JEMI

Financial and Non-Financial Determinants of Business Performance: Financial Market and The Real Economy Perspectives

Edited by

Piotr Łasak

Financial and Non-Financial Determinants of Business Performance: Financial Market and the Real Economy Perspectives

Edited by

Piotr Łasak

The JOURNAL OF ENTREPRENEURSHIP, MANAGEMENT AND INNOVATION
is an interdisciplinary, double blind-reviewed journal, emphasizing theoretical and empirical articles in entrepreneurship, management, innovation and related fields. The journal is published both in printed form and on-line at www.jemi.edu.pl.

THE ENTREPRENEURSHIP AREA OF THE JOURNAL
The entrepreneurship area of the journal covers the three major topics: 1) venture creation and small business, 2) the impact of entrepreneurship on economic growth including local and regional development, and 3) entrepreneurial attitudes and motives. We invite original papers of theoretical and empirical nature, rooted in the disciplines of economics, management, sociology, political science, and psychology. The interdisciplinary research is encouraged to assure a comprehensive approach to the topics discussed and to advance both theory and practice.

THE MANAGEMENT AREA OF THE JOURNAL
Management, as a thematic scope of the journal, focuses on theoretical and empirical considerations of various areas, such as: strategic management, operation or production management, human resource management, information and management, contemporary management problems, new methods and management tools, new forms of organization and management, new threats in management, or new challenges in the organization's environment.

THE INNOVATION AREA OF THE JOURNAL
The innovation area of the Journal's focus will emphasize a broad range of topics and approaches, including (but not limited to): 1) role of private and public sector in development and diffusion of innovations, 2) product, process and business model innovations, 3) profiles of innovative products, structures and processes, aimed at improving management practice and providing inspiration for entrepreneurs, 4) comparative analyses of national, regional policy or sector issues, such as R&D trends, patents, citations etc., 5) theoretical work on economic, organizational and scientific aspects of innovation, encouraging the search for inspirations from various disciplines, including natural sciences, arts and humanities.

THE ENTREPRENEURIAL FINANCE AREA OF THE JOURNAL
The entrepreneur or entrepreneurial firm, the institutions providing finance to the entrepreneurs, and the different types of financial sources used by the entrepreneurial firms or investors. Among the areas of our special interests might be enumerated: accounting and corporate finance, financial market as a background for SME development, entrepreneurial finance, regulatory and supervisory aspects related to corporate finance.

Table of Contents

Contemporary determinants of business performance: From the Editor

Piotr Łasak[1] iD

Running a business today is becoming more complex than two or three decades ago. The world is becoming increasingly open and globalized, and the production processes of goods and provision of services are inscribed in global supply and value-added chains. Large corporations are doing well in such a market, but small and medium-sized enterprises often find it increasingly difficult to function. In addition, apart from the processes exerting pressure on enterprises operating in the real economy, as a result of financial globalization, the scope of financial entities (banks, investment funds, stock exchanges) was also increasing (Knox-Hayes & Wójcik, 2020). However, this is a phase of the past. Currently, not only crossing borders but, above all, far-reaching digitalization and the development of modern technologies set the main direction for the development of enterprises (Florek-Paszkowska et al., 2021). In order to cope with these changes, both individual companies and entire sectors, public administration, and society, as well as national economies, have to make so-called digital transformation (Gajewski et al., 2016). More profound changes are triggered by sustainability, ecology, and human-oriented goals, leading towards industry 5.0. All these processes exert pressure both on big companies as well as on small- and medium-size enterprises.

The ongoing changes related to the digitalization process mean not only incorporating modern technologies into existing entities and structures but are much more critical. They are *spiritus movens*, leading to the transformation of entire sectors of the real economy and the financial markets (Marszk & Lechman, 2021). We can observe the emergence of ecologies and ecosystems (Gancarczyk & Rodil-Marzábal, 2022; Piątkowski & Urbaniec, 2023), mechanisms leading to the development of sharing economies (Szpringer, 2020), as well as the increasing rooting and linking of traditional financial services with services leading to meeting the needs of society. Financial services are embedded in products and become inseparable from these products, and the traditional

1   Piotr Łasak, Ph.D. Hab., Associate Professor, Institute of Economics, Finance and Management, Jagiellonian University, ul. Prof. S. Łojasiewicza 4, 30-348 Kraków, Poland, e-mail: piotr.lasak@uj.edu.pl (ORCID ID: 0000-0002-3726-3862).

division into sectors is gradually disappearing. This is possible thanks to the creation of platforms which connect many market participants (Sironi, 2021).

