a formal innovation plan and a framework for developed cooperation with external partners.

CONCLUSIONS

We analysed the existing literature on the drivers of firms' innovation activities. We drew research attention to the firm's innovation culture as an intangible resource that leads to an increase in firms' innovation performance. We were interested in the linkages between the firm's innovation culture and external cooperation as a developing area of research on the connections between knowledge diffusion and innovation processes. This is because innovation culture is regarded as a driver of firms' innovation performance, which is oriented towards the acquisition, transformation and use of knowledge for innovation processes and can lead to an increase in the firm's competitiveness. Nevertheless, this field suffers from a lack of comprehensive examinations of previously published articles. Considering the above, our study contributes to the field by providing a systematic review that gives attention to the relationship between the firm's innovation culture and external collaboration. We explored research articles from 2000 to 2022, and we provided a review of 25 articles selected from the Scopus Web of Science databases. We summarised systematic information on the time evolution and geography of the studies, the methodological profile of the articles and the main findings of the scholars. The review provides evidence that the literature on the linkages between the firm's innovation culture and external cooperation is still relatively limited, but the interest in the field is growing. Moreover, our review suggests that the research on this topic is not homogeneous, and varies in scope, focus, and findings, which may provide further research avenues. In this regard, our findings suggest a heterogeneous view of the firm's innovation culture. We also found heterogeneous results on the link between the firm's innovation culture and cooperation with external partner or partners. The review also provides evidence that through technological support, the capabilities of the firm's human resources, and the attitude towards innovation and external collaboration, firms can support the relationship between its innovation culture and external cooperation.

The present review provides implications for scholars and practitioners. Although researchers have shed some light on the topic, there remains a need for an in-depth understanding of the relationship between the firm's innovation culture and external cooperation. This study raises several questions that we may regard as propositions for future research. We would also suggest more longitudinal studies to increase the number of repeated observations in the field. Furthermore, along with the focus on small and medium-sized enterprises, we would suggest more research on large firms to compare whether the obtained results also fit this size of firms. Considering the implications for practitioners, the review suggests that firms should foster the linkages between the firm's innovation culture and collaboration with external partners to provide conditions for enhancing firms' innovation activities. The findings also point to the need to promote the strengthening of the firm's innovation culture and reduce the potential mismatch of expectations between the innovation culture of the firm and collaboration with external partners.

This study also provides implications for policymakers. The findings suggest that the support of government institutions is needed to promote the linkages between the firm's innovation culture and external collaboration. This is because such a link can lead to the improvement of firms' competitive-

ness and, consequently, to the improvement of the competitive advantages of regions and countries. In this regard, our study points to the need for further development of a favourable environment for firms' innovativeness by providing support for technological upgrading and research subsidies.

This study is not free of limitations, which are related to the methodology applied in our systematic literature review. We may see these limitations as opportunities for future systematic literature reviews on the linkages between the firm's innovation culture and external collaboration. Firstly, our review was limited to the articles from the Scopus and Web of Science databases. Another limitation was that the review did not consider book chapters and conference proceedings. Furthermore, many full-text articles written in English were not accessible. Despite this, we believe that our review offers an interesting set of results, which may direct future empirical research.

REFERENCES

Abdul Halim, H., Ahmad, N.H., Geare, A., & Thurasamy, R. (2019a). Innovation culture in SMEs: the importance of organizational culture, organizational learning and market orientation. *Entrepreneurship Research Journal*, *9*(3), 20170014. https://doi.org/10.1515/erj-2017-0014

Abdul Halim, H., Ahmad, N.H., & Ramayah, T. (2019b). Sustaining the innovation culture in SMEs: the importance of organisational culture, organisational learning and market orientation. *Asian Journal of Business Research*, *9*(2), 14-33. https://doi.org/10.14707/ajbr.190059

Arsawan, I.W., Koval, V., Rajiani, I., Rustiarini, N.W., Supartha, W.G., & Suryantini, N.P.S. (2022). Leveraging knowledge sharing and innovation culture into SMEs sustainable competitive advantage. *International Journal of Productivity and Performance Management*, *71*(2), 405-428. https://doi.org/10.1108/IJPPM-04-2020-0192

Audretsch, D.B., & Belitski, M. (2024). Knowledge collaboration, firm productivity and innovation: A critical assessment. *Journal of Business Research, 172*, 114412. https://doi.org/10.1016/j.jbusres.2023.114412

Audretsch, D.B., & Belitski, M. (2020). The role of R&D and knowledge spillovers in innovation and productivity. *European Economic Review, 123*, 103391. https://doi.org/10.1016/j.euroecorev.2020.103391

Bader, K., Vanbrabant, L., & Enkel, E. (2014, June). Drivers of firm openness: innovation culture and strategic direction as stimulating factors. Proceedings of the EURAM 2014 (European Academy of Management) Conference, Valencia. ISBN: 978-84-697-0377-9

Bashir, N., & Malik, K. (2021). Developing firm capabilities to utilise social media for the fuzzy front end of innovation. *Technology Analysis & Strategic Management*, *35*(6), 721-736. https://doi.org/10.1080/09537325.2021.1980530

Batz, A., Kunath, M., & Winkler, H. (2018). Discrepancies between cluster services and SMEs' needs constraining the creation of a culture of innovation amidst industry 4.0. *LogForum*, *14*(3), 387-405. https://doi.org/10.17270/J.LOG.2018.286

Becker, W., & Dietz, J. (2004). R&D cooperation and innovation activities of firms—evidence for the German manufacturing industry. *Research Policy*, *33*(2), 209-223. https://doi.org/10.1016/j.respol.2003.07.003

Bourdeau, S., Aubert, B., & Bareil, C. (2021). The effects of IT use intensity and innovation culture on organizational performance: the mediating role of innovation intensity. *Management Research Review*, *44*(2), 359-380. https://doi.org/10.1108/MRR-02-2020-0068

Brettel, M., & Cleven, N. (2011). Innovation culture, collaboration with external partners and NPD performance. *Creativity and Innovation Management*, *20*(4), 253-272, https://doi.org/10.1111/j.1467-8691.2011.00617.x

Cameron, K.S., & Quinn, R.E. (1999). Diagnosing and changing organizational culture. Based on the competing values framework. Reading, Massachusetts: Addison Wesley.

Castaneda, D.C., & Cuellar, S. (2020). Knowledge sharing and innovation: A systematic review. *Knowledge and Process Management*, *27*(3), 159-173. https://doi.org/10.1002/kpm.1637

Cooper, S.C., Pereira, V., Vrontis, D., & Yipeng, L. (2023). Extending the resource and knowledge based view: Insights from new contexts of analysis. *Journal of Business Research, 156*, 113523. https://doi.org/10.1016/j.jbusres.2022.113523

Cordero P.L., & Ferreira, J.J. (2018). Absorptive capacity and organizational mechanisms: A systematic review and future directions. *Review of International Business and Strategy*, *29*(1), 61-82. https://doi.org/10.1108/RIBS-10-2018-0089

Dobni, C.B. (2008). Measuring innovation culture in organizations: The development of a generalized innovation culture construct using exploratory factor analysis. *European Journal of Innovation Management*, *11*(4), 539-559, https://doi.org/10.1108/14601060810911156

Duygulu, E., Ozeren, E., Bagiran, D., Appolloni, A., & Mavisu, M. (2015). Gaining insight into innovation culture within the context of R&D centres in Turkey. *International Journal of Entrepreneurship and Innovation Management*, *19*(1/2), 117-146, https://doi.org/10.1504/IJEIM.2015.068439

Edler, J., & Fagerberg, J. (2017). Innovation policy: What, why, and how. *Oxford Review of Economic Policy*, *33*(1), 2-23. https://doi.org/10.1093/oxrep/grx00

El Harbi, S., Anderson, A.R., & Amamou, M. (2014). Innovation culture in small Tunisian ICT firms. *Journal of Small Business and Enterprise Development*, *21*(1), 132-151. https://doi.org/10.1108/JSBED-06-2013-0086

Frangenheim, A., Trippl, M., & Chlebna, C. (2020). Beyond the Single Path View: Interpath Dynamics in Regional Contexts. *Economic Geography, 6*(1), 31-51. https://doi.org/10.1080/00130095.2019.1685378

Fritsch, M., Titze, M., & Piontek, M. (2020). Idenifying cooperaton for innovation—a comparison of data sources. *Industry and Innovation*, *27*(6), 630-659. https://doi.org/10.1080/13662716.2019.1650253

Gabaldón-Estevan, D., & Ybarra, J-A. (2017). Innovative culture in district innovation systems of European ceramics SMEs. *European Planning Studies*, *25*(11), 2021-2036. https://doi.org/10.1080/09654313.2017.1353591

Garcia-Martinez, L.J., Kraus, S., Breier, M., & Kallmuenzer, A. (2023). Untangling the relationship between small and medium-sized enterprises and growth: a review of extant literature. *International Entrepreneurship and Management Journal, 19*, 455-479. https://doi.org/10.1007/s11365-023-00830-z

Greer, C.R., & Lei, D. (2012). Collaborative innovation with customers: a review of the literature and suggestions for future research. *International Journal of Management Reviews, 14,* 63-84*.* https://doi.org/10.1111/j.1468-2370.2011.00310.x

Grillitsch, M., Schubert, T., & Srholec, M. (2019). Knowledge base combinations and firm growth. *Research Policy*, *48*(1), 234-247. https://doi.org/10.1016/j.respol.2018.08.009

Gui, L., Lei, H., & Le, P.B. (2024). Fostering product and process innovation through transformational leadership and knowledge management capability: the moderating role of innovation culture. *European Journal of Innovation Management, 27*(1), 214-232. https://doi.org/10.1108/EJIM-02-2022-0063

Hadjimanolis, A. (2010). Methods of political marketing in (trans) formation of innovation culture. *Journal of Political Marketing*, *9*(1-2), 93-110. https://doi.org/10.1080/15377850903472554

Hanifah, H., Abdul Halim, H., & Vafaei-Zadeh, A. (2022). Social capital as innovative performance driver in SMEs leveraging on innovation culture and government support. *Global Journal Al-Thaqafah*, 45-54. https://doi.org/10.7187/GJATSI022022-5

Heider, A., Hülsbeck, M., & von Schlenk-Barnsdorf, L. (2022). The role of family firm specific resources in innovation: An integrative literature review and framework. *Management Review Quarterly*, *72*(*2*), 483-530. https://doi.org/10.1007/s11301-021-00256-3

Hervás-Oliver, J-L., Parrilli, M.D., Rodríguez-Pose, A., & Sempere-Ripoll, F. (2021). The drivers of SME innovation in the regions of the EU. *Research Policy, 50*(9), 104316. https://doi.org/10.1016/j.respol.2021.104316

Herzog, P., & Leker, J. (2010). Open and closed innovation – different innovation cultures for different strategies. *International Journal of Technology Management, 52*(3/4), 322-343. https://doi.org/10.1504/IJTM.2010.035979

Huggins, R., & Johnston, A. (2010). Knowledge flow across inter-firm networks: the influence of network resources, spatial proximity, and firm size. *Entrepreneurship and regional development*, *22*(5), 457-484. https://doi.org/10.1080/08985620903171350

Hyland, P., & Beckett, R. (2005). Engendering an innovative culture and maintaining operational balance. *Journal of Small Business and Enterprise Development*, *12*(3), 336-352. https://dx.doi.org/10.1108/14626000510612268

Jouny-Rivier, E., Reynoso, J., & Edvardsson, B. (2017). Determinants of services co-creation with business customers. *Journal of Services Marketing*, *31*(2), 85-103. https://doi.org/10.1108/JSM-01-2016-0001

Kim, S., & Yoon, G. (2015). An innovation-driven culture in local government: do senior manager's transformational leadership and the climate for creativity matter?. *Public Personnel Management*, *44*(2), 147-168. https://doi.org/10.1177/0091026014568896

Knight, K.E. (1967). A descriptive model of the intra-firm innovation process. *The Journal of Business*, *40*(4), 478-496. Retrieved from https://www.jstor.org/stable/2351630 on October 12, 2023.

Kratzer, J., Meissner, D., & Roud, V. (2017). Open innovation and company culture: Internal openness makes the difference. *Technological Forecasting and Social Change*, *119*, 128-138, https://doi.org/10.1016/j.techfore.2017.03.022

Kraus, S., Breier, M., & Dasí-Rodríguez, S. (2020). The art of crafting a systematic literature review in entrepreneurship research. *International Entrepreneurship and Management Journal*, *16*, 1023-1042. https://doi.org/10.1007/s11365-020-00635-4

Kraus, S., Reiche, B., & Reschke, C. (2005, September). The role of strategic planning in SMEs: literature review and implications. In *proceedings of the Conference Annual Meeting of the British Academy of Management* (pp. 13-15). Oxford, UK.

Lee, W.I. (2018). The effect of external technology cooperation and internal relation on innovative behaviour in technology intensive organizations. *International Journal of Engineering & Technology*, *7*(4.4), 26-29. https://doi.org/10.14419/ijet.v7i4.4.19601

Macpherson, A., & Holt, R. (2007). Knowledge, learning and small firm growth: a systematic review of the evidence, *Research Policy*, *36*(2), 172-192. https://doi.org/10.1016/j.respol.2006.10.001

Martínez-Costa, M., Jiménez-Jiménez, D., & Rabeh, H.A.D. (2018). The effect of organisational learning on interorganisational collaborations in innovation: an empirical study in SMEs. *Knowledge Management Research & Practice*, *17*(2), 137-150. https://doi.org/10.1080/14778238.2018.1538601

Meissner, D., & Shmatko, N. (2019). Integrating professional and academic knowledge: the link between researchers skills and innovation culture. *The Journal of Technology Transfer*, *44*, 1273-1289. https://doi.org/10.1007/s10961-018-9662-8

Morcillo, P., Rodríguez-Antón, J.M., & Rubio, L. (2007). Corporate culture and innovation: in search of the perfect relationship. *International Journal of Innovation and Learning*, *4*(6), 547-570. https://doi.org/10.1504/IJIL.2007.013448

Naranjo-Valencia, J.C., & Calderon-Hernández, G. (2018). Model of culture for innovation. In J. Vveinhardt (Ed.), *Organizational Culture*, (pp. 13-34), Intechopen. https://doi.org/10.5772/intechopen.81002

Nestle, V., Täube, F.A., Heidenreich, S., & Bogers, M. (2019). Establishing open innovation culture in cluster initiatives: The role of trust and information asymmetry. *Technological Forecasting and Social Change*, *146,* 563-572. https://doi.org/10.1016/j.techfore.2018.06.022

Netz, J., Reinmoeller, P., & Axelson, M. (2022). Crisis-driven innovation of products new to firms: The sensitization response to COVID-19. *R and D Management*, *52*(2), 407-426. https://doi.org/.1111/radm.12522

Nowak, R. (2019). Responding to key exogenous changes: the joint effect of network heterogeneity and culture of innovation. *International Journal of Innovation Management*, *23*(4), 1950030. https://doi.org/10.1142/S1363919619500300

Olmos-Peñuela, J., García-Granero, A., Castro-Martínez, E., & D'Este, P. (2017). Strengthening SMEs' innovation culture through collaborations with public research organizations. Do all firms benefit equally?. *European Planning Studies*, *25*(11), 2001-2020. https://doi.org/10.1080/09654313.2017.1279592

Pereira, R.M., MacLennan, M.L.F., & Tiago, E.F. (2020). Interorganizational cooperation and eco-innovation: a literature review. *International Journal of Innovation Science*, *12*(5), 477-493. https://doi.org/10.1108/IJIS-01-2020-0008

Pittaway, L., Holt, R., & Broad, J. (2014). Synthesising knowledge in entrepreneurship research - the role of systematic literature reviews. In E., Chell, & M. Karataş-Özkan (Eds.), *Handbook of research on small business and entrepreneurship* (pp. 83-105). Edward Elgar Publishing Limited. https://doi.org/10.4337/9781849809245.00014

Pittaway, L., Robertson, M., Munir, K., Denyer, D., & Neely, A. (2004). Networking and innovation: a systematic review of the evidence*. International Journal of Management Reviews*, *5/6*(3&4), 137-168. https://doi.org/10.1111/j.1460-8545.2004.00101.x

Puślecki, Ł. (2023). Forging innovation cooperation in Central and Eastern Europe: Unveiling the location role in biopharmaceutical industry. *Entrepreneurial Business and Economics Review, 11*(3), 123-142. https://doi.org/10.15678/EBER.2023.110308

Raajpoot, N., & Sharma, A. (2021). The function of innovation culture in the success of new services. *Journal of Global Scholars of Marketing Science*, *31*(3). 392-414, https://doi.org/10.1080/21639159.2021.1924818

Raisal, I., Tarofder, A.K., & Silva, D. (2019). Exploring critical effect of knowledge inflows and absorptive capacity on product innovation. *Opción*, *34*, 985-1013

Sai Manohar, S., & Pandit, S.R. (2014). Core values and beliefs: a study of leading innovative organizations. *Journal of Business Ethics*, *125,* 667-680. https://doi.org/10.1007/s10551-013-1926-5

Sanni, M., & Verdolini, E. (2022). Eco-innovation and openness: Mapping the growth trajectories and the knowledge structure of open eco-innovation. *Sustainable Futures*, *4*, 100067. https://doi.org/10.1016/j.sftr.2022.100067

Santos-Vijande, M.L., González-Mieres, C., & López-Sánchez, J.A. (2013). An assessment of innovativeness in KIBS: implications on KIBS' co-creation culture, innovation capability, and performance. *Journal of Business & Industrial Marketing*, *28*(2), 86-102, https://doi.org/10.1108/08858621311295236

Sindakis, S., Aggarwal, S., & Chen, C. (2020). Coopetitive dynamics and inter-organizational knowledge flow among venture capital firms: A systematic literature review. *Kybernetes*, *49*(1), 47-72, https://doi.org/10.1108/K-05-2019-0302

Soniewicki, M. (2022). Internal market knowledge sharing in medium-high-tech manufacturing company. *Entrepreneurial Business and Economics Review, 10*(2), 113-130. https://doi.org/10.15678/EBER.2022.100207

Stelmaszczyk, M. (2020). How Absorptive Capacity and Organisational Learning Orientation Interact to Enable Innovation Capability? An Empirical Examination. *Entrepreneurial Business and Economics Review, 8*(1), 7-32. https://doi.org/10.15678/EBER.2020.080101

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research, 104*, 333-339. https://doi.org/10.1016/j.jbusres.2019.07.039

Thomas, E., Faccin, K., & Asheim, B.T. (2020). Universities as orchestrators of the development of regional innovation ecosystems in emerging economies. *Growth and Change*, *52*, 1-20. https://doi.org/10.1111/grow.12442

Tian, M., Deng, P., Zhang, Y., & Salmador, M.P. (2018). How does culture influence innovation? A systematic literature review. *Management Decision*, *56*(5), 1088-1107. https://doi.org/10.1108/MD-05-2017-0462

Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence informed management knowledge by means of systematic review. *British Journal of Management, 14,* 207-222. https://doi.org/10.1111/1467-8551.00375

Thorpe, R., Holt, R., Macpherson, A., & Pittaway, L. (2006). Using knowledge within small and medium-sized firms: A systematic review of the evidence*. International Journal of Management Reviews*, *7*(4), 257-281. https://doi.org/10.1111/j.1468-2370.2005.00116.x

Vokoun, M., & Dvouletý, O. (2022). International, national and sectoral determinants of innovation: evolutionary perspective from the Czech, German, Hungarian and Slovak community innovation survey data. *Innovation: The European Journal of Social Science Research*, https://doi.org/10.1080/13511610.2022.2158309

Wang, C., & Hu, Q. (2020). Knowledge sharing in supply chain networks: effects of collaborative innovation activities and capability on innovation performance. *Technovation*, 94-95, 102010. https://doi.org/10.1016/j.technovation.2017.12.002

West, J., & Bogers, M. (2013). Leveraging external sources of innovation: a review of research on open innovation. *Journal of Product Innovation Management, 31*(4), 814-831. https://doi.org/10.1111/jpim.12125

Wolf, P., Kaudela-Baum, S., & Meissner, J.O. (2012). Exploring innovating cultures in small and medium-sized enterprises: Findings from Central Switzerland. *International Small Business Journal*, *30*(3), 242-274. https://doi.org/10.1177/0266242610386666

Yoon, W., & Kwon, S. (2023).The Impact of Technological and Non-technological Innovative Activities on Technological Competitiveness. *Journal of the Knowledge Economy, 14*, 1-19. https://doi.org/10.1007/s13132-021-00868-w

Zahoor, N., & Al-Tabbaa, O. (2020). Inter-organizational collaboration and SMEs' innovation: A systematic review and future research directions. *Scandinavian Journal of Management*, *36*(2), 101109. https://doi.org/10.1016/j.scaman.2020.101109

Zygmunt, A. (2022). The effect of research and development personnel on innovation activities of firms: Evidence from small and medium-sized enterprises from the Visegrad Group countries. *Entrepreneurial Business and Economics Review, 10*(3), 105-121. https://doi.org/10.15678/EBER.2022.100307

Zygmunt, J. (2017). Enterprises' development in peripheral regions: patterns and determinants. *Problemy Zarządzania*, *15, 1*(65), 226-236. https://doi.org/10.7172/1644-9584.65.14

Authors

The contribution share of authors is as follows: Aleksandra Zygmunt 80%, Ondřej Dvouletý 20%.
Aleksandra Zygmunt: Conceptualization, Methodology, Investigation, Formal analysis and interpretation, Writing – Original Draft, Writing – Review & Editing; Ondřej Dvouletý: Methodology, Writing – Review & Editing

Aleksandra Zygmunt
PhD in Economics; Assistant Professor at Opole University of Technology. Her research interests include innovation, knowledge transfer, and regional development.
Correspondence to: Aleksandra Zygmunt, PhD, Opole University of Technology, Department of Economics, Finance, Regional and International Studies ul. Luboszycka 7, 45-036 Opole, Poland, e-mail: a.zygmunt@po.edu.pl
ORCID http://orcid.org/0000-0001-5879-5684

Ondřej Dvouletý
Associate Professor for the field of Business Economics and Management. His research interests include entrepreneurial activity, evaluating the impacts of public entrepreneurship supporting policies, business economics and labour market economics. His research has been published in leading international scientific journals, such as Small Business Economics, Journal of Small Business Management, and European Journal of Innovation Management. Ondřej Dvouletý received several awards for his research activities, including the Josef Hlávka Award (2017) or the award for an outstanding research article published in the international scientific journal Journal of Entrepreneurship in Emerging Economies (2020). He is involved in various international projects, and he also actively contributes to the development of the academic community as a reviewer of academic studies and research projects. He also serves on the editorial boards of several scientific journals (such as the Journal of Small Business Management and, the Journal of Entrepreneurship in Emerging Economies) and is also involved in a number of professional groups. He is a member of the Czech Evaluation Society, and he is a member of the Committee for socioeconomic development which is a part of the Czech Government Council for Sustainable Development.
Correspondence to: Ondřej Dvouletý, Associate Professor, Prague University of Economics and Business, Department of Entrepreneurship, nám. W. Churchilla 1938/4, 130 67 Praha 3 – Žižkov, Czech Republic, e-mail: ondrej.dvoulety@vse.cz
ORCID http://orcid.org/0000-0001-9151-2033

Acknowledgements and Financial Disclosure

The authors would like to kindly thank Luke Pittaway, Joel West and Mu Tian for their insightful comments on the string. The authors would like to thank the anonymous reviewers for their useful comments, which allowed them to improve the value of the article. The publication fee was funded by Opole University of Technology.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright and License

Published by Krakow University of Economics – Krakow, Poland

Ministry of Education and Science
Republic of Poland

The journal is co-financed in the years 2022-2024 by the Ministry of Education and Science of the Republic of Poland in the framework of the ministerial programme "Development of Scientific Journals" (RCN) on the basis of contract no. RCN/SP/0583/2021/1 concluded on 13 October 2022 and being in force until 13 October 2024.

Entrepreneurial Business and Economics Review

2024, Vol. 12, No. 3

10.15678/EBER.2024.120310

Navigating the valley of death: Open innovation strategies for start-up survival

Yulissa Navarro-Castillo, Katia Mastrostefano, Mercedes Grijalvo, Gustavo Morales-Alonso

ABSTRACT

Objective: The objective of the article is to showcase the utilisation of open innovation in new technology-based firms (NTBFs) from the perspective of entrepreneurs who have successfully survived the crossing of the valley of death. We examined the interplay of open innovation (OI), and the entrepreneurial background (*i.e.* human capital, entrepreneurial education) to identify success factors in crossing the valley of death.

Research Design & Methods: The research was qualitative and based on interviews conducted with founders of ten start-ups based in Madrid, Spain. To process the information obtained in a more objective manner, we utilised three R codes for qualitative data analysis. Subsequently, we employed word clouds to condense the interviews and ascertain the most significant variables related to the success of the ventures and OI.

Findings: There were several recurring components among the entrepreneurs that have enabled them to successfully cross the valley of death. During the early stages, the entrepreneurship background becomes apparent, enabling them to implement their ideas based on the experience and knowledge acquired. In the subsequent stage, the emergence of family support for entrepreneurship facilitates access to initial financing beyond one's own savings invested. Therefore, it appears that human capital and access to informal sources of finance are more critical for entrepreneurial success than open innovation.

Implications & Recommendations: Despite the fact that open innovation facilitates the acquisition of new knowledge from a theoretical standpoint, our results suggest that prioritising entrepreneurs' human capital and ensuring access to financing are more crucial in overcoming the valley of death, by optimizing the efforts of various stakeholders.

Contribution & Value Added: The article offers a comprehensive understanding of the survival process of non-traditional business enterprises (NTBFs) and categorises three distinct variables that contribute to comprehending the significance of external and internal factors to which entrepreneurs are exposed.

Article type: research article

Keywords: open innovation; start-up; entrepreneur; social support; professional experience

JEL codes: O36, M13, L26

Received: 29 January 2024 Revised: 18 April 2024 Accepted: 18 April 2024

Suggested citation:

Navarro-Castillo, Y., Mastrostefano, K., Grijalvo, M., & Morales-Alonso, G. (2024). Navigating the valley of death: Open innovation strategies for start-up survival. *Entrepreneurial Business and Economics Review,* 12(3), 185-204. https://doi.org/10.15678/EBER.2024.120310

INTRODUCTION

The establishment of novel enterprises significantly contributes to economic progress (Holcombe, 2007; Schumpeter, 1934). It is achieved primarily by utilising innovative concepts to develop commercially viable products (Beckman *et al.*, 2012) consequently reducing unemployment rates and fostering economic growth (Morales-Alonso *et al.*, 2016).

Beginning with the differentiation between two modalities of entrepreneurship: necessity entrepreneurship, which emerges in response to economic crises or unemployment; and opportunity entrepreneur-ship, which evolves by capitalizing on favourable conditions for new business creation

(Cantillon, 1755; Peterson & Valliere, 2008), we established a foundational framework to comprehend the motivations and context that propel entrepreneurial activity in diverse economic landscapes.

New technology-related firms that exhibit attributes such as scalability, replicability, and a highly profitable business model are commonly referred to as start-ups (Blank & Dorf, 2020). These ventures often offer products or services with high uncertainty (Ries, 2017), leading to a high attrition rate within the first year of operation for most of them (Dahl & Reichstein, 2007). This can largely be attributed to the numerous obstacles they encounter during their initial stages of operation, particularly when they are relatively new and inexperienced.

Ultimately, there exists a valley of death that start-ups must overcome during the initial stages of their existence (Morales-Alonso *et al.*, 2020). These hurdles include barriers to entry, limited resources, lack of market familiarity, and financial constraints (de Jong & Freel, 2010; Eftekhari & Bogers, 2015; Gruber & Henkel, 2006; Radas & Božić, 2009). Therefore, an alternative approach to addressing these challenges would involve implementing open innovation (OI) practices within the organisation, thereby enabling them to overcome the initial shortcomings (Bogers, 2011).

However, the capacity to depend on external actors is somewhat interlinked with the presence of human capital within the company. Specifically, the education received by the entrepreneur and their professional background impacts entrepreneurial success (Morales-Alonso *et al.*, 2022).

In recent times, the related scientific literature has placed greater emphasis on new firms utilising OI (Remneland Wikhamn & Styhre, 2019) enabling companies to leverage external ideas that have not been fully exploited within a specific industry. According to Chesbrough (2003), companies continue to integrate their own discoveries with existing or emerging technologies. Furthermore, there is evidence of a strong correlation between the phenomenon of start-ups and OI (Spender *et al.*, 2017) and an increased likelihood of success (Gupta & Rubalcaba, 2022).

For this reason, this research showcases the utilisation of open innovation in new technology-based firms (NTBFs) from the perspective of entrepreneurs who have successfully survived the crossing of the valley of death. We examined the interplay of OI and the entrepreneurial background (*i.e.* human capital, entrepreneurial education) to identify success factors in crossing the valley of death, contributing to boosting the survival process of non-traditional business enterprises (NTBFs) and categorises three distinct variables that contribute to comprehending the significance of external and internal factors to which entrepreneurs are exposed. Hence, the research question was 'How do entrepreneurial background (human capital) and the existence of financial and social support for entrepreneurship help to overcome the valley of death in technological new ventures?'

Consequently, we developed this article aiming to understand the varied interests of start-up founders and their relationship with OI. It also seeks to comprehend their interaction with the stakeholders involved in the project. The article consists of five sections. The initial section 'Introduction' will examine the context and underscores the study's significance. The second section will encompass a comprehensive literature review, enabling us to grasp the fundamental concepts essential for formulating the proposed hypotheses. The third section will elucidate the methodology employed in this document. The fourth section will present the most significant findings and discussions arising from the research. Finally, the concluding chapter is presented.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Open Innovation and Entrepreneurial Ecosystems

Start-ups have emerged as the cornerstone of prosperity and constitute a pivotal innovation policy initiative in both advanced and developing economies (Ferràs-Hérnandez *et al.*, 2021). This is due to the theoretical and empirical evidence indicating their impact on reducing unemployment (Audretsch *et al.*, 2001) and enhancing gross domestic product (GDP) (Gomes & Ferreira, 2022). Such behaviour may not be decisive when attempting to extrapolate a cyclical trend or apply it to diverse contexts. However, it proves to be effective over the long term (Carree *et al.*, 2002). Particularly during periods of economic downturn, as this is the greatest demand for the creation of enterprises (Congregado *et*

al., 2010). This also contributes to the reduction of gender disparities, as an increasing number of start-ups are founded by women or have female members on their founding teams (Modaffari *et al.*, 2023).

To foster innovation and technological advancement, businesses must actively engage with their surroundings (Janssen *et al.*, 2014). In the realm of OI, organisations employ two primary methodologies: inbound OI, which involves the internal utilization of external knowledge from partners, customers, suppliers, or universities, and outbound OI, which focuses on harnessing external ideas or expertise for solutions beyond the confines of the organization (Chesbrough *et al.*, 2006). Moreover, Gassmann and Enkel (2004) introduced a third process called co-innovation, wherein companies seek to merge the entry and exit points by means of collaborations, alliances, or joint ventures.

In this context, OI emerges as a crucial instrument for the strategic advancement of knowledge (Modaffari *et al.*, 2023) by incorporating key stakeholders such as academic institutions, support platforms, other start-ups, and customers (Pakura, 2020). New entrepreneurs are transforming entrepreneurship into action (Makai & Dory, 2023) though evidence of greater market influence by innovative companies compared to others is rare (Audretsch, 1995). According to Chesbrough, OI is the next step in the classical treatment of innovation, which he calls closed innovation. To put it differently, the notion that a company must develop its own technology and guard it with utmost care despite not utilising it has been abandoned. Companies like P&G have a policy of releasing ideas that are not effective for three years or more to be taken advantage of by other players in the market, even direct competitors. This is done with the safeguard of maintaining intellectual property (Chesbrough, 2009; 2015).

In the literature, the most studied relationship between OI and entrepreneurship is the initial one, in which the benefits companies receive are from their ecosystems (Remneland Wikhamn & Styhre, 2019). In the research, we worked with new technology-based firms (NTBF) that design products for an unmet market or need and are committed to technology. In the initial phase of a start-up, the availability of information is limited (Sanasi *et al.*, 2023) and some entrepreneurs make errors in defining the value proposition, which can lead to future difficulties (Sus *et al.*, 2020).

Open innovation is a fundamental component in start-ups management. These improve their opportunities for innovation, competitiveness, and survival by opening to collaborations with stakeholders and strategic partners (Iglesias-Sánchez *et al.*, 2022). This OI approach not only has a significant impact on the success of start-ups, but it can also be facilitated by the appropriate partner selection (Fernandes & Castela, 2019) and a well-defined entrepreneurial model (Joseph *et al.*, 2021). It has been documented that individuals who engage in collaborative environments, such as science parks, exhibit superior performance in comparison to those who do not participate in such settings (Ramírez-Alesón & Fernández-Olmos, 2018). This finding emphasizes the importance of interactions and synergies facilitated by coexistence in specialized environments, pointing to a positive relationship between collaboration in science parks and improved performance of NTBFs. Based on this literature, we proposed our first proposition:

P1: In an NTBF, OI comes mainly from clients and universities or research centres.

Open innovation extends beyond the establishment of partnerships with large corporations and accelerators, as it has the potential to enhance the competitiveness of start-ups through the establishment of partnerships with small and medium-sized enterprises (Bereczki, 2019). The literature on OI has undergone a transformation from its initial focus on large enterprises to a more contemporary context of expanding digital enterprises (Al Sharif *et al.*, 2022). This emergence demonstrates the versatility and significance of operational intelligence in the context of diverse factors influencing business dynamics (Cavallo *et al.*, 2019). The implementation of OI not only has a significant impact on firms' strategic management, but also highlights its significance in the strategic development of knowledge (Modaffari *et al.*, 2023; Santoso *et al.*, 2020). The rapid adoption of novel technologies such as 3D printing or artificial intelligence is facilitating the creation of novel business models (Block *et al.*, 2017) by facilitating more efficient and timely access to existing knowledge and, according to the creation of knowledge (Wurth *et al.*, 2022).

However, as start-ups engage in network structures (Dooly *et al.*, 2022), intellectual property-related challenges arise for an increasing number of companies of both public and private nature that

are partnering. The influence of OI is remarkable, especially when public-private companies are established (Godlewska-Majkowska *et al.*, 2023; Hahn *et al.*, 2019). The initial evaluation of NTBF's potential and viability is notably influenced by the alliances forged with corporations, investors, and the development of patents (Wessendorf *et al.*, 2019). Consequently, while exposure to open innovation (OI) in companies associated with scientific parks or local university institutions may not reach exceptional levels, it persists to a greater extent compared to companies not affiliated with such entities (Lindelöf & Löfsten, 2004). Drawing upon this academic literature stream, we propose:

P2: Start-up incubators should try to impact beyond entrepreneurial education if they want to improve NTBFs' survivability.

Entrepreneurial Background

When evaluating entrepreneurship and its correlation with human capital, it is imperative to acknowledge that it has distinct metrics that differ based on the perspective employed. There are many different relationships between, *e.g.* entrepreneurs' origins, training (Acevedo *et al.*, 2007), personality (Krieger *et al.*, 2022), and early exposure (Morales-Alonso *et al.*, 2016; 2022). We may also analyse these relationships through their relationship with entrepreneurship ecosystems, such as innovation and digital knowledge (Di Vaio *et al.*, 2021) and technological turbulence (Li, 2012). However, there is still no consensus that human capital is key to the success of high-tech firms (Colombo & Grilli, 2010; Morales-Alonso *et al.*, 2023), there are many more factors.

Skill Variety and Entrepreneurial Human Capital

Human capital plays a critical role in the search for new business opportunities and this influence is growing stronger with experience in a specific sector and general education (Jang, 2019). Indeed, cognitive traits possess the ability to surpass demographic factors and human capital in the context of high-tech-based start-ups (Morales-Alonso *et al.*, 2022). Furthermore, when the complementary capabilities of the founders are combined, synergy emerges, resulting in enhanced profits (Colombo & Grilli, 2005).