In the context of the abovementioned far-reaching processes, many business entities operate according to traditional principles. The key for them are sales, profit and liquidity, which define the crucial financial performance. Among important aspects are also such issues as maintaining the security of business operations and obtaining the desired market indicators in stock companies. For enterprises from developing countries, the basic problem is access to finance, the market, and advanced technologies (Jalil et al., 2022; Łasak, 2022). In developed countries, enterprises also encounter many challenges related to the traditional corporate finance dimension despite a better situation.

The current Issue published in the *Journal of Entrepreneurship, Management and Innovation* (Volume 19, Issue 4, 2023) is aimed at considering the nexus of topics related to the various aspects of the functioning of financial and non-financial enterprises. The main purpose of the articles is to focus on selected problems related to the financial aspects of business activity. The considered problems were presented in the context of contemporary processes taking place in the environment of enterprises. These include, on the one hand, far-reaching digitalization and the use of advanced technologies and, on the other hand, processes belonging to the Environment, Social, and Governance (ESG) area.

A description of the situation faced by many enterprises, including financial institutions, undergoing digital transformation is presented in the article written by Łasak and Wyciślak (2023). Digitalization processes not only lead to far-reaching digitization of enterprises and related dilemmas regarding corporate governance but also the transformation of entire sectors of the industry. The banking sector is the best example of this. The question arises what is the pattern of behavior of digital platform partners in the situation of transformation of this sector and platformization of banking services? The paper aims to present the dynamic pattern of behavior among partners stemming from the tensions between governance costs and co-created value within platforms in banking services. The study provides a taxonomy of digital platforms in banking, highlights the values of the most typical platforms, namely blockchain-based and cloud-based platforms, and discusses the potential implications of the platformization of banking services.

One of the key contemporary perspectives of business activity is looking through the prism of the need for a responsible and sustainable approach. This is the perspective embodied in the approach referred to by the term ESG. Sustainable business models, considering the ESG principles in the company's operation, are based on financial and non-financial reasons. The paper written by Zioło, Szaruga, and Spoz (2023) aims to examine the relationship between financial and non-financial factors in enterprises and indicate for which groups

of enterprises the relationship of ESG financial performance is most visible in the context of building sustainable business models and the ability to adapt to sustainability. It was found that large enterprises with a solid financial position simultaneously get better non-financial results. In each of the analyzed aspects, large enterprises with an excellent financial standing did better.

The conclusion presented by Zioło, Szaruga, and Spoz (2023) does not change the fact that small and medium-sized enterprises play a key role in the economic growth of emerging economies. The paper by Amoa-Gyarteng and Dhliwayo (2023) examines the impact of capital structure and profitability on the short-term solvency of nascent SMSs in Ghana, building on the liability of the newness framework. The study demonstrates that financing decisions and financial performance are crucial mitigating factors for the potential risks of default and failure faced by nascent SMEs. Notably, the study finds that an appropriate balance between debt and equity financing raises the working capital ratio and thus reduces the liability of newness, which is a major challenge faced by nascent SMEs. The analysis also identifies that return on equity (ROE) is a crucial driver of short-term solvency for nascent SMEs. Declining profitability is manifested by a decrease in operating profits and cash flows. The resulting cash flow shortages can cause the company to fall behind on payments and obligations, leading to short-term insolvency, with all the adverse consequences. All these conclusions might be valuable for enterprises in other developing countries.

Operational and financial market performance is a crucial determinant not only for SMEs but also for larger companies. Such type of businesses is presented in the paper by Yaşar and Gerede (2023). The article shows how complex are the processes accompanying the functioning of such enterprises as airlines. This paper refers to the competitiveness of such airline companies and the conditions determining their favorable market position and long-term competitive advantage. The market position of such companies is influenced by such factors like firm maturity, its size, financial resources and some technical dimensions (number of flights, fleet homogeneity). This means that despite the processes taking place today, the business performance of such entities as airlines still depends on the classic factors described in the literature of corporate finance.

The contemporary opportunities resulting from the dynamic development of information technology contribute to the development of new forms of financing business activity. One such form is crowdfunding. The paper by Nose and Hosomi (2023) is dedicated to the equity crowdfunding (ECF) issue in the Japanese context. The research provides an answer to the question of what makes equity crowdfunding successful. The "Signaling Hypothesis" and "Lack of Financial Literacy Hypothesis" were tested. Despite the research is focusing more on investors' side, it also sends an important signal to the business considering

crowdfunding as a source of funding. The conclusions can be helpful for start-ups planning ECF campaigns in the future.