The increasing number of academic entrepreneurs has led technical and university entities to adopt a more focused approach to training their students towards innovation (Dooly *et al.*, 2022). Together, these dynamics propel entrepreneurship and innovation in the business landscape, particularly among those students who have been exposed to entrepreneurial training (Lee *et al.*, 2019). In the context of NTBFs, the presence of PhDs in their teams has been a topic of interest, with significant evidence showing that investment programs prefer to derive their capital from those who have PhDs in their teams (Ferràs-Hérnandez *et al.*, 2021). Indeed, it aims to integrate scientists (Hahn *et al.*, 2019), researchers, publishers, and libraries to enhance the potential of start-ups (Gupta & Rubalcaba, 2022). This is because the amalgamation of technological knowledge, entrepreneurial education, and educational diversity are crucial factors for success (Bertin & Mavoori, 2022).

The literature has delineated the positive influence of various factors on the success of start-ups, including the entrepreneur's leadership, agility, technology orientation, sustainability, teamwork, motivation (Lago *et al.*, 2023), the ability to remain vigilant, acquired experience (Edigbo *et al.*, 2021), and risk-taking (Wadood *et al.*, 2022). Moreover, the presence of individuals possessing prior business expertise within the founding team is also associated with superior growth (Colombo & Grilli, 2005) and better financial outcomes (García-Cabrera *et al.*, 2021). Anchoring on this literature, we propose:

P3: For the survivability of a NTBF, professional experience is more important than education.

Financial Support for Entrepreneurship

In addition to the technological foundation and experience, the primary factors that determine a company's success include family support, which can be either economic or emotional (Ascarya & Rahmawati, 2018). It has been demonstrated that the financial or capital support that the family provides at the onset of entrepreneurial activities has a greater impact than the emotional support (Gao *et al.*, 2021), thereby ensuring that entrepreneurs find their initial access to business capital through family financing (Marliati, 2020).

The configuration of network structures emerges as a crucial factor in the development of start-ups (Dooly *et al.*, 2022). Moreover, the implementation of OI significantly enhances the managerial prospects of these start-ups by emphasising the significance of involving stakeholders in attaining innovation, fostering competitiveness, and ensuring survival (Iglesias-Sánchez *et al.*, 2022). There are at least four OI models that allow for the interaction of different agents with start-ups, such as corporate accelerators, external platforms, consortia or alliances, and the direct business approach (Boni & Joseph, 2019). Despite their positive impact on collaboration and innovation, they also create a dilemma and conflict around the claim of intellectual property within these networks. Despite these challenges, there is a growing trend in the association of public-private companies (Dooly *et al.*, 2022).

The aim of collaboration between educational institutions and start-ups is to achieve sustainability by facilitating access to technology that would otherwise be inaccessible. Several start-ups, particularly NTBFs, seek collaboration with university incubators, particularly in the hopes of obtaining resources through tax incentives and incubator support (Jirapong *et al.*, 2021; Ziakis *et al.*, 2022). This is because access to educational institutions will enable entrepreneurs to make decisions based on data and not on unreliable intuitions (Gupta & Rubalcaba, 2022).

Nonetheless, this type of collaboration is less prevalent in emerging enterprises with a social focus, as public programs tend to invest in start-ups that specialise in big data management or artificial intelligence (Eiteneyer *et al.*, 2019). Furthermore, the competitiveness of a start-up is not solely contingent on the environment in which it operates, but also influenced by the characteristics of its managers, knowledge management, absorptive capacity, and participatory capacity (Salimi *et al.*, 2023). The most realistic options that entrepreneurs have to obtain financial resources during their initial stage include their own savings, business angels or their close circle composed of family, friends, and fools (FFF) (Hamilton, 2001). In the case of companies that are just starting their activities, FFF (as an informal finance source) provides financial support in most cases (Ramachandran & Ramnarayan, 1993). These results in terms of funding sources for entrepreneurship led us to our next proposition:

P4: The initial survivability of NTBFs depends mainly on the availability of funding from informal sources.

Social Ties for Entrepreneurship

According to empirical research, it has been demonstrated that the training of entrepreneurs, along with the management of their budgets and the mitigation of any negative experiences they may have encountered in the past, have a significant impact on the degree of future expansion that start-ups can achieve (Ireta Sanchez, 2023). Moreover, it is important to understand the needs of customers and their levels of satisfaction when purchasing a product or service (Khaliq *et al.*, 2022). If we are referring to social relationships, entrepreneurs must possess a high level of social intelligence in order to maintain relationships with interest groups (Ingram *et al.*, 2019). Another form of social assistance that aids in the advancement of enterprises is the exposure to entrepreneurial activities that they have received during their academic years. When they are at an advanced stage, this exposure can provide them with access to incubators that connect them to venture capital investors or financing entities (Hoang *et al.*, 2022) because, when entrepreneurs perceive their project to be risky, they avoid taking on loans with uncertain interests (Liu & Yang, 2023) or an incentive that makes them feel in danger with their novel knowledge property (Lin *et al.*, 2023). Hence, we propose:

P5: Founders of NTBFs give the greatest importance to industry knowledge and independence.

RESEARCH METHODOLOGY

Sample Choice

The research centred on the collection of data pertaining to the NTBFs of the Autonomous Community of Madrid. While the concept of an NTBF is not universalised and is used in different ways (Autio, 1994; Bollinger *et al.*, 1983; Storey & Tether, 1998), for this investigation, we decided to employ Autio's con-

cept, which asserts that NTBFs are novel, relatively small, based on solid scientific and technological foundations, and also contribute to the generation of employment and innovation (Autio, 2008).

To establish communication with the NTBFs, Universidad Politécnica de Madrid partnered with the Madri+d Foundation, which provided access to the founders or co-founders of companies with highly technological operations. We sent a preliminary questionnaire to 500 companies, of which 7% responded. The filter inquiry inquired about the degree of satisfaction (ranging from 1 to 5) pertaining to the technological knowledge acquired through the foundation. To ensure the sample's representativeness, we selected eight companies that indicated a low level of satisfaction (1 or 2), and eight that indicated a high satisfaction level (4 or 5) in a completely random manner. Once we obtained a list of the 16 companies eligible for the interview, we contacted them.

To conduct the necessary interviews, it was imperative to conduct four rounds from June 29 to July 4, 2018. During this period, we contacted. only 10 founders or co-founders of the NTBFs, resulting in a response rate of 62.50%. Figure 1 depicts the summary of the process for gathering the information. The interview protocol consisted of six carefully crafted inquiries designed to explore the hypotheses outlined in the research. We interviewed ten entrepreneurs and meticulously recorded their responses and transcribed them to facilitate thorough analysis.

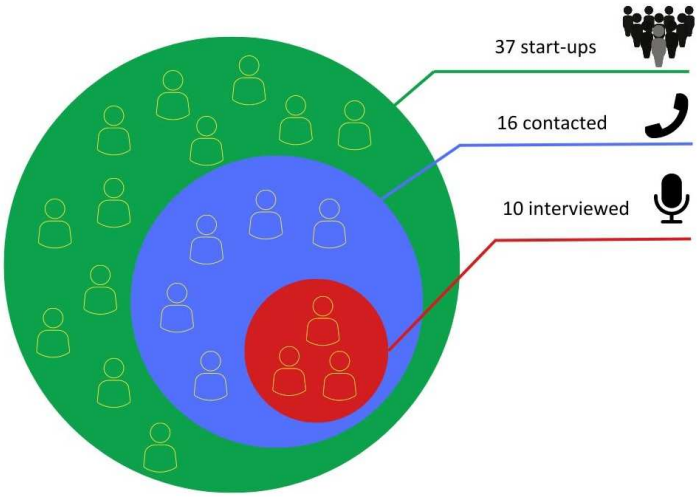

Figure 1. Selected sample and data collected
Source: own elaboration.

Descriptive Sample Analysis

The oldest company surveyed commenced its operations in 2005, while the most recent company was established in 2014 spanning various industries including Information and communication, factory, professional, scientific and technical activities, administrative and support service activities, financial and insurance activities, human health and social work activities, wholesale and retail sales of engine parts, vehicles, and motorcycles and professional, scientific and technical activities. The distribution of companies based on their number of employees was as follows: six companies had fewer than nine employees, while four had more than nine but fewer than 49 employees, reaffirming their status as small enterprises.

Data Analysis Method

To analyse the data gathered from the interviews, the statistical software R for Qualitative Data Analysis (RQDA) was utilised, offering a unified platform for analysing both qualitative and quantitative variables (Huang, 2014). Furthermore, given the exploratory analysis, we generated a Word Cloud for each inquiry, facilitating the visualisation of the most salient topics among the interviewed entrepreneurs. Moreover, we employed the information conglomerate to define the recurring variables and identify the primary connections among the responses obtained during the interviews.

RESULTS AND DISCUSSION

This section presents findings derived from an in-depth analysis of three codes in RQDA, strategically used to explore central themes of innovation, entrepreneurship, and support networks. We also used Word Cloud maps to visually represent interview data, highlighting key topics such as university collaboration, business strategies, and connections with stakeholders. The following discussion will examine each hypothesis to understand the impact of OI components on overcoming challenges in business development such as crossing the valley of death.

Entrepreneurs emphasized innovation as crucial for their ventures, often using it to develop business ideas. While universities were seen as catalysts, some entrepreneurs felt they lacked expected technical support. Interpersonal relationships and soft skills, previously undervalued, emerged as vital for business expansion.

The first inquiry, 'Can you describe your start-up idea and your experience facilitating its development?' aimed to explore knowledge sources and compare OI practices. It delved into idea generation, opportunities identified at the start, and potential modifications over time.

Figure 2 illustrates entrepreneurs' interactions with external agents. Most acknowledged customers' influence on product development. Nearly half collaborated with universities, while a small percentage worked with corporations or research centres. However, 30% reported no external collaboration, underscoring the importance of diverse assistance in venture expansion.

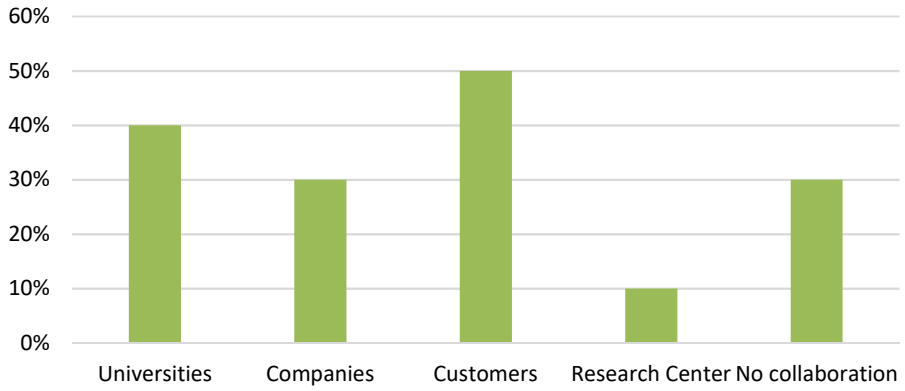

Figure 2. Links developed by firms
Source: own elaboration (*n* = 10).

Furthermore, we noted an increase in sales as companies effectively communicated with diverse stakeholders. Initially, companies showed reluctance to embrace OI but became more receptive over time, engaging with stakeholders such as customers, larger businesses, research centres, and public institutions as they progressed through the development stages.

When the gathered responses of the companies to the initial inquiry (Figure 3) highlighted prominent variables such as 'idea,' 'university,' 'business,' and 'knowledge,' with 'customers' being less prominent. We can attribute this to the focus of the initial question on formulating concepts rather than subsequent business evolution. To better understand the impact of OI on high-tech start-ups, three subquestions were formulated (Figure 4).

> *Question 1.1 Have you had any other considerable interactions with other actors? (*e.g. *universities, suppliers, customers, private research institutions, government or public authority).*

Given that the initial funding predominantly stemmed from personal savings or familial loans, as explored further in hypothesis 4, we could deduce that the initial growth of the surveyed start-ups remained uninfluenced by external factors. In more exceptional cases, some entrepreneurs asserted that the operational methodology they had devised proved adequate to sustain continued expansion, even in the presence of additional investment income.

Question 1.2 What benefits and challenges are related to the involvement of these actors in the innovation process?

In the case of companies that received support from entities affiliated with the Madri+d Foundation, they opted to highlight the progress of innovation within their ventures. This strategy allowed them to attract a broad clientele and bolster the sustainability of their ventures. Moreover, they endeavoured to bridge the divide between invention and innovation, aiming to market their products consistently in the marketplace.

Question 1.3 Which competencies did you acquire from these actors that you did not have?

The cohort of entrepreneurs acknowledging the benefits of leveraging their network of contacts to involve various stakeholders in their development process also identified a shortfall in their business management information systems. This inadequacy could be addressed by harnessing the expertise and experience of these newcomers.

In alignment with Hypothesis 1, positing that OI predominantly stems from customers and universities or research centres, the word cloud underscores the substantial contributions of 'university' and 'knowledge' in shaping these entrepreneurial ventures. This nuanced comprehension partially corroborates the initial hypothesis, revealing a correlation between business concepts that are enriched through external collaborations such as clients and academic institutions to a greater extent, albeit with a lower involvement with research centres.

Figure 3. Word cloud: Question 1
Source: own elaboration.

Figure 4. Word cloud: Question 1.1, 1.2 y 1.3
Source: own elaboration.

Regarding question 2, which addresses the degree of satisfaction with technological learning provided by the Madri+d Foundation, it was subdivided into three sub-questions to explore entrepreneurs' perceptions of the role of incubators in their business development, spanning from the initial conceptualization of the idea to achieving self-sustainability. Noteworthy, to ensure the sample's representativeness, companies with varying levels of satisfaction were included, thereby enabling balanced responses

regarding the performance of an entrepreneurship support entity. This methodological approach enhances the accuracy and comprehensiveness of the outcomes obtained, facilitating a deeper understanding of the impact of incubators on the entrepreneurial journey of the analysed enterprises.

Q2.1 What services have you used from the foundation?

Q2.2 Can you describe what are the negatives (or positives) you noticed about the services? Are there positives (or negatives)?

Q2.3 After you had used the foundation's services, how did you continue on your path grow? And now?

Based on the gathered data, entrepreneurs expressed a notable reliance on their internal development of knowledge to manage and operate their enterprises, rather than placing significant reliance on external institutions. However, they acknowledged the value added by incubators, which provide ongoing support and tools such as mentorship and marketing strategies. This discovery suggests that entrepreneurs are increasingly embracing autonomy and internal drive, while also recognising the specific resources that incubators can offer in key areas for growth and entrepreneurial advancement. This aspect is relevant for incubators to consider as they enhance their support procedures and strive to foster greater engagement among entrepreneurs who rely on incubation processes, thereby facilitating their access to anticipated resources.

The interviews revealed that entrepreneurs benefiting from the services offered by the Madri+d Foundation exclusively expressed positive perceptions. Several participants emphasized the valuable assistance provided in acquiring essential tools and establishing strategic connections, significantly facilitating the acceleration of their business growth processes. On the other hand, those three who did not use the foundation's services or whose satisfaction level was assessed as low (2 or 1) chose not to express their opinion on the matter. This response pattern underscores the positive correlation between the effective utilization of services provided by the Madri+d Foundation and favourable perceptions among entrepreneurs regarding the positive impact on their respective development processes.

Among the array of services provided by the foundation, mentorship and networking opportunities were the most commonly utilized, as affirmed by 90% of the participating companies. Despite the lack of adverse outcomes, respondents indicated that they acquired substantial knowledge that propelled the advancement of their companies. This analysis underscores the effectiveness of the mentorship and networking initiatives offered by the incubator and their beneficial impact on the growth and progression of the participating enterprises.

To propose an incubation strategy, we conducted a thorough analysis of word clouds to identify primary concerns overlooked by the incubators. Figure 5 vividly illustrates that participants unanimously stressed the necessity for investment capital, whether from foundations or investors, to improve their products, increase production levels, and ultimately solidify the stability of their ventures. This finding underscores the importance of concentrating on targeted strategies for securing funding as a critical element in the development of enhancements for incubators.

In other words, entrepreneurs' expectations suggest that the incubator's responsibilities should not be solely confined to providing courses on soft skills or mentoring for business development, supporting the second hypothesis that implies incubators should go beyond offering basic skills to enhance the survival probability for a start-up. Entrepreneurs anticipate incubators to establish direct connections with potential investors for their business concepts. The issue of funding has emerged as a significant concern for new entrepreneurs in the high-tech sector, as they are aware that implementing their business concepts requires substantial initial capital and the resulting returns may take months or even years to materialize. This approach highlights the need for incubators to broaden their responsibilities beyond conventional training, emphasizing the importance of establishing direct connections with funding sources to address the specific requirements and financial challenges faced by high-tech entrepreneurs.

With regards to the third hypothesis, the testimonials provided by entrepreneurs who have experienced a favourable outcome from the Madri+d Foundation provide pertinent insights. Entrepreneurs have mentioned that the favourable impact was not solely reflected in the enhancement of business skills and

the enhancement of accessible projects, but also the enhancement of financial skills and the acquisition of seed capital through contests and competitions. Thus, we formulated the following question:

Q3 Which competencies did you acquire from these services that you did not have?

Figure 5. Word Cloud: Questions 2.1, 2.2 y 2.3
Source: own elaboration.

This finding suggests that within the framework of incubation offered by the Madri+d Foundation, hands-on experience and active participation in contests and competitions play a pivotal role in entrepreneurs' success. While education may offer theoretical foundations, the practical application of business skills and involvement in specific entrepreneurial activities emerge as the determining factors in the perceived positive impact.

This comparative approach highlights the synergy between education and professional experience, indicating that both components are fundamental and interact synergistically to achieve entrepreneurial success. The hypothesis favouring professional experience does not negate the significance of education but rather emphasizes the necessity for a balanced amalgamation of both dimensions to have a significant impact on entrepreneurial advancement.

A significant proportion of entrepreneurs emphasized the importance of acquiring training in business skills, particularly those with backgrounds in engineering fields that did not include these subjects in their initial education (75%). Nonetheless, it is imperative to emphasize that numerous individuals have highlighted that one of the primary advantages of achieving entrepreneurial success stems from the prior experience they acquired before establishing their ventures. Despite incorporating business skills through additional training, prior experience has been identified as a distinct factor that significantly contributed to the successful accomplishment of their organizations.

Upon examination of the word cloud corresponding to Question 3 (Figure 6), we discerned a distinct consensus among all entrepreneurs who expressed their involvement in previous projects. These projects provided them with the opportunity to enhance their entrepreneurial abilities, which were further bolstered through the training provided by incubators, should they choose to avail themselves of these educational opportunities. This finding highlights the coherence in the experiences of entrepreneurs, accentuating the importance of previous projects as a basis for the development of entrepreneurial skills. This fully supports the third hypothesis, which states that experience is more important than academic knowledge. These skills were further enhanced through incubation programs, enriching their entrepreneurial experience.

To analyse this part of the research, we proposed three different for the progression of an emerging company towards maturity. The 0-period 'existence' is commonly referred to as the start-up stage, wherein entrepreneurs are faced with limited resources and capabilities, leading them to rely on their own resources to accomplish their tasks. Next was Period 1 'survival,' the stage of market openness, at which performance, and management of technological and financial knowledge become critical factors. It is at this point that the use of OI becomes more relevant. In Period 2 'success,' start-ups are on the path to maturity with consolidated ideas, growing and maturing, escaping the dreaded Valley of Death, and becoming sustainable over time.

Table 1 depicts the source of financial funds procured by companies during each aforementioned stage. During the initial phase of the start-up process, a majority of companies utilised their own resources, augmented by funds from family or acquaintances. During the initial period, certain enter-

prises commenced acquiring funds from a diverse range of financing sources, including both public and private ones. During the second period, the majority of companies expressed a more clarified comprehension of the necessity to raise additional funding to sustain their expansion.

Figure 6. Word Cloud: Questions 3
Source: own elaboration.

Table 1. Funding sources

Codification	Period 0	Period 1	Period 2
1	Personal	N/a	N/a
2	Personal	Personal and public sources	Personal and public sources
3	Personal	N/a	Personal
4	Personal	Personal and public sources	Personal and public sources
5	Personal and public sources	Private sources	Personal and public sources
6	Personal	Personal	Personal
7	Personal	Private sources	N/a
8	Personal	Personal	Personal and public sources
9	Personal	Personal	Personal and public sources
10	Personal	Personal and public sources	Personal and public sources

Source: own study (*n* = 10).

To gain a more comprehensive understanding of the present perception of entrepreneurs who have successfully consolidated their technological organisations, we conducted an analysis of the word cloud of their responses (Figure 7) from Q4 'Was it necessary to raise funds to support your business? If so, can you describe how you collected them and what is the composition (%) of the firm's ownership structure? (*e.g.* entrepreneurs and co-founders, friends and family, crowd equity investors, professional investors or other).' The significance attributed to capital primarily from family and the public sector, through contests or awards that promoted their ideas is particularly noteworthy. In certain instances, incubators played a pivotal role in facilitating access to these financial resources. Despite the importance of investors in capital raising, a minority of respondents expressed reluctance to seek financial assistance from individuals outside their immediate circle (FFF), even after consolidating their enterprises. This analysis supports the fourth hypothesis completely, which proposes that the first financial supports of successful entrepreneurs were supported by FFF from the beginning, because we also found that entrepreneurs obtained some financial sources from the public sector.

When asked about the most valuable advice entrepreneurs could offer to individuals embarking on the exciting journey of entrepreneurship, as illustrated in Figure 8, the most frequently mentioned phrase was 'always begin,' obtained from Q5 'If you could, what would be the three pieces of advice you would give to a new, young entrepreneur?'

Furthermore, additional responses included recommendations to adequately prepare for and execute all tasks, acquire knowledge during the initial year, and be ready to confront various obstacles. As entrepreneurship continues to evolve, they suggested securing a stable and traditional occupation, as it may experience slow growth. They also advised focusing on acquiring market knowledge to max-

imise competitive advantages and survival prospects in the valley of death. Consequently, the fifth hypothesis was fully supported, as entrepreneurs based their success on the specialised knowledge they had acquired about the market in which they operate and prefer economic freedom that keeps them away from debt, especially with banks.

Figure 7. Word Cloud: Question 4
Source: own elaboration.

Figure 8. Word cloud: Question 5
Source: own elaboration.

DISCUSSION

We aimed to analyse the relevance of IO by drawing insights from successful entrepreneurs who have navigated the challenging period known as the valley of death, thus creating a safer journey map for future entrepreneurs aiming to establish high-tech businesses (Figure 9). Due to the intrinsic nature of the Internet of Things, the analysis focused on entrepreneurs' stakeholders and their interactions, thereby facilitating start-up survival. Three distinct components have been identified.

The first component identified was the entrepreneurs' background (emphasizing human capital) and their sustained relationships with stakeholders, laying the groundwork for entrepreneurial activities. These findings are in line with Elston and Audretsch's (2011) assertion that human capital is among the most crucial resources for technology-related start-ups. The second concept aligns with Neyens *et al.* (2010) and Iglesias-Sánchez *et al.* (2022), who argue that entrepreneurial innovation is bolstered by formed alliances.

The second component for advancing along our journey map encompasses incubators and the entrepreneurship skills refined during incubation processes. In agreement with Lamperti *et al.* (2023), Jirapong *et al.* (2021), and Ziakis *et al.* (2022), we assert that business incubators play a pivotal role in facilitating entrepreneurs' access to economic and knowledge resources.

Finally, the third component for navigating the death valley describes the initial access to financing, sourced from friends, family, and fools. This finding corroborates Gao *et al.* (2021), Marliati (2020), and Gbadegeshin *et al.* (2022), who suggest that FFFs play a crucial role in surviving the death

valley during the company's initial years. They enable avoidance of bank interest rates and allow NTBFs. to focus on the challenges in their developmental stage.

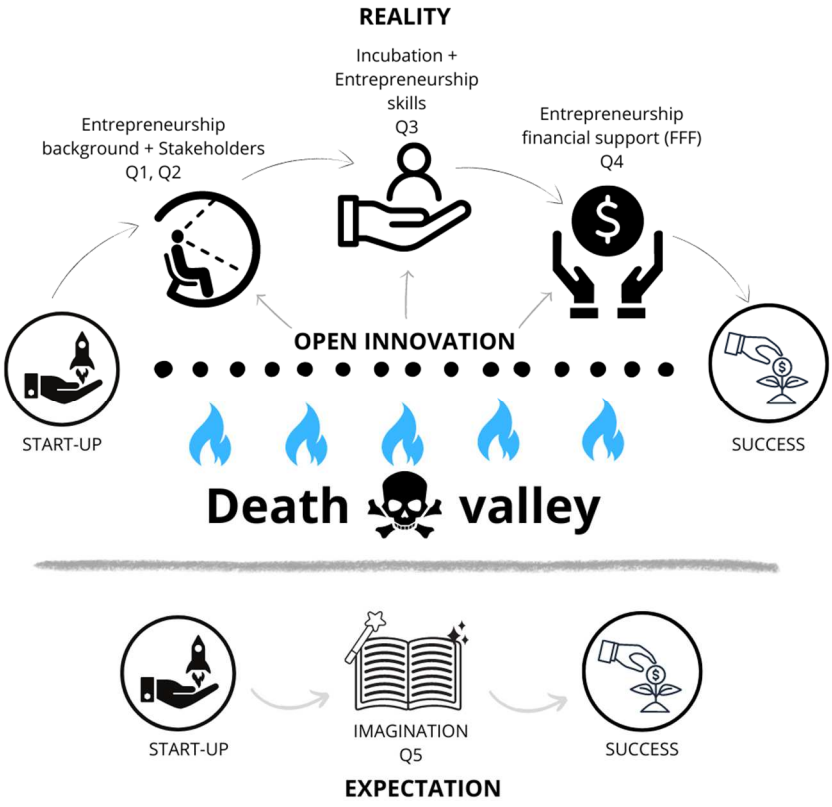

Figure 9. The valley of death journey map
Source: own elaboration.

CONCLUSIONS

In the present study, we examined the significance of open innovation (OI) for new technology-based firms (NTBFs) through empirical research involving ten companies incubated within the Madri+d ecosystem in Madrid, Spain. The findings provided full support for four out of the five hypotheses posited and partial support for one. This indicates that, for navigating the valley of death, the possession of human capital and access to informal sources of funding appear to be more crucial than OI itself.

From the hypotheses entirely supported by the findings, we concluded that:

1. Incubators should not merely focus on imparting entrepreneurship skills and business modelling knowledge but also go further by fostering networking and facilitating access to funding sources and potential clients (H2);
2. Despite NTBFs being highly specialised, contrary to expectations, professional experience remains the indispensable factor for survival over education (H3);
3. Initial financial support available to entrepreneurs relies on their family, friends, and fools (FFF) network and personal savings (H4);
4. One of the primary sources of motivation for entrepreneurs is the opportunity to actively contribute to industry knowledge development and achieve work independence.

From the hypothesis that was not fully supported (H1), it can be concluded that while open innovation is important for a company's development, it takes a backseat in the early stages of entrepreneurship, which prioritises survival through the 'Valley of Death' and emphasise activities conducive to establishing a stable market position. At this juncture, universities emerge as critical partners, primarily assuming the role of incubators providing access to business information to enhance the likelihood of surviving the valley of death.

Regarding the implications of the study for the academic community, we underscored the importance of examining and understanding the factors determining entrepreneurs' perception of openness in the early stages of their companies' development. Specifically, our study on NTBFs suggests that OI may be less critical for start-ups than the scientific community might presume, especially, in comparison to human capital and access to informal funding sources. This insight enriches existing literature on OI and provides valuable information for future research endeavours.

For managers, entrepreneurs, and other professionals, the results underscore the strategic relevance of focusing efforts on points identified as critical for surviving the valley of death, such as possessing adequate human capital and accessing informal funding sources.

Regarding implications for public entities involved in entrepreneurship, including incubators, it is suggested to promote policies supporting the training and ongoing support provided by these entities. This aims to enhance entrepreneurs' human capital and facilitate their access to funding sources. In particular, we highlighted the importance of exploring avenues to facilitate access to external funding as emerging companies progress through their developmental stages. The positive perception of incubators as resources for capacity building underscores their crucial role in developing essential entrepreneurial skills. Collaboration with incubators may be considered an effective means to nurture entrepreneurial talent and strengthen knowledge bases in the business domain.

Lastly, the study acknowledges the presence of limitations, such as focusing on a specific context (Spain) and reliance on highly specialized data. These limitations underscore the need to avoid generalizing results and encourage exploring multiple contexts in future research on entrepreneurship and OI.

REFERENCES

Acevedo, M.C., Montes, I.C., Vásquez, J.J., Villegas, M.N., Mejía, T.B., & Economía –SIEDE–, U.E.S. de I. en. (2007). Capital humano: Una mirada desde la educación y la experiencia laboral. *Cuadernos de Investigación*, *56*, Article 56. Retrieved from https://publicaciones.eafit.edu.co/index.php/cuadernos-investigacion/article/view/1287 on January 2, 2024.

Al Sharif, R., Pokharel, S., Ayari, M.A., Essam, M., & Aqeel, S. (2022). Enabling Open Innovation in Digital Startups through the Incubation Program—A Case of Qatar. *Sustainability (Switzerland)*, *14*(11). https://doi.org/10.3390/su14116557

Ascarya, & Rahmawati, S. (2018). Analysis of the determinants of micro enterprises graduation. *Journal of Islamic Economics, Banking and Finance*, *14*(1), 12-60. https://doi.org/10.12816/0051166

Audretsch, D.B. (1995). *Innovation and Industry Evolution*. MA: The MIT Press. Retrieved from https://books.google.es/books?hl=es&lr=&id=xbGbfSQWRMMC&oi=fnd&pg=PR9&dq=Audretsch,+D.+(1995).+%E2%80%9CInnovation+and+Industry+Evolution%E2%80%9D+(p.+280).+Cambridge,+MA:+The+MIT+Press.&ots=6YJhhQ4FQM&sig=fcWDBEnZy4sWnjO1iA2M5SacC0Q#v=onepage&q&f=false on January 2, 2024.

Audretsch, D., Carree, M.A., & Thurik, R. (2001). *Does Entrepreneurship Reduce Unemployment?* Tinbergen Institute Discussion Paper, No. 01-074/3, Tinbergen Institute, Amsterdam and Rotterdam Retrieved from https://hdl.handle.net/10419/85927 on July 1, 2023.

Autio, E. (1994). New, technology-based firms as agents of R&D and innovation: An empirical study. *Technovation*, *14*(4), 259-273. https://doi.org/10.1016/0166-4972(94)90010-8

Autio, E. (2008). Growth of Technology-based New Firms. In *The Blackwell Handbook of Entrepreneurship* (pp. 329-347). https://doi.org/10.1002/9781405164214.ch16

Beckman, C.M., Eisenhardt, K., Kotha, S., Meyer, A., & Rajagopalan, N. (2012). The Role of the Entrepreneur in Technology Entrepreneurship. *Strategic Entrepreneurship Journal*, *6*(3), 203-206. https://doi.org/10.1002/sej.1136

Bereczki, I. (2019). An open innovation ecosystem from a startup's perspective. *International Journal of Innovation Management*, *23*(8). https://doi.org/10.1142/S1363919619400012

Bertin, C., & Mavoori, H. (2022). Innovative Technology-Based Startup–Large Firm Collaborations: Influence of Human and Social Capital on Engagement and Success. *IEEE Transactions on Engineering Management*, 1-13. https://doi.org/10.1109/TEM.2022.3187924

Blank, S., & Dorf, B. (2020). *The Startup Owner's Manual: The Step-By-Step Guide for Building a Great Company*. John Wiley & Sons.

Block, J.H., Fisch, C.O., & van Praag, M. (2017). The Schumpeterian entrepreneur: A review of the empirical evidence on the antecedents, behaviour and consequences of innovative entrepreneurship. *Industry and Innovation*, *24*(1), 61-95. https://doi.org/10.1080/13662716.2016.1216397

Bogers, M. (2011). The open innovation paradox: Knowledge sharing and protection in R&D collaborations. *European Journal of Innovation Management*, *14*(1), 93-117. https://doi.org/10.1108/14601061111104715

Bollinger, L., Hope, K., & Utterback, J.M. (1983). A review of literature and hypotheses on new technology-based firms. *Research Policy*, *12*(1), 1-14. https://doi.org/10.1016/0048-7333(83)90023-9

Boni, A.A., & Joseph, D. (2019). Four models for corporate transformative, open innovation. *Journal of Commercial Biotechnology*, *24*(4), 23-31. https://doi.org/10.5912/JCB911

Cantillon, R. (1755). *Essai Sur La Nature Du Commerce En General*. Macmillan. Retrieved from https://www.iberlibro.com/9781169974012/Essai-Nature-Commerce-General-1755-1169974015/plp on July 1, 2023.

Carree, M., van Stel, A., Thurik, R., & Wennekers, S. (2002). Economic Development and Business Ownership: An Analysis Using Data of 23 OECD Countries in the Period 1976-1996. *Small Business Economics*, *19*(3), 271-290. https://doi.org/10.1023/A:1019604426387

Cavallo, A., Ghezzi, A., & Balocco, R. (2019). Entrepreneurial ecosystem research: Present debates and future directions. *International Entrepreneurship and Management Journal*, *15*(4), 1291-1321.

Chesbrough, H. (2009). *Innovación abierta*. Plataforma Editorial.

Chesbrough, H. (2015). *Reinventar la empresa en la era digital*. BBVA. Retrieved from https://www.bbvaopenmind.com/wp-content/uploads/2015/02/BBVA-OpenMind-Innovacion-abierta-Innovar-con-exito-en-el-siglo-xxi-Henry-Chesbrough.pdf. on January 3, 2024.

Chesbrough, H., Vanhaverbeke, W., & West, J. (2006). *Open Innovation: Researching a New Paradigm*. OUP Oxford.

Chesbrough, H.W. (2003). *Open Innovation: The New Imperative for Creating and Profiting from Technology*. Harvard Business Press.

Colombo, M.G., & Grilli, L. (2005). Founders' human capital and the growth of new technology-based firms: A competence-based view. *Research Policy*, *34*(6), 795-816. https://doi.org/10.1016/j.respol.2005.03.010

Colombo, M.G., & Grilli, L. (2010). On growth drivers of high-tech start-ups: Exploring the role of founders' human capital and venture capital. *Journal of Business Venturing*, *25*(6), 610-626. https://doi.org/10.1016/j.jbusvent.2009.01.005

Congregado, E., Golpe, A.A., & Carmona, M. (2010). Is it a good policy to promote self-employment for job creation? Evidence from Spain. *Journal of Policy Modeling*, *32*(6), 828.

Dahl, M.S., & Reichstein, T. (2007). Are You Experienced? Prior Experience and the Survival of New Organizations. *Industry and Innovation*, *14*(5), 497-511. https://doi.org/10.1080/13662710701711414

de Jong, J.P.J., & Freel, M. (2010). Absorptive capacity and the reach of collaboration in high technology small firms. *Research Policy*, *39*(1), 47-54.