The company's position on the market may also depend on factors other than financial performance, and recently, it has depended to an increasing extent on environmental, social, and governance performance (defining corporate sustainability performance). In this context very important research thread is the relationship between corporate sustainability performance and stability of dividend payouts. This topic is presented in the paper by Matuszewska-Pierzynka, Mrzygłód, and Pieloch-Babiarz (2023). The research verifies many detailed interdependencies between the ESG performance of an enterprise and the propensity to pay stable dividends to the enterprise.

The possibility of financing business activity is determined by the situation in the banking sector. The conditions of financing provided by banks are of particular importance in the case of developing countries, where other forms of raising capital by enterprises are often limited. Shaikh, Tunio, and Dagar (2023) paper discusses the relationship between banks funding liquidity, capital funds and bankers' lending activity in emerging markets. This research firstly provides insight into the activity of financial companies in emerging markets, and secondly, informs the public, and especially the business, about the lending practices of the banking sector, and in consequence, on the financing opportunities in these economies.

These unique studies presented in this Issue enrich our knowledge about contemporary business activity. The papers contribute to understanding the nature of business performance and link corporate finance issues with other, mainly technological and social aspects. Particular attention, however, is paid to the traditional conditions of operation and financing of enterprises. At the same time, however, efforts were made to combine new business conditions, including digitization. The issues raised also concern processes ensuring sustainable development. We want to express the hope that the papers presented here will be of interest to readers, scholars, and researchers worldwide. They provide theoretical concepts, and quantitative analyses, and indicate pathways for further research. Many of the presented areas require further, in-depth analysis.

Acknowledgements

References

Amoa-Gyarteng, K., & Dhliwayo, S. (2023). Capital structure, profitability, and short-term solvency of nascent SMEs in Ghana: An empirical study. *Journal of Entrepreneurship, Management, and Innovation, 19*(4), 85-112. https://doi.org/10.7341/20231943

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

Gajewski, J. M., Paprocki, W., & Pieriegud, J. (Eds.). (2016). *Cyfryzacja gospodarki i społeczeństwa: szanse i wyzwania dla sektorów infrastrukturalnych*. Gdańsk: Instytut Badań nad Gospodarką Rynkową. Gdańska Akademia Bankowa.

Gancarczyk, M., & Rodil-Marzábal, Ó. (2022). Fintech framing financial ecologies: Conceptual and policy-related implications. *Journal of Entrepreneurship, Management and Innovation 18*(4), 7–44. https://doi.org/10.7341/20221841

Jalil, M.F., Ali, A., & Ahmed, Z. (2022). Microfinance services and MSE growth in Pakistan: The mediating perspective of social and psychological capital. *Journal of Entrepreneurship, Management and Innovation 18*(1), 93–130. https://doi.org/10.7341/20221814

Knox-Hayes, J., & Wójcik, D. (Eds.). (2020). *The Routledge Handbook of Financial Geography*. New York: Taylor & Francis.

Łasak, P., & Wyciślak, S. (2023). Blockchain and cloud platforms in banking services: A paradox perspective. *Journal of Entrepreneurship, Management, and Innovation*, *19*(4), 13-48. https://doi.org/10.7341/20231941

Łasak, P. (2022). The role of financial technology and entrepreneurial finance practices in funding small and medium-sized enterprises. *Journal of Entrepreneurship, Management and Innovation, 18*(1), 7–34. https:doi.org/10.7341/20221811

Marszk, A., & Lechman, E. (2021). *The Digitalization of Financial Markets: The Socioeconomic Impact of Financial Technologies*. London: Routledge.

Matuszewska-Pierzynka, A., Mrzygłód, U., & Pieloch-Babiarz, A. (2023). ESG performance and dividend stability of the world's largest enterprises. *Journal of Entrepreneurship, Management, and Innovation*, *19*(4), 187-220. https://doi.org/10.7341/20231946

Nose, Y., & Hosomi , C. (2023). What makes equity crowdfunding successful in Japan? Testing the signaling and lack of financial literacy hypotheses. *Journal of Entrepreneurship, Management, and Innovation*, *19*(4), 149-186. https://doi.org/10.7341/20231945

Piątkowski, M., & Urbaniec, M. (2023). *Ekosystem przedsiębiorczości. Uwarunkowania i źródła finansowania*. Warszawa: Difin.

Shaikh, E., Tunio, M.N., & Dagar, V. (2023). Funding liquidity on bank lending growth: The case of India. *Journal of Entrepreneurship, Management, and Innovation*, *19*(4), 221-242. https://doi.org/10.7341/20231947

Sironi, P. (2021). *Banks and Fintech on Platform Economies: Contextual and Conscious Banking*. 1st edition. Chichester, West Sussex, United Kingdom: Wiley.

Szpringer, W. (2020). *Platformy cyfrowe i gospodarka współdzielenia*. Warszawa: Poltext.

Zioło, M., Szaruga, E., & Spoz, A. (2023). Financial and non–financial factors in companies' adaptation process towards sustainability and sustainable business models. *Journal of Entrepreneurship, Management, and Innovation*, *19*(4), 49-83. https://doi.org/10.7341/20231942

Yaşar, M., & Gerede, E. (2023). Results of competitive dynamics: Examination of the factors determining the operational and financial performance of airlines: The case of the Turkish international airline market. *Journal of Entrepreneurship, Management, and Innovation*, *19*(4), 113-147. https://doi.org/10.7341/20231944

Biographical note

Piotr Łasak (Ph.D., Hab.) is an Associate Professor at the Institute of Economics, Finance and Management, Jagiellonian University in Krakow, Poland. His research, publication and teaching activities focus on banking, corporate finance and international finance. Among the main research topics are financial market development, regulation and supervision, mechanisms of financial and currency crises, and shadow banking system development. Among his particular research interests is the development of the Chinese financial market. The current, main research area is concerned with financial technology (FinTech) and the banking sector transformation as the consequence of the processes of digitalization and the influence of financial technologies. He is author of several publications on this subject.

Citation (APA Style)

Łasak, P. (2023). Contemporary determinants of business performance: From the Editor. *Journal of Entrepreneurship, Management, and Innovation*, *19*(4), 6-11. https://doi.org/10.7341/20231940

Blockchain and cloud platforms in banking services: A paradox perspective

Piotr Łasak[1] iD, Sławomir Wyciślak[2] iD

Abstract

PURPOSE: The banking sector is under intense pressure from digitalization. One of the accompanying processes is the development of digital platforms and platform ecosystems in banking services. The paper aims to present the dynamic pattern of behavior among partners stemming from the tensions between governance costs and co-created value within platforms in banking services. **METHODOLOGY:** The study employs an approach based on a systematic literature review of 54 publications selected from Scopus and WoS databases. We applied an approach that consists of two steps. The first step of the research was a literature review and critical analysis of the sources related to our research questions. In the second step, we propose a causal loop diagram research procedure, which is a research system dynamic tool used in modeling system dynamics. **FINDINGS:** There are different types of platforms, and among the most important are blockchain-based and cloud-based platforms. In both types, the relations between owners, complementors, and customers are important. The tension between governance costs and co-created value informs behavior patterns among platform partners. The degree of interconnectedness between platform participants and the level of centralization of banking services depends on the platform type. The study highlights that blockchain-based and cloud-based platforms play a significant role in the transformation of the current banking services. The choice of platform type has important implications for the platformization of banking services. **IMPLICATIONS:** The pattern of behavior among platform partners identifies the self-reinforcing dynamics that suggest how managers can navigate the tension over time amidst the asymmetry of benefits and risks. The research findings can be informative for financial regulators and they help work out a policy that reduces the asymmetry of benefits and contributes to the more sustainable development of digital platforms. **ORIGINALITY AND VALUE:** This paper addresses the paradox perspective on the banking sector changes during the intensive processes of

1 Piotr Łasak, Ph.D. Hab., Associate Professor, Institute of Economics, Finance and Management, Jagiellonian University, ul. Prof. S. Łojasiewicza 4, 30-348 Kraków, Polan, e-mail: piotr.lasak@uj.edu.pl (ORCID ID: 0000-0002-3726-3862), corresponding author.
2 Sławomir Wyciślak, Ph.D., Associate Professor, Institute of Economics, Finance and Management, Jagiellonian University, ul. Prof. S. Łojasiewicza 4, 30-348 Kraków, Poland, e-mail: slawomir.wycislak@uj.edu.pl (ORCID ID: 0000-0002-8913-1634).

digitalization and the creation of new 'platform ecosystems.' This topic has not been studied in this context so far.
Keywords: *banking services, banking sector transformation, blockchain-based platforms, cloud-based platforms, paradox theory, blockchain, cloud*

INTRODUCTION

Digital platforms transformed the step-by-step arrangement to produce, distribute, and sell a product. They leverage the networked relationship of consumers, producers, and prosumers. Such processes are visible in the real economy and financial services, especially in the banking sector. The platformization of banking services enables transformation from linear business provision to non-linear business models, where services are offered in real-time. The changes embrace especially the move from output-based business models to outcome-based models, focused on customers and their needs (Sironi, 2021).