Di Vaio, A., Palladino, R., Pezzi, A., & Kalisz, D.E. (2021). The role of digital innovation in knowledge management systems: A systematic literature review. *Journal of Business Research*, *123*, 220-231. https://doi.org/10.1016/j.jbusres.2020.09.042

Dooly, Z., Duane, A., & O'Driscoll, A. (2022). Creating and Managing EU Funded Research Networks: An Exploratory Case. *Electronic Journal of Business Research Methods*, *20*(1). https://doi.org/10.34190/ejbrm.20.1.2556

Edigbo, A.O., Ogbo, A., Onwe, C.C., Igwe, A., & Okafor, L.C. (2021). Mediating role of entrepreneurial alertness between prior entrepreneurial exposures and entrepreneurial intentions. *Entrepreneurial Business and Economics Review*, *9*(4), 67-84. https://doi.org/10.15678/EBER.2021.090405

Eftekhari, N., & Bogers, M. (2015). Open for Entrepreneurship: How Open Innovation Can Foster New Venture Creation. *Creativity and Innovation Management*, *24*(4), 574-584. https://doi.org/10.1111/caim.12136

Eiteneyer, N., Bendig, D., & Brettel, M. (2019). Social capital and the digital crowd: Involving backers to promote new product innovativeness. *Research Policy*, *48*(8), 103744. https://doi.org/10.1016/j.respol.2019.01.017

Elston, J.A., & Audretsch, D.B. (2011). Financing the entrepreneurial decision: An empirical approach using experimental data on risk attitudes. *Small Business Economics*, *36*(2), 209-222. https://doi.org/10.1007/s11187-009-9210-x

Fernandes, S., & Castela, G. (2019). Start-ups' accelerators support open innovation in Portugal. *International Journal of Innovation and Learning*, *26*(1), 82-93. https://doi.org/10.1504/IJIL.2019.100522

Ferràs-Hérnandez, X., Tarrats-Pons, E., Arimany-Serrat, N., & Armisen-Morell, A. (2021). The value of PhDs: How the Presence of PhDs in founding teams increases the attractiveness of startups for corporate investors. *International Journal of Innovation and Technology Management*, *18*(7). https://doi.org/10.1142/S0219877021500383

Gao, J.L., Li, D.S., & Conway, M.L. (2021). Family support and entrepreneurial passion: The mediating role of entrepreneurs' psychological capital. *Social Behavior and Personality*, *49*(3). https://doi.org/10.2224/SBP.9791

García-Cabrera, A.M., García-Soto, M.G., & Nieves, J. (2021). Knowledge, innovation and NTBF short- and long-term performance. *International Entrepreneurship and Management Journal*, *17*(3), 1067-1089. https://doi.org/10.1007/s11365-020-00656-z

Gassmann, O., & Enkel, E. (2004). Towards a Theory of Open Innovation: Three Core Process Archetypes. *University of St.Gallen*, *6*.

Gbadegeshin, S.A., Natsheh, A.A., Ghafel, K., Mohammed, O., Koskela, A., Rimpiläinen, A., Tikkanen, J., & Kuoppala, A. (2022). Overcoming the Valley of Death: A New Model for High Technology Startups. *Sustainable Futures*, *4*, 100077. https://doi.org/10.1016/j.sftr.2022.100077

Godlewska-Majkowska, H., Komor, A., Pilewicz, T., & Zarebski, P. (2023). The regional environment of smart organisations as a source for entrepreneurship development in the EU. *Entrepreneurial Business and Economics Review*, *11*, 143-162. https://doi.org/10.15678/EBER.2023.110309

Gomes, S., & Ferreira, P. (2022). Entrepreneurial activity and economic growth: A dynamic data panel analysis of European countries. *Entrepreneurial Business and Economics Review*, *10*. https://doi.org/10.15678/EBER.2022.100201

Gruber, M., & Henkel, J. (2006). New ventures based on open innovation – an empirical analysis of start-up firms in embedded Linux. *International Journal of Technology Management*, *33*(4), 356-372. https://doi.org/10.1504/IJTM.2006.009249

Gupta, V., & Rubalcaba, L. (2022). University libraries as open innovation partners: Harnessing hidden potential to foster global entrepreneurship. *Journal of Academic Librarianship*, *48*(2). https://doi.org/10.1016/j.acalib.2021.102432

Hahn, D., Minola, T., & Eddleston, K.A. (2019). How do Scientists Contribute to the Performance of Innovative Start-ups? An Imprinting Perspective on Open Innovation. *Journal of Management Studies*, *56*(5), 895-928. https://doi.org/10.1111/joms.12418

Hamilton, R.H. (2001). E-commerce new venture performance: How funding impacts culture. *Internet Research*, *11*(4), 277-285. https://doi.org/10.1108/10662240110402731

Hoang, G., Luu, T.T., Le, T.T.T., & Tran, A.K.T. (2022). Dark Triad traits affecting entrepreneurial intentions: The roles of opportunity recognition and locus of control. *Journal of Business Venturing Insights*, *17*. https://doi.org/10.1016/j.jbvi.2022.e00310

Holcombe, R.G. (2007). *Entrepreneurship and Economic Progres*. Routledge.

Huang, R.G. (2014). *RQDA: R-Based Qualitative Data Analysis: R Package Version 0.2-7*. Retrieved from http://rqda.r-forge.rproject.org on January 2, 2024.

Iglesias-Sánchez, P.P., Fayolle, A., Jambrino-Maldonado, C., & de las Heras-Pedrosa, C. (2022). Open innovation for entrepreneurial opportunities: How can stakeholder involvement foster new products in science and technology-based start-ups?. *Heliyon*, *8*(12). https://doi.org/10.1016/j.heliyon.2022.e11897

Ingram, A., Peake, W.O., Stewart, W., & Watson, W. (2019). Emotional Intelligence and Venture Performance. *Journal of Small Business Management*, *57*(3), 780-800. https://doi.org/10.1111/jsbm.12333

Ireta Sanchez, J.M. (2023). Attributes of scaling up SMEs in the IT sector towards sustaining high-performance business results. *Journal of Entrepreneurship in Emerging Economies*, *15*(5), 910-944. https://doi.org/10.1108/JEEE-04-2021-0149

Jang, Y. (2019). Entreprenurial Human Capital and Inward Technology Licensing in the Context of New Technology-Based Firms. *International Journal of Innovation and Technology Management*, *16*(7). https://doi.org/10.1142/S0219877019500536

Janssen, W., Bouwman, H., van Buuren, R., & Haaker, T. (2014). An organizational competence model for innovation intermediaries. *European Journal of Innovation Management*, *17*(1), 2-24. https://doi.org/10.1108/EJIM-09-2012-0087

Jirapong, K., Cagarman, K., & von Arnim, L. (2021). Road to sustainability: University–start-up collaboration. *Sustainability (Switzerland)*, *13*(11). https://doi.org/10.3390/su13116131

Joseph, D., Boni, A.A., & Abremski, D. (2021). A note on corporate open innovation: Engagement with startups. *Journal of Commercial Biotechnology*, *26*(2), 33-35. https://doi.org/10.5912/jcb989

Khaliq, A., Ali, S., Chen, Z., Kanwal, S., Khan, F., Niazi, A.A.K., & Chen, L. (2022). Effects of the COVID-19 Pandemic on the Success of Traditional Small and Medium Enterprises (SMEs): An Investigation of the Footprints of Economic Crisis Attributable to COVID-19. *Frontiers in Psychology*, *13*. https://doi.org/10.3389/fpsyg.2022.924340

Krieger, A., Stuetzer, M., Obschonka, M., & Salmela-Aro, K. (2022). The growth of entrepreneurial human capital: Origins and development of skill variety. *Small Business Economics*, *59*(2), 645-664. https://doi.org/10.1007/s11187-021-00555-9

Lago, N.C., Marcon, A., Ribeiro, J.L.D., Olteanu, Y., & Fichter, K. (2023). The role of cooperation and technological orientation on startups' innovativeness: An analysis based on the microfoundations of innovation. *Technological Forecasting and Social Change*, *192*. https://doi.org/10.1016/j.techfore.2023.122604

Lamperti, S., Sammut, S., & Courrent, J.M. (2023). From incubator's knowledge transfer to sustainability start-ups' impact: A case study in a French support program. *Journal of Knowledge Management*, *27*(9), 2393-2413. https://doi.org/10.1108/JKM-09-2022-0690

Lee, J., Kim, D., & Sung, S. (2019). The eect of entrepreneurship on start-up open innovation: Innovative behavior of university students. *Journal of Open Innovation: Technology, Market, and Complexity*, *5*(4). https://doi.org/10.3390/joitmc5040103

Li, C.Y. (2012). The influence of entrepreneurial orientation on technology commercialization: The moderating roles of technological turbulence and integration. *African Journal of Business Management*, *6*(1), 370-387. https://doi.org/10.5897/AJBM11.025

Lin, Y.H., Lu, L.H., & Tang, S.Y. (2023). Entrepreneurial orientation and product innovativeness: The mediating roles of technology diversity and intellectual property protection. *Technology Analysis and Strategic Management*. https://doi.org/10.1080/09537325.2023.2293859

Lindelöf, P., & Löfsten, H. (2004). Proximity as a resource base for competitive advantage: University-industry links for technology transfer. *Journal of Technology Transfer*, *29*(3-4), 311-326. https://doi.org/10.1023/b:jott.0000034125.29979.ae

Liu, X., & Yang, Z. (2023). Security token offerings versus loan guarantees for risk-averse entrepreneurs under asymmetric information. *Finance Research Letters*, *57*. https://doi.org/10.1016/j.frl.2023.104171

Makai, A.L., & Dory, T. (2023). Perceived university support and environment as a factor of entrepreneurial intention: Evidence from Western Transdanubia Region. *PLoS ONE*, *18*(6 June). https://doi.org/10.1371/journal.pone.0283850

Marliati, A. (2020). Factors Influencing on Entrepreneurial Behavior of Street Vendors (A Case in Pekanbaru City, Riau Province). *AGRARIS: Journal of Agribusiness and Rural Development Research*, *6*(2). https://doi.org/10.18196/agr.6296

Modaffari, G., Paoloni, N., & Manzo, M. (2023). Intellectual capital's contribution to innovative female agri-start-ups: A multiple case study. *Journal of Intellectual Capital*. https://doi.org/10.1108/JIC-07-2022-0150

Morales-Alonso, G., Blanco-Serrano, J.A., Núñez Guerrero, Y., Grijalvo, M., & Blanco Jimenez, F.J. (2022). Theory of planned behavior and GEM framework – How can cognitive traits for entrepreneurship be used by incubators and accelerators?. *European Journal of Innovation Management*. https://doi.org/10.1108/EJIM-04-2022-0208

Morales-Alonso, G., Pablo-Lerchundi, I., & Núñez-Del-Río, M.C. (2016). Entrepreneurial intention of engineering students and associated influence of contextual factors / Intención emprendedora de los estudiantes de ingeniería e influencia de factores contextuales. *International Journal of Social Psychology*, *31*(1), 75-108. https://doi.org/10.1080/02134748.2015.1101314

Morales-Alonso, G., Pablo-Lerchundi, I., Ramírez-Portilla, A., & Ordieres-Meré, J. (2023). Entrepreneurial intention through the lens of the Pareto rule: A cross-country study. *Cogent Business & Management*, *10*(3), 2279344. https://doi.org/10.1080/23311975.2023.2279344

Morales-Alonso, G., Vila, G.A., Lemus-Aguilar, I., & Hidalgo, A. (2020). Data retrieval from online social media networks for defining business angels' profile. *Journal of Enterprising Communities*, *14*(1), 57-75. https://doi.org/10.1108/JEC-10-2019-0095

Neyens, I., Faems, D., & Sels, L. (2010). The impact of continuous and discontinuous alliance strategies on startup innovation performance. *International Journal of Technology Management*, *52*(3/4), 392-410. https://doi.org/10.1504/IJTM.2010.035982

Pakura, S. (2020). Open innovation as a driver for new organisations: A qualitative analysis of green-tech start-ups. *International Journal of Entrepreneurial Venturing*, *12*(1), 109-142. https://doi.org/10.1504/IJEV.2020.105135

Peterson, R., & Valliere, D. (2008). Entrepreneurship and national economic growth: The European entrepreneurial deficit. *European Journal of International Management*. Retrieved from https://www.inderscience-online.com/doi/10.1504/EJIM.2008.021249 on January 3, 2024.

Radas, S., & Božić, L. (2009). The antecedents of SME innovativeness in an emerging transition economy. *Technovation*, *29*(6), 438-450. https://doi.org/10.1016/j.technovation.2008.12.002

Ramachandran, K., & Ramnarayan, S. (1993). Entrepreneurial orientation and networking: Some Indian evidence. *Journal of Business Venturing*, *8*(6), 513-524. https://doi.org/10.1016/0883-9026(93)90036-5

Ramírez-Alesón, M., & Fernández-Olmos, M. (2018). Unravelling the effects of Science Parks on the innovation performance of NTBFs. *Journal of Technology Transfer*, *43*(2), 482-505. https://doi.org/10.1007/s10961-017-9559-y

Remneland Wikhamn, B., & Styhre, A. (2019). *Managerial challenges of outbound open innovation: A study of a spinout initiative in AstraZeneca*. https://doi.org/10.1111/radm.12355

Ries, E. (2017). *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses*. Currency.

Salimi, S., Shahriari, M., & Shirani, B.A. (2023). Designing A Framework of Influencing Variables on Open Innovation in Startup Companies. *International Journal of Innovation Management*. https://doi.org/10.1142/S1363919623500147

Sanasi, S., Ghezzi, A., & Cavallo, A. (2023). What happens after market validation? Experimentation for scaling in technology-based startups. *Technological Forecasting and Social Change*, *196*, 122839. https://doi.org/10.1016/j.techfore.2023.122839

Santoso, A.S., Prijadi, R., & Balqiah, T.E. (2020). How open innovation strategy and effectuation within platform ecosystem can foster innovation performance: Evidence from digital multi-sided platform startups. *Journal of Small Business Strategy*, *30*(3), 102-106. Retrieved from https://libjournals.mtsu.edu/index.php/jsbs/article/view/1471 on January 10, 2024.

Schumpeter, J.A. (1934). *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle*. Oxford University Press.

Spender, J.C., Corvello, V., Grimaldi, M., & Rippa, P. (2017). Startups and open innovation: A review of the literature. *European Journal of Innovation Management*, *20*(1), 4-30. https://doi.org/10.1108/EJIM-12-2015-0131

Storey, D.J., & Tether, B.S. (1998). New technology-based firms in the European union: An introduction. *Research Policy*, *26*(9), 933-946. https://doi.org/10.1016/S0048-7333(97)00052-8

Sus, A., Perczynska, M., & Sajewski, T. (2020). Project of Empirical Research on Innovative Organizations in Poland. *IBIMA Business Review*, *2020*. https://doi.org/10.5171/2020.189652

Wadood, F., Alshaikh, M.E., Akbar, F., & Mahmud, M. (2022). Adoption of open innovation and entrepreneurial orientation practices in Malaysian furniture industry. *Entrepreneurial Business and Economics Review*, *10*(2), 21-40. https://doi.org/10.15678/EBER.2022.100202

Wessendorf, C.P., Kegelmann, J., & Terzidis, O. (2019). Determinants of early-stage technology venture valuation by business angels and venture capitalists. *International Journal of Entrepreneurial Venturing*, *11*(5), 489-520. https://doi.org/10.1504/IJEV.2019.102259

Wurth, B., Stam, E., & Spigel, B. (2022). Toward an Entrepreneurial Ecosystem Research Program. *Entrepreneurship Theory and Practice*, *46*(3), 729-778. https://doi.org/10.1177/1042258721998948

Ziakis, C., Vlachopoulou, M., & Petridis, K. (2022). Start-Up Ecosystem (StUpEco): A Conceptual Framework and Empirical Research. *Journal of Open Innovation: Technology, Market, and Complexity*, *8*(1). https://doi.org/10.3390/joitmc8010035

Authors

The contribution share of authors is equal and amounted to 25% for each of them.

Yulissa Navarro-Castillo
Adjunct Professor at Universidad Nacional Agraria la Molina, Peru, Department of Business Management. PhD student at Universidad Politécnica de Madrid. Her research interests include entrepreneurship, organizational behaviour, and innovation.
Correspondence to: Yulissa Navarro-Castillo, National Agrarian University La Molina, Department of Business Management, La Molina s/n, Lima 15024, Peru, e-mail: ynavarro@lamolina.edu.pe
ORCID http://orcid.org/0000-0002-3697-5163

Katia Mastrostefano
Master from Università degli Studi di Cassino e del Lazio Meridionale, Cassino, Italy in collaboration with Universidad Politécnica de Madrid. Her research interests include start-ups and open innovation.
Correspondence to: Katia Mastrostefano, Università degli Studi di Cassino e del Lazio Meridionale, Cassino, Italy, e-mail: katiamastrostefano@gmail.com
ORCID http://orcid.org/0009-0006-1780-2589

Mercedes Grijalvo
Associate Professor at Universidad Politécnica de Madrid. She has also been a visiting professor at Centre de Recherche en Gestion de l'École Polytechnique (Paris, France) and Southern Illinois University Carbondale (USA). Besides, she worked at NOVOTEC Consultores as a quality consultant. Her research interests include innovation as a business approach: new business models and new organizational forms, and as an educational approach, simulators and gamification.
Correspondence to: Mercedes Grijalvo, Universidad Politécnica de Madrid, Department of Industrial Engineering, Business Administration and Statistics, José Gutiérrez Abascal 2, Madrid 28006, Spain, e-mail: mercedes.grijalvo@upm.es
ORCID http://orcid.org/0000-0001-7885-4354

Gustavo Morales-Alonso
Associate professor in economics, entrepreneurship & innovation at Universidad Politécnica de Madrid (UPM). His research interests include the drivers of economic development, the sharing economy and sustainability, technological entrepreneurship and the response of consumers to sustainable initiatives.
Correspondence to: Prof. Gustavo Morales-Alonso, PhD, Universidad Politécnica de Madrid, Department of Industrial Engineering, Business Administration and Statistics, José Gutiérrez Abascal 2, Madrid 28006, Spain, e-mail: gustavo.morales@upm.es
ORCID http://orcid.org/0000-0001-5753-495X

Acknowledgements and Financial Disclosure

The authors would like to express their gratitude to the anonymous referees for their valuable comments, which significantly enhanced the value of this article. Additionally, we would like to express our gratitude to the entrepreneurs who allowed us to gain a deeper understanding of them in order to accomplish the objective of this study.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Published by Krakow University of Economics – Krakow, Poland

Ministry of Education and Science
Republic of Poland

The journal is co-financed in the years 2022-2024 by the Ministry of Education and Science of the Republic of Poland in the framework of the ministerial programme "Development of Scientific Journals" (RCN) on the basis of contract no. RCN/SP/0583/2021/1 concluded on 13 October 2022 and being in force until 13 October 2024.