The financial sector is currently undergoing a very far-reaching digital transformation. Banking services are offered to a lower degree by traditional banks, organized on a hierarchical structure, but are often submitted via other forms of institutions and structures (Avarmaa et al., 2022; Caron, 2018; Omarini, 2021). One of these solutions is financial platforms. Platform-based banking services are becoming common place and leading to new '*platform ecosystems*' (Claessens et al., 2018, Frost, Turner, & Zhu, 2018; Langley & Leyshon, 2021). The banking sector's transformation is non-homogeneous. Some incumbent banks implement technology to improve the efficiency of their activity (preservation). Others are entering market-oriented structures, like modularized networks or open ecosystems (Finken & Finkemeyer, 2019; Gozman et al., 2018; Hedman & Henningsson, 2015; Premchand & Choudhry, 2018). During such changes, the structure of the banking sector also changes, and some of these services are modified while others are newly created (Łasak & Gancarczyk, 2021). The development of banking platforms is also favoured by the incorporation of other entities into these platforms. They include, among others, e-commerce entities, insurance, telecommunications, shipping services, and many more (Omarini, 2020). Links between banks and other entities result in the dynamic development of the area treated as Banking-as-a-Service (BaaS). All of the transformation processes of the banking sectors are leading to significant changes in the bank's business models. Among other processes, an important one is the development of banking platforms and their growing role in this sector. These changes and processes prompted us to formulate our first research question (RQ):

RQ1) What are the specific types of digital platforms in banking services?

The development of digital platforms in banking is becoming a significant issue (Zachariadis & Ozcan, 2017). One of the critical facets related to these processes is the governance mechanisms. The first important aspect is who is the platform provider (owner). Sometimes, it is a bank, and sometimes the provider is an external entity. While the platform owner's leading role is crucial, simultaneously unambiguous, and equally important from the platform's operational perspective are complementors. Despite a strong consensus among scholars regarding complementors as particularly important in markets with network effects such as platforms (Omarini, 2020), most studies with a direct or indirect focus on the complementor role in the ecosystem consider complementors universally and homogenously (Huber et al., 2017; Sironi, 2021). A scientific consensus on distinguishing and classifying complementors is still lacking, although complementors differ significantly in numerous dimensions, including size, experience, financial background, strategic orientation, or motivation. Platform owners need to understand the heterogenous complementor structure in their ecosystem to adapt their governance rules accordingly and ensure the platform's long-term success (Deilen & Wiesche, 2021). When taking into account a customer-centric approach, it is also necessary to indicate the very important role of customers in banking services and their expectations. Based on such premises, we formulated the second research question (RQ):

RQ2) Who are the partners (owners, complementors, customers) of digital platforms in banking services, and what are their roles?

Every platform has its structure made by platform owners, complementors and customers. It should be noted, however, that the entire banking system is undergoing profound transformations. The platform participants are interconnected to varying degrees, have different levels of trust, and share information to varying degrees. The participation in a platform may result in further consequences for various entities. Their involvement in the platform may be associated with a different level of governance costs, impacting different co-created values and generating an asymmetry of benefits. Banks, when incorporating financial technology, expect the preservation of customer relations and greater efficiency in their activities. The non-bank entities (FinTech-based companies) want to expand their services and expect more significant participation in the banking market. All of these dynamics may create tensions between different partners and impact the ultimate shape of the platform structure. To examine these processes, we formulated a third research question (RQ):

RQ3) What is the dynamic pattern of behavior among partners stemming from the tensions between governance costs and co-created value within platforms in banking services?

Platform governance is a crucial aspect of the platformization of financial services. It embraces the problem of coordinating the relations between different platform participants. Governance of a platform also strongly influences all other aspects of the functioning of the platforms (Adner, 2017; Rietveld & Schilling, 2021). The processes of banking sector platformization, including platform governance, may largely depend on the type of technology used. Among them are blockchain and cloud technologies, which are successfully used to build a new banking sector structure and significantly impact platforms' development in banking services.