Entrepreneurial Business and Economics Review

2024, Vol. 12, No. 3

10.15678/EBER.2024.120311

The art of deception: The trade-off between the information distortion and perception of FDI location attractiveness

Katarzyna Mroczek-Dąbrowska, Dawid Cherubin, Aleksandra Kania

ABSTRACT

Objective: The objective of the article was to identify how various forms of information distortion influence foreign direct investment (FDI) location choices and location attractiveness perception. We focused on geopolitical factors that have been known to be an antecedent for FDI location choices but we identified new ways of impacting the perception of location's attractiveness.

Research Design & Methods: To this means, we applied the total interpretive structural modelling (TISM method) based on expert knowledge.

Findings: Our findings illustrate how we cannot perceive FDI location decisions and the evaluation of their attractiveness as a simple, straightforward process. Based on the model, deep fakes are the most crucial geopolitical factors influencing the perception of FDI locations, followed by colour revolutions and false flag operations.

Implications & Recommendations: Our model suggests that the factors influencing FDI location perceptions create a dynamic, interconnected network of several interdependent layers that make FDI location selection challenging. The proposed TISM framework will support managers in formulating effective strategies for deciding on the next steps regarding their FDI location choices.

Contribution & Value Added: In previous studies, scholars mostly assessed geopolitical factors through the lens of the classical approach to geopolitics, i.e. the overall perception of geopolitical risk. Nevertheless, recent geopolitical disruptions (e.g. tensions between China and the US, Russian invasion in Ukraine) as well as technological advancements have uncovered new ways in which geopolitics can affect international relations, including trade and investments.

Article type: research article

Keywords: information distortion; geopolitical factors; FDI location choice; FDI attractiveness perception; uncertainty; foreign direct investments

JEL codes: F21, F23

Received: 1 February 2024 Revised: 19 April 2024 Accepted: 6 June 2024

Suggested citation:

Mroczek-Dąbrowska, K., Cherubin, D., & Kania, A. (2024). The art of deception: The trade-off between the information distortion and perception of FDI location attractiveness. *Entrepreneurial Business and Economics Review,* 12(3), 205-220. https://doi.org/10.15678/EBER.2024.120311

INTRODUCTION

Geopolitics has always played a significant role in various areas of life. However, we have observed the gradual intensification of its importance, especially since 2001. Globalization led to an increase in the volume of international trade, strengthened business ties, and created regional blocks. The beginning of the twenty-first century was marked by intensive international cooperation, both in the sphere of entire economies, enterprises, and societies. Consequently, companies have been expanding to foreign markets more frequently, using different entry modes, from exports to foreign direct investment (FDI) (Dorożyński *et al*., 2020). As a form of equity expansion, equity investments are generally considered to be an expression of the company's greatest involvement in a given market, however, they depend on a number of factors, mainly geopolitical ones.

In recent years, international events (such as the kinetic conflict between Ukraine and Russia, the rising diplomatic tensions between China and Taiwan, Brexit, *etc.*) have significantly impacted the performance of existing investments and the feasibility of new ones. The so-called Arab Spring and the US Peacekeeping Mission in these regions have long influenced investments in Africa and the Middle East. Very often, the causes of geopolitical and geoeconomic risk are political instability, terrorism, regional conflicts, and broadly understood cybernetics. Caldara and Iacoviello (2018) believe that geopolitical risk is becoming one of the most important determinants of business decisions. In their research, Li *et al*. (2022) show that governments' control over resources and their political intentions influence the type of companies that later undertake international investments. In this regard, the researchers indicate that various geopolitical factors influence FDI in different global development programs such as *e.g.* the Belt and Road initiative. Lu and Liu (2022) believe that more and more research is focusing on the negative impact of geopolitical factors that disrupt the flow of FDI. Moreover, many geopolitical and geoeconomic events may threaten international investors or force them to change their investment strategy.

The existing body of literature on how geopolitics affects FDI shows that geopolitical risk is a key factor in determining the location and attractiveness of FDI. However, the literature also points to the fact that it is still an underexplored area (Bussy & Zheng, 2023), indicating a few novel research venues: geopolitical risk and uncertainty measurement, geopolitical risk and uncertainty perception, digitization and its impact on managerial responses, *etc*. Therefore, we aimed to explore two aspects that have been pushed to the forefront of attention due to the global increase of geopolitical threats: the influence of the perception of geopolitical tensions on FDI location choices and the use of information distortion in creating managerial perceptions on the matter. We contribute to the field by addressing some crucial gaps not undertaken by previous research and pose three research questions:

RQ1: What are the critical forms of information distortion affecting the attractiveness of an FDI location in emerging markets?

RQ2: Which of these forms are interrelated and how?

RQ3: What are the implications of how geopolitical risk and uncertainty perceptions are shaped for the investment strategies of companies?

The article is structured as follows. Section 2 will focus on understanding the interplay between three elements, *i.e.* FDI, geopolitical risk, uncertainty, and information distortion. Section 3 will present a brief description of the research methodology followed by the results in Section 4. Section 5 will outline practical and theoretical implications along with research limitations, which conclude the study.

LITERATURE REVIEW

Information Tools in Geopolitical Power Struggle

Economic uncertainty, policy uncertainty, and finally geopolitical uncertainty come together to contemporarily create the so-called 'uncertainty trinity' (Carney, 2016) which can have adverse effects on the economies and society at large. Recent years and international developments point to geopolitical uncertainty[1] as a factor requiring intensive monitoring since its impact spreads through numerous channels. Although the discussion on the exact definition of geopolitical risk is an ongoing debate (cf. Gray & Sloan, 2014), we adopted the understanding suggested by Caldara and Iacoviello (2022, p. 1197) who argue that it depicts 'threat, realization and escalation of adverse events associated with wars, terrorism and any tensions among states and political actors that affect the peaceful course of international relations.' In the past decade, the global political landscape has become more volatile and complex with the main sources of friction being rivalry between China, Russia, and the United States and their respective allies. These political disputes often escalate into overt military confrontations, which may appear as regional clashes, but have global implications. On the other hand, geopolitical risk includes also non-violent power

[1] We differentiate between geopolitical uncertainty where neither the probability nor the actual outcome of the disruption are known and geopolitical risk where the probability of an expected outcome can be assessed (Knight, 1921). In many articles, however these two items are discussed together (Caldara & Iacoviello, 2022; Bussy & Zheng, 2023).

struggles that do not focus on territory disputes but the ability to exercise power and control to benefit oneself (*e.g.* Brexit). Finally, geopolitical risk does not refer only to materialized events but mostly to the perception of such occurrences finally happening (Bussy & Zheng, 2023).

There are two main perspectives on geopolitics. The classical perspective considers the internal dynamics of a state and its interactions with other actors in the international arena. We assume here that geographical borders are fixed and stable and together with other geographical features influence country's foreign policies and actions. Scholars have commonly applied this perspective for delineating and measuring the level of geopolitical risk (cf. Gray & Sloan, 2014). However, another way to approach geopolitics is to turn to the behavioural and psychological aspects of the power game. According to the critical perspective on geopolitics, three main factors influence the power struggle, *i.e.* the infosphere, the noosphere, and the hybrid warfare. By infosphere, we understand a system to share and communicate data or information. Infosphere can be subject to manipulation, which means certain elements can be erased, transferred, or distorted. The element directly related to the infosphere is the noosphere. It refers to human cognition resulting in the collective interconnectedness of ideas and values (Kim *et al*., 2019). We could argue that the infosphere as a communication system feeds and shapes the noosphere which catalyzes creating perceptions. Exploiting the interplay between infosphere and noosphere has become the key element of hybrid warfare which – although still lacks conceptual clarity – entails using conventional (kinetic) and unconventional (information-related) tools to exert power (Bilal, 2021). Therefore, critical geopolitics is less visible and less understood by the business community or even some political circles as it operates at the perception level. Three main factors can alter people's perceptions. These are emotions, beliefs, and narratives.

According to Hoffman (2007), hybrid warfare is a strategy that simultaneously exploits various (political, conventional, cyber, *etc*.) methods of influence, such as fake news, diplomacy, lawfare, and foreign electoral intervention. Similarly, NATO (2023) defines the concept as actions of dis- or misinformation, cyber-attacks and economic pressure. Muradov (2022) classifies hybrid action as information warfare. The infosphere encompasses all the sources and channels of information that exist in the modern world, such as the Internet, media, academia, social networks, and public events. The infosphere determines how information is created, disseminated, and consumed (Petrie, 2022). The noosphere refers to the collective consciousness and awareness of individuals and groups, which is shaped by their knowledge, experiences, culture, beliefs, *etc*. (Jaseckova & Vartiak, 2023; Ronfeldt & Arquilla, 2020; 2022). The noosphere influences how information is interpreted, evaluated, and acted upon. Zaharna (2016) argues that the noosphere and the infosphere, which represent the intangible and tangible aspects of information respectively, are used to construct images and concepts that define the identity of individuals or social groups.

The strategic objectives of modern power struggle are achieved by manipulating the emotions of individuals or groups with minimal costs. The infosphere and the noosphere are the two mediums that enable emotion management. Various actors can conduct information warfare. These can be *e.g.* states, non-state actors, or individuals. The key feature of modern information warfare is that anyone with access to ICT can be both a target and a source of information. For instance, a person with Internet access can actively participate in hybrid activities by replicating harmful content.

Since 2013, the world has witnessed a growing escalation of international conflicts and information confrontations among major political players, such as China, Russia, and the United States. The current fourth-generation warfare relies heavily on soft power techniques, which target the subconscious layer of human consciousness, the noosphere. The development of new technologies, such as artificial intelligence and deep fakes, alters the way people perceive and disseminate information.

Geopolitical Factors in FDI Location Choices

There is a myriad of factors said to influence the FDI location choice that include the size of the market and its development prospects, labour costs and labour quality, the economy openness, the geographical distance between the host and home countries, taxes, the risk related to the political and macroeconomic situation, corruption level in the host country and others (Chowdhury *et al*., 2022). However, the interlink between FDI and geopolitical risk and uncertainty has not been a long-standing one. Previous

research has mostly examined political risk in general, without distinguishing the unique aspects of geopolitical risk (Chanegriha *et al.*, 2017). However, according to Pastor and Veronesi (2013), changes in geopolitical risk and uncertainty affect investment decisions. When risk increases, investors demand a higher payoff to proceed with the investment. When uncertainty increases, investors become more reluctant to invest and may postpone or cancel the investment altogether. Likewise, Bussy, and Zheng (2023) studied the FDI and geopolitical risk and uncertainty in emerging markets. Their results imply that geopolitical risk is less pronounced than geopolitical uncertainty in FDI decisions as companies prioritize safety over profit opportunity. Gao *et al.* (2018) point to similar conclusions regarding Japanese investment in China, highlighting the increase in transaction costs and exchange hazards. Historical entanglement of neighbouring countries in times of strained relationship negatively impacts the FDI inflow.

Regional conflicts *per se* can affect geoeconomic activities and remain crucial antecedents for investors (Verma, 2007; Sebastian & Warner, 2014; Luo, 2021; Tang *et al*., 2023). Along those factors, we can distinguish terrorist attacks on both civilian and government facilities that also proved significant for FDI location choices (Powers & Choi, 2012; Bandyopadhyay *et al.*, 2014; Haider & Anwar, 2014; Shah, 2015; Dimitrova *et al.*, 2022). Moreover, since 2019, a new source of geopolitical risk has emerged, related to the global pandemic (Jaworek *et al.*, 2020; Mazzotta, 2020; Badmus *et al.*, 2022; Ou-Yang & Kim, 2022). The COVID-19 pandemic has triggered a new kind of political conflict called pandemopolitics, which describes the global process that alters the population dynamics of the world and creates a situation of geopolitical and geoeconomic stress (Mionel *et al.*, 2020).

To sum up, previous studies on geopolitical influence on FDI generally focused on events that materialized. However, it remains equally important to study the *perception* of geopolitical threats (Giambona *et al*., 2017; Bussy & Zheng, 2023). In the VUCA[2] world, the outcome of the geopolitical tensions is difficult to predict and managers involved in the FDI decisions need to vastly base their choices on perceptions. In the study, we seek to understand how these geopolitical perceptions can be shaped through various digitalized information channels that are prone to distortion, misinterpretation, or even purposeful manipulation. Unlike Caldara and Iacoviello (2022), we focus not only on the mainstream media outlets as sources for information spread, but allow for the notion that perceptions can be also shaped through other, mostly online channels.

Information Distortion and FDI Location Attractiveness

One of the reasons for increase in the modern society polarization is the spread of distorted information,[3] which became more apparent with the 'digital ubiquity' (Gupta *et al.,* 2023; Mirhoseini *et al.,* 2023). It becomes increasingly easy to influence the perception not only of a specific region but even entire countries through the use of media channels. Online platforms and mainstream media can cause the information to flow at a high speed and can reach a large audience causing 'digital wildfires.' Whilst in the past managers used to suffer from information asymmetry, now data and information are in abundance, shifting the struggle towards processing capacity. The decision processes are additionally blurred by the inability of managers to determine which of the available information is genuine and which could be subject to distortion.

Information distortion can be instigated through various channels including echo chambers and associated informational cascades that either lead to an unintentional increase of the credibility of rumours or to purposeful alterations of viewpoints and outright informational propaganda (Gupta *et al.,* 2023; Wang *et al.,* 2018). The so-called computational propaganda uses big data, bots-automated programs, fake news, and many other digitized tools to influence 'the emotions and (…) [bypass] rational thought, to achieve a specific goal' (Bolsover & Howard, 2017, p. 273). These tools are mediums by which the infosphere and the noosphere create, manage, and control perceptions. In effect, the uncertainty and anxiety over geopolitical tensions can be multiplied causing investors from uninvolved third countries to reconsider their potential FDIs.

[2] VUCA stands for volatility, uncertainty, complexity, and ambiguity.

[3] Tucker *et al.* (2018) highlight the diversity of information distortions that include rumors, misinformation, disinformation, biased information, and hyper partisan information.

RESEARCH METHODOLOGY

To explore the research questions set in the study, we used total interpretive structural modelling (TISM). It belongs to a set of methods used for multi-criteria decision-making (MCDM) problems and allows for investigating the relationship between the problem components (Sorooshian *et al.,* 2023). As the issue under study here concerns the decision process related to foreign direct investments, TISM constitutes an effective tool for determining not only what affects the FDI location attractiveness but also how and why these antecedents are interconnected.

Data and Sample

Although TISM as an analytical technique follows a fairly standardised protocol and requires that data is collected with the use of a pre-defined fixed questionnaire, it is still classified as a qualitative not quantitative method. Therefore, we collected the data for the study among 40 experts who have at least 15 years of experience working in manufacturing industries (companies classified in Section C of the NACE Rev 2 classification; breakdown of economic activities can be found in Table A1.) and form part of the top-level management team in the company. Moreover, the companies they work for had to be classified as large companies with a recorded history of undertaking FDIs in developing countries. We chose experts in a purposeful manner so that they represented different types of manufacturing activities and were involved in the decision-making of at least three FDIs. We collected the data using the CAWI method between April and June 2023.

Measures

The study related to a 'cause-and-effect' phenomenon where the outcome is the perception of attractiveness of a certain FDI location. Although indisputably the FDI location choice is determined by various groups of factors, here we set the focus on the geopolitical perspective. Hence, we studied the potential antecedents driving the FDI location choice through the lenses of critical geopolitics. Table 1 presents the constructs together with their brief description. We delineated the factors based on the literature review that relate to forms of information distortion and expert input. Combining these two elements enabled us to relate information distortion to the specific case of geopolitics.

Table 1. Potential factors influencing the perception of FDI location attractiveness in developing countries

Factor	Short definition
Disinformation	Mainstream information that may be inaccurate and unverified.
Propaganda	Intentional disinformation about a particular event aimed at reaching a certain objective.
Reflexive control	Process of imposing assumptions and highlighting chosen (often biased) information that leads to a specific impression.
Emotional reflexive games	A process similar to reflexive control that uses strong emotions as the main tool for exerting control.
Colour revolutions	Mass events (demonstrations, social riots) inspired by events in the country or the world.
False flag	Actions aimed at transferring responsibility for a specific event/outcome to another social group/state.
Deep fake	Specific AI disinformation tool that uses sound, image, and video causing temporary or long-term challenges in determining whether the material is real or not.
Cyber attacks	An attempt to disrupt, take over, impair, or gain unauthorized access to a specific system or network.

Source: own study based on Mustak *et al*., 2023; Kietzmann *et al*., 2020; Jost *et al*., 2020; Petratos, 2021; Vasist & Krishnan, 2023; Hua, Chen & Luo, 2018; Pirca & Lallie, 2023; Wach *et al*., 2023.

Data Analysis

As mentioned before, we used TISM as an analytical framework for the study. The technique consisted of a number of steps that follow one another in a sequence of three phases, *i.e.* preparatory stage, the operation stage, and finally validation stage[4]. These include:

A. Phase 1 – Preparatory stage:

- Step 1: Formulation of the objectives and research questions;
- Step 2: Method establishment;
- Step 3: Identification of the experts and development of the questionnaire;
- Step 4: Testing phase with feedback incorporated into the questionnaire.

B. Phase 2 – Operation stage:

- Step 5: Data and expert opinion collection;
- Step 6: Data interpretation and model development, including construction of aggregated structural self-interactive matrix (SSIM), final reachability matrix and computation of driving power and dependence.

C. Phase 3 – Model validation:

- Step 7: Identification of the experts for validation;
- Step 8: Model validation and potential adjustment to the hierarchical TISM model.

The preparatory stage included the identification of the problem and study objective, the review of potential decision determinants, respondents' selection, and finally questionnaire preparation. Since the factors under study suggested that decisions concerning FDI were not always objective but in a digitalized world are subject to misinformation and 'creating perceptions,' we had to design the questionnaire in a way that ensures as objective and truthful answers as possible. Therefore, instead of asking directly whether factors from Table 1 influenced the perception of FDI location attractiveness, we asked respondents to evaluate the impact of a set of situations (depicting those factors but without naming them) on their FDI decisions (Table A2). Next, in Phase 2, we asked respondents to determine the pairwise relationships between those factors. Based on the aggregated data, we created a structural self-interaction matrix (SSIM) and subsequently translated it to the reachability matrix with transitivity checks. The final reachability matrix allowed for conducting the level partitioning, diagraph design, and contextual interpretation of relationships. In effect, we created a total interpretive structural model. In the final stage of the study, a separate group of experts validated the model (meeting the same criteria described in 'Data and sample' section).

RESULTS AND DISCUSSION

Hierarchical Model Development

We analysed the relationships between all pairs of elements and obtained the binary reachability matrix. This helped us determine the driving power and dependence value of each factor. The strongest driving power was revealed by the usage of deep fakes (F7) followed by the emergence of colour revolutions (F5) and false flag operations (F6). High driving power indicates that these factors were the key elements in influencing the FDI decisions. In terms of dependence, we observed high values among the usage of disinformation (F1), propaganda (F2), and application of both reflexive control (F3) and emotional reflexive games (F4).

We applied transitivity checks to verify the consistency of the model, as suggested by Farris and Sage (1975), Sushil (2017), and Jena *et al.* (2017). We distinguished between 'transitive links' and 'significant transitive links' following Jena *et al.* (2017). We used the CFCS method to construct the crisp reachability matrix, which we then converted into the transitive reachability matrix (Table 2.).

[4] The article does not elaborate on the TISM method itself. For detailed information on method please see Jena *et al.*, 2017.

Table 2. Transitive reachability matrix

Factors	F1	F2	F3	F4	F5	F6	F7	F8
F1 – Disinformation	1	1	1	1*	0	0	0	0
F2 – Propaganda	1	1	1	1	0	0	0	0
F3 – Reflexive control	1	1	1	1	0	0	0	0
F4 – Emotional reflexive games	1	1*	1	1	0	0	0	0
F5 – Colour revolutions	1	1	1*	1*	1	1	0	0
F6 – False flag	1	1	1*	1*	1	1	0	0
F7 – Deep fake	1	1	1*	1*	1*	1	1	0
F8 – Cyberattacks	1	1	1*	1*	0	0	0	1

Note: * – transitivity check.
Source: own study.

Level Partitioning

To build a hierarchical model, we conducted the level partitioning of factors. We ranked the factors and divided them into subsequent levels based on their reachability and antecedent sets (Table 3). We assigned the usage of disinformation (F1), propaganda (F2), and application of both reflexive control (F3) and emotional reflexive games (F4) to Level 1 (L1) factors, whilst the emergence of colour revolutions (F5) and false flag operations (F6) as well as attempts on cyber attacks (F8) – to Level 2 (L2) factors. Finally, Level 3 (L3) consists of the deep fake application (F7).

Table 3. Level partitioning

Factors	Reachability	Antecedents	Intersection	Level
F1	F1,F2,F3,F4	F1,F2,F3,F4,F5,F6,F7,F8	F1,F2,F3,F4	I
F2	F1,F2,F3,F4	F1,F2,F3,F4,F5,F6,F7,F8	F1,F2,F3,F4	I
F3	F1,F2,F3,F4	F1,F2,F3,F4,F5,F6,F7,F8	F1,F2,F3,F4	I
F4	F1,F2,F3,F4	F1,F2,F3,F4,F5,F6,F7,F8	F1,F2,F3,F4	I
F5	F1,F2,F3,F4,F5,F6	F5,F6,F7	F5,F6	II
F6	F1,F2,F3,F4,F5,F6	F5,F6,F7	F5,F6	II
F7	F1,F2,F3,F4,F5,F6,F7	F7	F7	III
F8	F1,F2,F3,F4,F8	F8	F8	II

Source: own study.

Model validation

To verify the model's validity, we tested the relationships we found. We asked a control group of 10 managers who were not engaged in the initial stage of the study to rate their agreement with the model's relationships. We used a 7-point Likert scale where 1 meant 'strongly disagree' and 7 meant 'strongly agree.' We accepted the relationships with an average score of 4 or more (Figure 1).

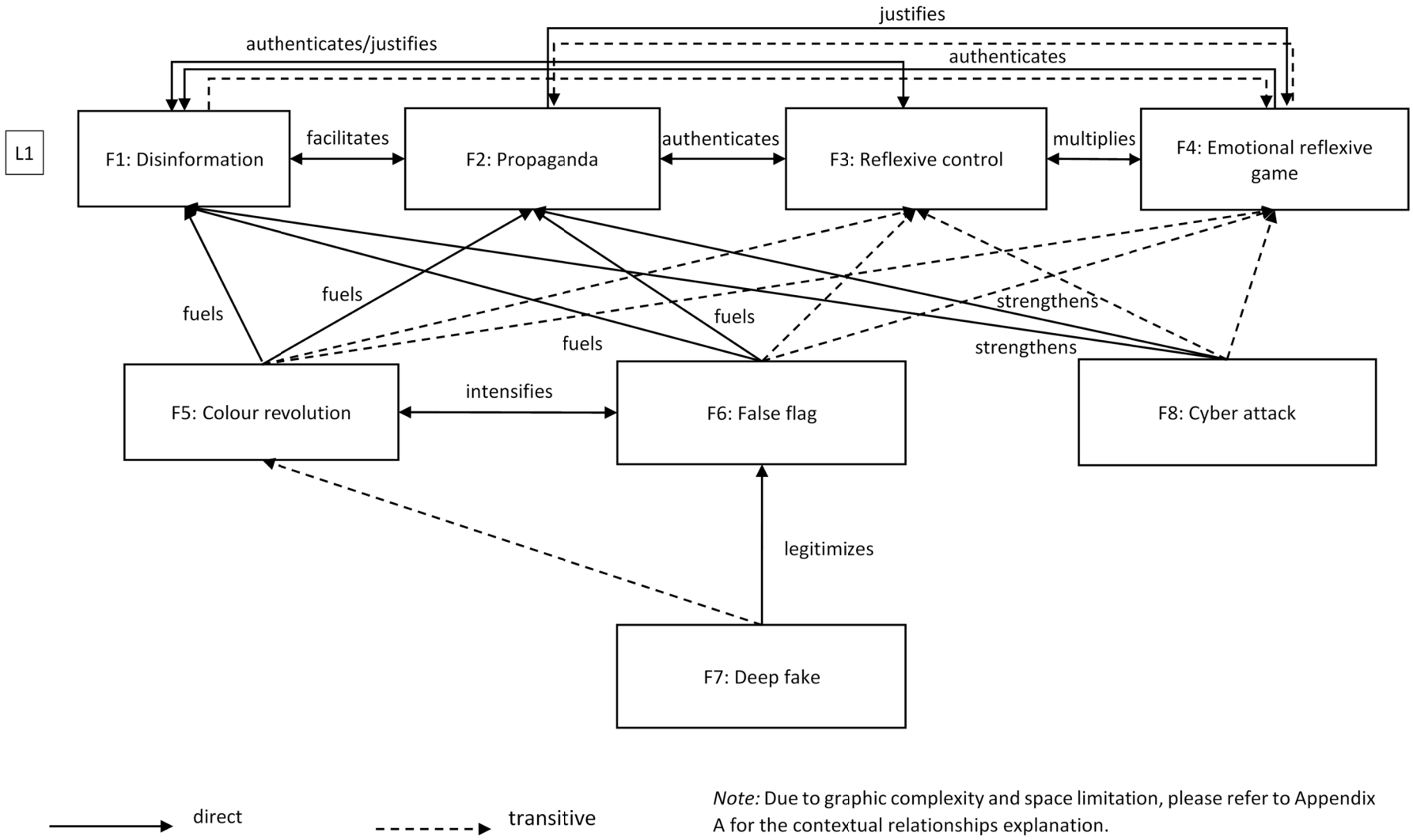

Figure 1. Hierarchical model of factors determining the perception of FDI location attractiveness in developing countries

Source: own elaboration with the use of a spreadsheet.

MICMAC Analysis

The study used the MICMAC analysis (Matrice d'impacts croisés multiplication appliquée á un classment, Figure 2) to categorize the factors into four quadrants based on their influence and dependence levels (autonomous, dependent, linkage, and driver quadrants). We obtained the MICMAC scores from the transitive reachability matrix (Table 2). The factors in the driver quadrant were the emergence of colour revolutions (F5) and false flags (F6), usage of deep fake (F7) and attempts at cyber-attacks (F8). These factors had high influence and low dependence on other factors. Moreover, they were crucial for the perception of FDI location attractiveness. The remaining factors (spread of disinformation (F1) and propaganda (F2), usage of reflexive control (F3), and emotional reflexive games (F4)) were in between the linkage and dependent quadrants. These factors display high driving power and, at the same time, medium dependency level. Thus, they were unstable and vulnerable to changes. None of the factors belonged to the autonomous quadrant, which meant that all factors were interrelated in the system.

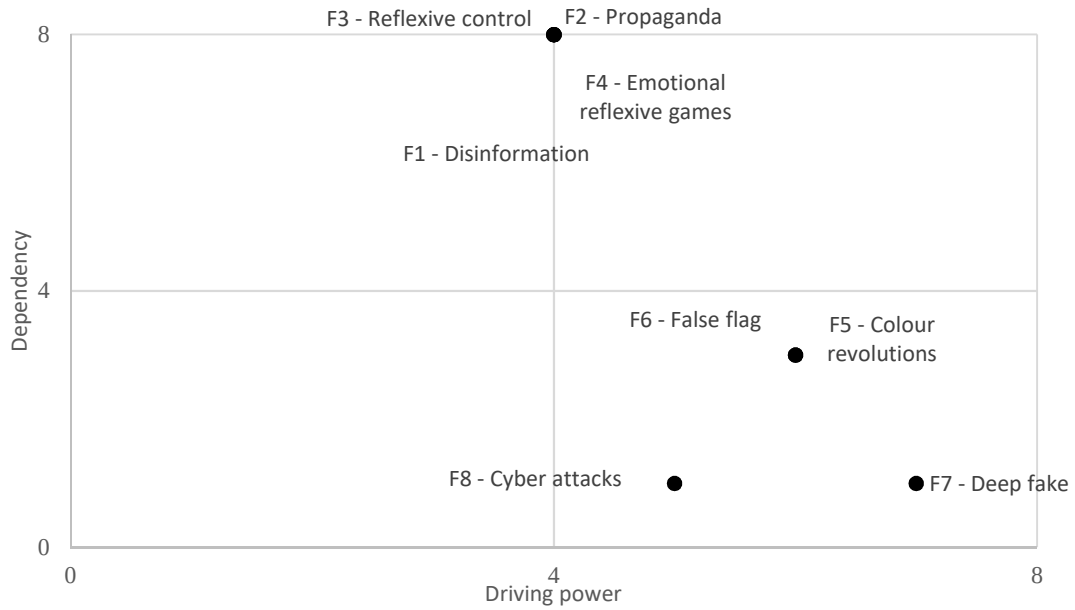

Figure 2. MICMAC analysis
Source: own elaboration with use of a spreadsheet.

The study results indicate that the information distortion related to geopolitical tensions can be achieved through different layers. Levels 2 and 3 of the hierarchical model are specific tools that if used directly and indirectly strengthen the more general tools of dis- and misinformation, emotional steering, and reflexive control. At the same time, cyber-attacks remain the one factor that helps create information distortion but is not related to other L2 and L3 factors.

CONCLUSIONS

We live in turbulent times, full of geopolitical disruptions and technological advancements. Recent changes have already shown that geopolitics can impact FDI location choices and location attractiveness perception in many new ways. In this article, we aimed to find out the directions of this impact and connections between separate geopolitical factors.

The proposed hierarchical model allowed us to answer the first two research questions. It indicates that the most crucial geopolitical factors influencing the perception of FDI locations were the usage of deep fakes, followed by the emergence of colour revolutions and false flag operations. Fake videos ridiculing celebrities and politicians have long ago stopped being just innocent fun. They can influence elections, cause riots, or impact strategic internationalization choices of businesses all over the world

which was also discussed by Tucker *et al.* (2018). Similarly, false flag operations (*e.g.* separatist forces pretending to be Ukrainian forces to provoke Russian troops to attack) may influence not only armies and politicians but also investors as they may potentially distort their perception of a particular FDI location. However, thus far, researchers have discussed false flags operations mostly in the context of exit strategies and not new investments (Gonchar & Greve, 2022). Colour revolutions may have a comparable impact, as they not only overthrow governments but also very often lead to the introduction of a state of emergency that may be one of the factors changing the perception of the attractiveness of a given FDI location. Our results are in line with previous studies by Dimitrova *et al*. (2022) who indicated that terrorist attacks influence FDI decision choices. Our study confirmed that cyberattacks, which are classified as such, also significantly impact the process.

Our findings show that currently, we cannot perceive company's FDI location decision and appraisal of its attractiveness as a simple, straightforward process, but rather as an interconnected ecosystem. Deciding on an FDI location becomes a challenging task since – as our model indicates – the factors influencing the perception of its attractiveness create a dynamic interwoven network with several interdependent layers. In light of recent geopolitical developments, many business owners tackle this challenge. War in Ukraine, tensions in Taiwan, and the trade war between China and the USA, to name just a few struggles, provide a test for many strategic internationalization decisions. Similar concerns may be voiced for investment locations that use the Strait of Hormuz for shipment. The hierarchical model developed from the proposed TISM framework will support managers in formulating effective strategies for deciding on the next steps regarding their FDI location choices, thus answering the third research question. Firstly, the study proves that the perception of geopolitical risk and uncertainty does affect FDI location choices and requires hedging strategies. Managers are prone to be influenced by distortion tools such as deep fakes, cyber-attacks, and mass events. In turn, these tools strengthen general perception strategies, such as dis- and misinformation, emotional pressure, and reflexive control. Given the recent developments in AI technologies, the scale of information distortion will continue to increase and is expected to take on new forms as well. In the era of information abundance, the key managerial skills seem to become first, the awareness of information manipulation and second, the ability to filter and process the information. Since decision-makers suffer from limited cognitive processing capacity, they risk curbing or redirecting FDIs based on the unvalidated information often widespread through social media and other alternative media channels.

These results are also meaningful for host countries willing to attract FDI. On the one hand, the fact that geopolitical perception is relevant for investment should signal the need for either establishing or strengthening transparent and stable governance practices to mitigate potential tensions. On the other hand, they also indicate that host countries should take a proactive role in fighting information distortion (Fang *et al.,* 2018). Such strategies may prove crucial in attracting FDI since Bussy and Zheng (2023) have proven that investors are indeed sensitive to geopolitical turmoil. For instance, some advanced economies (*e.g.* Finland) have successfully set policies and tools to fight misinformation and deep fakes.

Apart from practical implications, the study presented in this article provides also an important and novel input to theoretical research on determinants of perception of companies' FDI location attractiveness. Previous studies focused mostly on other aspects than geopolitics and even if they took geopolitical determinants into account they followed classic instead of critical viewpoint. We expanded Bussy and Zheng's (2023) study on the perception of geopolitical risk and uncertainty by exploring the infospheric channels that impact the FDI-related decision-making process. Secondly, the study incorporates elements of information theory and in particular the sources of information distortion to the FDI location decisions. The increased digitization of business and society has pushed to the forefront factors that previous studies tended either to forego or outright neglect. Information distortion can be both unintentional – resulting from either reasonable disagreement or negligence – or intentional-resulting from manipulation. Regardless of the intention itself, digitization has accelerated and intensified the phenomenon serving as a tool for persuading and creating perceptions. In effect, we point to yet unexplored links in IB literature, namely digitalization, information distortion and FDI investment decisions under geopolitical pressure.

Moreover, in the present article, we proposed a new, systematized research framework. Compared to the conventional multi-criteria decision-making models, which can only provide the ranking of factors determining the attractiveness of company's FDI location choices, the applied framework integrates not only the relationship network but also its contextual interpretation.

However, our study has some limitations. Firstly, the model based on the TISM methodology and its validation are grounded on the subjective opinions of individual experts. Therefore, both the model and its validation are to some point susceptible to expert biases due to their experience or character traits. Secondly, the data collected for the study were limited to the territory of Poland and the scope of the FDI locations in developing countries. Hence, the conclusions formulated in the article are mostly applicable to large companies situated in Poland, deciding on locating their FDI's in developing countries. Even though we are confident our findings will still stay significant in other contexts, we encourage future researchers to conduct similar studies to determine the hierarchical and contextual links of geopolitical factors influencing the perception of attractiveness of FDI locations in other regions of the world.

REFERENCES

Badmus, J.O., Bisiriyu, S.O., & Alawode, O.S. (2022). Does COVID-19 shock endanger the flows of FDI in OECD? Empirical evidence based on AMG panel estimator. *Future Business Journal*, *8*(1), 19, https://doi.org/10.1186/s43093-022-00132-w

Bandyopadhyay, S., Sandler, T., & Younas, J. (2014). Foreign direct investment, aid, and terrorism. *Oxford Economic Papers*, *66*(1), 25-50. https://doi.org/10.1093/oep/gpt026

Bilal, A. (2021). *Hybrid Warfare – New Threats, Complexity, and 'Trust' as the Antidote*. NATO Review. Retrieved from https://www.nato.int/docu/review/articles/2021/11/30/hybrid-warfare-new-threats-complexity-and-trust-as-the-antidote/index.html on April 5, 2023.

Bolsover, G., & Howard, P. (2017). Computational Propaganda and Political Big Data: Moving Toward a More Critical Research Agenda. *Big Data, 5*(4), 273-276. https://doi.org/10.1089/big.2017.29024.cpr

Bussy, A., & Zheng, H. (2023). Responses of FDI to geopolitical risks: The role of governance, information, and technology. *International Business Review, 32*(4), https://doi.org/10.1016/j.ibusrev.2023.102136

Caldara, D., & Iacoviello, M. (2022). Measuring geopolitical risk*. American Economic Review*, *112*(4), 1194-1225. https://doi.org/10.1257/aer.20191823

Carney, M. (2016). *Uncertainty, the Economy and Policy*. Speech, Bank of England, London, June 30. Retrieved from https://www.bis.org/review/r160704c.pdf on June 30, 2023.

Chanegriha, M., Stewart, C., & Tsoukis, C. (2017). Identifying the robust economic, geographical and political determinants of FDI: an Extreme Bounds Analysis. *Empirical Economics*, *52*, 759-776. https://doi.org/10.1007/s00181-016-1097-1

Chowdhury, S., Sharma, R.R., & Yu, Y. (2022). Inward foreign direct investment in emerging economies: A review and future research avenues. *Review of International Business and Strategy*, *33*(5), 717-739. https://doi.org/10.1108/RIBS-03-2022-0033

Dimitrova, A., Triki, D., & Valentino, A. (2022). The effects of business-and non-business-targeting terrorism on FDI to the MENA region: The moderating role of political regime. *International Business Review*, *31*(6). https://doi.org/10.1016/j.ibusrev.2022.101976

Dorożyński, T., Dobrowolska, B., & Kuna-Marszałek, A. (2020). Institutional Quality in Central and East European Countries and Its Impact on FDI Inflow. *Entrepreneurial Business and Economics Review*, *8*(1), 91-110. https://doi.org/10.15678/EBER.2020.080105

Fang, J., Chen, L., Wang, X., & George, B. (2018). Not all posts are treated equal: an empirical investigation of post replying behavior in an online travel community. *Information & Management, 55*(7), 890-900. https://doi.org/10.1016/j.im.2018.04.003

Farris, D.R., & Sage, A.P. (1975). On the use of interpretive structural modelling for worth assessment. *Computers & Electrical Engineering*, *2*(2/3), 149-174.

Gao, G.Y., Wang, D.T., & Che, Y. (2018). Impact of historical conflict on FDI location and performance: Japanese investment in China. *Journal of International Business Studies*, *49*, 1060-1080. https://doi.org/10.1057/s41267-016-0048-6

Giambona, E., Graham, J.R., & Harvey, C.R. (2017). The management of political risk. *Journal of International Business Studies*, *48*(4), 523-533. Retrieved from https://people.duke.edu/~charvey/Research/Published_Papers/P125_The_management_of.pdf on July 2, 2023.

Gonchar, K., & Greve, M. (2022). The impact of political risk on FDI exit decisions. *Economic Systems*, *46*(2). https://doi.org/10.1016/j.ecosys.2022.100975

Gray, C.S., & Sloan, G. (2014). *Geopolitics, geography and strategy*. Routledge.

Gupta, M., Dennehy, D., Parra, C.M., Mantymaki, M., & Dwivedi, Y.K. (2023). Fake news believability: The effects of political beliefs and espoused cultural values. *Information & Management*, *60*(2), https://doi.org/10.1016/j.im.2022.103745

Haider, M., & Anwar, A. (2014). *Impact of terrorism on FDI flows to Pakistan*. MPRA Paper 57165, University Library of Munich. Germany. https://doi.org/10.2139/ssrn.2463543

Hoffman, F.G. (ed.) (2007). *Conflict in the 21st century: The rise of hybrid wars.* Arlington: Potomac Institute for Policy Studies.

Hua, J., Chen, Y., & Luo, X. (2018). Are we ready for cyberterrorist attacks?—Examining the role of individual resilience. *Information & Management*, *55*(7), 928-938, https://doi.org/10.1016/j.im.2018.04.008

Jaseckova, G., & Vartiak, L. (2023). Vernadsky's Concept of the Noosphere in a Global Management Environment: Searching for Ways to Exit Global Crises. *Education*, *3*(2), 328-331. https://doi.org/10.55677/ijssers/V03I2Y2023-15

Jaworek, M., Karaszewski, W., & Kuczmarska, M. (2020). Pandemic risk: doesn't it really matter? Foreign direct investment after COVID-19. *Economics and Law, 19*(2), 275-290. https://doi.org/10.12775/EiP.2020.019

Jena, J., Sidharth, S., Thakur, L.S., Kumar Pathak, D., & Pandey, V.C. (2017). Total Interpretive Structural Modeling (TISM): approach and application. *Journal of Advances in Management Research, 14*(2), 162-181. https://doi.org/ 10.1108/JAMR-10-2016-0087

Jost, P.J., Pünder, J., & Schulze-Lohoff, I. (2020). Fake news - Does perception matter more than the truth?. *Journal of Behavioral and Experimental Economics*, *85*, https://doi.org/10.1016/j.socec.2020.101513

Kietzmann, J., Lee, L.W., McCarthy, I.P., & Kietzmann, T.C. (2020). Deepfakes: Trick or treat?. *Business Horizons, 63*(2), 135-146, https://doi.org/10.1016/j.bushor.2019.11.006

Kim, K.K., Lee, A.R., & Lee, U-K. (2019). Impact of anonymity on roles of personal and group identities in online communities. *Information & Management, 56*(1), 109-121. https://doi.org/10.1016/j.im.2018.07.005

Knight, F.H. (1921). *Risk, uncertainty and profit.* Houghton Mifflin.

Li, J., Van Assche, A., Fu, X., Li, L., & Qian, G. (2022). The Belt and Road Initiative and international business policy: A kaleidoscopic perspective. *Journal of International Business Policy, 5*, 135-151. https://doi.org/10.1057/s42214-022-00136-x

Lu, B., & Liu, W. (2022). *Does Comprehensive Geopolitical Risk Deter FDI Outflows: Evidence from China. Defence and Peace Economics*. https://doi.org/10.1080/10242694.2022.2160140

Luo, D.Y. (2021). *Make Money Move: Understanding the Nexus Between Geopolitical Risk and Foreign Direct Investment*. https://doi.org/10.14288/1.0400154

Mazzotta, S. (2020). *Recent evolution of Chinese Foreign Direct Investment: Sino-European economic relationship through the investment policies*. Università Ca' Foscari Venezia.

Mirhoseini, M., Early, S., El Shamy, N., & Hassanein, K. (2023). Actively open-minded thinking is key to combating fake news: A multimethod study. *Information & Management*, *60*(3), https://doi.org/10.1016/j.im.2023.103761

Mionel, V., Neguț, S., & Mionel, O. (2020). Pandemopolitics. How a public health problem become a geopolitical and geoeconomic issue*. Eurasian Geography and Economics, 61*(4-5), 389-403. https://doi.org/ 10.1080/15387216.2020.1828125

Muradov, I. (2022). The Russian hybrid warfare: the cases of Ukraine and Georgia. *Defence Studies*, *22*(2), 168-191. https://doi.org/10.1080/14702436.2022.2030714

Mustak, M., Salminen, J., Mäntymäki, M., Rahman, A., & Dwivedi, Y.K. (2023). Deepfakes: Deceptions, mitigations, and opportunities. *Journal of Business Research*, *154*, https://doi.org/10.1016/j.jbusres.2022.113368

NATO (2023). NATO's response to hybrid threats. Retrieved from https://www.nato.int/cps/en/natohq/topics_156338.html on March 16, 2023.

Ou-Yang, R., & Kim, Y. (2022). *Geopolitics of Chinese Outward FDI and Its Implications for Asia-Pacific Middle Powers. In The Strategic Options of Middle Powers in the Asia-Pacific*. 57-82. Routledge. https://doi.org/10.1080/00396338.2020.1763608

Pastor, L., & Veronesi, P. (2013). Political uncertainty and risk premia. *Journal of Financial Economics*, *110*(3). https://doi.org/10.1016/j.jfineco.2013.08.007

Petrie, L. (2022). *The News and Social Media Algorithms: An Evaluation of Serendipity in the Infosphere*. Journalism Undergraduate Honors Theses.

Petratos, P.N. (2021). Misinformation, disinformation, and fake news: Cyber risks to business. *Business Horizons*, *64*(6), 763-774. https://doi.org/10.1016/j.bushor.2021.07.012

Pirca, A.M., & Lallie, H.S. (2023). An empirical evaluation of the effectiveness of attack graphs and MITRE ATT&CK matrices in aiding cyber-attack perception amongst decision-makers. *Computers & Security*, *130*, https://doi.org/10.1016/j.cose.2023.103254

Powers, M., & Choi, S.W. (2012). Does transnational terrorism reduce foreign direct investment? Business-related versus non-business-related terrorism. *Journal of Peace Research*, *49*(3), 407-422. https://doi.org/10.1177/0022343312436768

Rajan, R., Rana, N.P., Parameswar, N., Dhir, S., Sushil, & Dwivedi, Y.K. (2021). Developing a modified total interpretive structural model (M-TISM) for organizational strategic cybersecurity management. *Technological Forecasting and Social Change*, *170*, https://doi.org/10.1016/j.techfore.2021.120872

Ronfeldt, D., & Arquilla, J. (2022). *Rethinking Strategy and Statecraft for the Age of 4IR: Implications for Higher Education. Global Initiatives and Higher Education in the Fourth Industrial Revolution*, 133.

Ronfeldt, D., & Arquilla, J. (2020). The *continuing promise of the noosphere and noopolitik: 20 years after. In Routledge Handbook of Public Diplomacy*, 445-480. Routledge. https://doi.org/10.4324/9780429465543

Sebastian, A.G., & Warner, J.F. (2014). Geopolitical drivers of foreign investment in African land and water resources. *African Identities, 12*(1), 8-25. https://doi.org/ 10.1080/14725843.2013.868669

Shah, M.H. (2015). Terrorism and foreign direct investment: An empirical analysis of SAARC countries. *City University Research Journal*, *5*(2). Retrieved from https://mpra.ub.uni-muenchen.de/82008/8/MPRA_paper_82008.pdf on July 1, 2023.

Sorooshian, S., Tavana, M., & Ribeiro-Navarrete, S. (2023). From classical interpretive structural modeling to total interpretive structural modelling and beyond: A half-century of business research. *Journal of Business Research*, *157*. https://doi.org//10.1016/j.jbusres.2022.113642

Sushil, N. (2017). Modified ISM/TISM process with simultaneous transitivity checks for reducing direct pair comparisons. *Global Journal of Flexible Systems Management, 18*(4), 331-351. https://doi.org/ 10.1007/s40171-017-0167-3

Tang, Y., Chen, X.H., Kumer Sarker, P., & Baroudi, S. (2023). Asymmetric effects of geopolitical risks and uncertainties on green bond markets. *Technological Forecasting and Social Change, 189*, https://doi.org/10.1016/j.techfore.2023.122348

Tucker, J.A., Guess, A., Barbera, P., Vaccari, C., Siegel, A., Sanovich, S., Stukal, D., & Nyhan, B. (2018). *Social Media, Political Polarization, and Political Disinformation: A Review of the Scientific Literature*. https://doi.org/10.2139/ssrn.3144139

Vasist, P.N., & Krishnan, S. (2023). Disinformation 'gatecrashes' tourism: An empirical study. *Annals of Tourism Research*, *101*, https://doi.org/10.1016/j.annals.2023.103575

Verma, S.K. (2007). Energy geopolitics and Iran–Pakistan–India gas pipeline. *Energy Policy, 35*(6), 3280-3301. https://doi.org/10.1016/j.enpol.2006.11.014

Wach, K., Duong, C.D., Ejdys, J., Kazlauskaitė, R., Korzynski, P., Mazurek, G., … & Ziemba, E. (2023). The dark side of generative artificial intelligence: A critical analysis of controversies and risks of ChatGPT. *Entrepreneurial Business and Economics Review*, *11*(2), 7-30. https://doi.org/10.15678/EBER.2023.110201

Wang, Q., Yang, X., & Xi, W. (2018). Effects of group arguments on rumor belief and transmission in online communities: an information cascade and group polarization perspective. *Information & Management, 55*(4), 441-449. https://doi.org/10.1016/j.im.2017.10.004

Zaharna, R.S. (2016). Reassessing "Whose Story Wins": The Trajectory of Identity Resilience in Narrative Contests. *International Journal of Communication*, *10*(2016), 4407-4438. Retrieved from https://ijoc.org/index.php/ijoc/article/view/5121/1775 on April 3, 2023.

Appendix:

Table A1. Overview of experts' portfolio

Characteristics		N	%
Current industry represented	Division 10 – Manufacture of food products	17	42.5
	Division 20 – Manufacture of chemicals and chemical products	3	7.5
	Division 21 – Manufacture of basic pharmaceutical products and pharmaceutical preparations	3	7.5
	Division 23 – Manufacture of other non-metallic mineral products	5	12.5
	Division 28 – Manufacture of machinery and equipment n.e.c.	3	7.5
	Division 29 – Manufacture of motor vehicles, trailers and semi-trailers	3	7.5
	Other manufacturing divisions	6	15.0
Ownership of the company represented	Subsidiary of MNC	24	60.0
	Holding company	16	40.0

Source: own study.

Table A2. Information distortion sources: Questionnaire examples

Type	Geopolitics-related examples in the questionnaire
Disinformation	There have been mass media reports that indicate the possibility of an open military conflict between countries A and C. The news is based on an allegedly strained relationship between the countries. Information at the diplomatic and governmental level exclude the possibility of such an event.
Propaganda	A prominent politician from country A delivered a speech that was published by the media, in which he urged the international community to follow the WHO's guidance on COVID-19 and adopt a stricter pandemic policy in his country, thus hindering business operations. The speech did not receive any official endorsement or rejection from country A's government, leaving the issue unresolved and open to interpretation.
Reflexive control	The media report on the outcome of the presidential election in country A, where the new leader was known for criticizing country B harshly. This antagonism is now strongly discussed in the media. Country B is a major supplier of components for firms in your industry. Later, the foreign ministers of both countries meet, but their statements on cooperation are vague.
Emotional reflexive games	A representative of country A's government signed a contract for the delivery of energy for the next 15 with a contractor from country B. The agreement increased potential costs for your company. The representative of government A claimed ignorance of such activities and disassociated himself from the allegedly signed agreement during a press conference at the same time assuring investors that their interests be protected.
Colour revolutions	The government of country A passes a law that is unfavourable to investors from certain countries. The mainstream media is calling on the citizens and businesses of country A to boycott the bill. After several weeks of dealing with the protestants, the government of country A does not change its decision and the mass protests are brought under control.
False flag	The government of country A operates the transmission infrastructure of energy in its country through private companies. The transmission infrastructure was sabotaged by third parties from country B, disrupting supply chains and causing panic among the public. The government managed to restore the normal functioning of the infrastructure after a few days, but the private operators incurred significant financial losses.
Deep fake	A video clip featuring a prominent politician of country A criticizing your industry and announcing legal action against its firms goes viral on social media and mainstream media. However, the politician later holds a press conference, where he refutes such claims and tries to defuse the situation.
Cyber attack	A surge of cyberattacks targeting companies in country A has been observed in recent months. These companies lack adequate security arrangements and cannot control how their data is protected by their partners. The likelihood of similar attacks happening again is high.

Note: Country A – potential location of FDI; country B – third country in close geographical proximity to country A.
Source: own study.

Authors

The contribution share of authors was equal and amounted to ⅓ for each of them.

Katarzyna Mroczek-Dąbrowska

She holds a PhD and is an Associate Professor at the Poznan University of Economics and Business, Department of International Competitiveness. Her main research areas include international competitiveness of firms and industries, transaction costs, and the internationalization process of industries. She is the author and co-author of published works covering, among others, the Global Financial Crisis and its impact on strategies of Polish enterprises and the impact of Brexit on the EU-27 cohesion. Professor Mroczek-Dąbrowska is a National Representative of Poland in the European International Business Academy and works on several international research and teaching projects, cooperating with universities and consulting companies in the United Kingdom, Belgium, and Slovenia. Her research interests include entry modes, organizational resilience and global value chains.
Correspondence to: Katarzyna Mroczek-Dąbrowska, Poznan University of Economics and Business, al. Niepodleglosci 10, 61-875 Poznan, e-mail: katarzyna.mroczek-dabrowska@ue.poznan.pl
ORCID http://orcid.org/0000-0002-9015-899X

Dawid Cherubin

PhD candidate at Poznań University of Economics and Business who specializes in critical geopolitics and foreign direct investment during and after the COVID-19 period. His research interests include geopolitics, reshoring and FDI choices.
Correspondence to: Dawid Cherubin, Poznan University of Economics and Business, al. Niepodleglosci 10, 61-875 Poznan, e-mail: dawid.cherubin@phd.ue.poznan.pl
ORCID http://orcid.org/0000-0001-9984-3144

Aleksandra Kania

She holds a PhD in Economics (2017, Poznan university of Economics and Business) and is an Assistant Professor at Department of International Competitiveness at Poznan University of Economics and Business. She participated in national and international research and educational projects within the European Union. She focuses her research on company resilience, economic uncertainty, and strategic management. She is a former Rotary Scholar in Mannheim, Germany, and an active AIB and EIBA member. Before her current research role, she worked for MNEs in Poland and in Germany. Her research interests include entry clusters, organizational resilience, and global value chains.
Correspondence to: Aleksandra Kania, Poznan University of Economics and Business, al. Niepodleglosci 10, 61-875 Poznan, e-mail: aleksandra.kania@ue.poznan.pl
ORCID http://orcid.org/0000-0002-7721-5750

Acknowledgements and Financial Disclosure

During the preparation of this work the authors used 'Bing AI' to improve language as none of the Author is an English native speaker. After using this tool/s, the Authors reviewed and edited the content as needed and take full responsibility for the publication's content.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright and License

Published by Krakow University of Economics – Krakow, Poland

Ministry of Education and Science
Republic of Poland

The journal is co-financed in the years 2022-2024 by the Ministry of Education and Science of the Republic of Poland in the framework of the ministerial programme “Development of Scientific Journals” (RCN) on the basis of contract no. RCN/SP/0583/2021/1 concluded on 13 October 2022 and being in force until 13 October 2024.

Visit us at **www.eber.uek.krakow.pl**

EBER

Entrepreneurial Business and Economics Review

KRAKOW
UNIVERSITY
OF ECONOMICS

Centre for Strategic and International Entrepreneurship

INTERNATIONAL
TRADE
DEPARTMENT

ISSN 2353-883X

eISSN 2353-8821