Our study contributes to the literature dedicated to the technology-driven transformation of the financial markets. There are numerous studies related to the impact of technology on the market structure of financial services (Arslanian & Fischer, 2019; Jacobides et al., 2018; Scardovi, 2017; Tanda & Schena, 2019) and the banking industry (Łasak & Gancarczyk, 2022; Rajnak & Puschmann, 2021; Tanda & Schena, 2019; Wewege & Thomsett, 2019). In this article, we focus on banking platforms development, as they are, in our opinion, still poorly researched.

The article provides three contributions to the extant literature on the platform-based transformation of the banking sector. Firstly, we described platform-based banking structures and governance of banking. Secondly, we provided the taxonomy of the digital platforms operating in the banking sector. Thirdly, we elaborated a theoretical, conceptual model of a pattern of behavior mechanisms emerging amongst platform partners. Based on our research, we provided conclusions on the types of platforms shaped by the behavior of the platform participants (owners, complementors, and customers).

The methodology and aims of our research are presented in the second section. The third section specifies the theoretical aspects related to the platforms, which are crucial in the context of our study. In section four, we present the taxonomy of platforms in banking services. Section five contains the conceptualization of behavior among platform partners. Section six presents a discussion and contribution to the theory, whereas in section seven, we present our conclusions.

METHODOLOGY AND AIMS OF THE RESEARCH ANALYSIS

Our research begins with general research questions, and from these general assumptions, we logically deduce what specific implications can be derived. In

our approach, we used the desk research method. The first step of the research was a literature review and critical analysis of the current literature. The research questions guided the development of a literature review. This comprehensive analysis provided an initial understanding of the research topic, which allowed the authors to discern existing knowledge gaps. Pre-formulated research questions informed the further literature review. The RQ1 was the driver for the selection of keywords "digital platforms" and "banking services," whereas RQ2 informed keywords "platform owners," "complementors," "banking platform customers," "banking platform services." RQ3 triggered keywords including "digital platform governance," "tensions," and "paradox theory." The literature search was performed in the Scopus and WoS databases, where we selected and reviewed 54 publications related to our research questions. We skimmed through the full-text articles to evaluate further the quality and eligibility of the studies and conducted the literature review iteratively. Using the list of references at the end of each article informed about the most critical papers in researched fields and turned out to be the most efficient narrative, literature review strategy. We focused on the most relevant authors in the researched fields (these included Arslanian & Fischer, 2019; Baldwin & Woodard, 2008; Clarke, 2019; Gozman et al., 2018; Jackson, 2017; Langley & Leyshon, 2021; Nicoletti, 2021; Scardovi, 2017; Sironi, 2021; Tanda & Schena, 2019). The literature review informed the research phase on identifying specific types of digital platforms and partners (Table 1). We applied the thought process, which combined analysis and synthesis.

Table 1. Phases of the research procedure

Phase	Information gathering	Information analysis	Theorizing mode	Research question
Studying problems in the context	Literature review	Classifications of digital platforms in banking services Identification of banking services which can be offered via digital platforms and platform ecosystems Identification of partners (owners, complementors, customers) of digital platforms	Inductive analysis Synthesizing	RQ1 RQ2
Proposing solutions	Literature review, coding at the first level, searching for conceptions	Defining the causal loop diagram	Analysis Abstracting Synthesizing Idealizing	RQ3
Creation of the research framework	Literature review, coding at a second level according to research questions (RQ2, RQ3), searching for conceptions	Analysis of the impact of patterns of behaviors of platform participants on the platforms deployability Analytical generalization based on patterns	Inductive Deductive	RQ3
Conceptualization of the solutions	Coding insights and proposals	Building insights on our research framework, outlining the future research avenues	Inductive Deductive	RQ3

In the second step of the research procedure, we proposed a causal loop-diagram research procedure, which is a research system dynamic tool. The Causal Loop is a tool used in modeling system dynamics. Causal loop diagrams emphasize the feedback structure of a system. A causal loop diagram consists of variables connected by arrows denoting the causal influences among the variables. The important feedback loops are also identified in the diagram. Causal links, shown by arrows, relate to variables. Each causal link is assigned a polarity, either positive (+) or negative (-), to indicate how the dependent variables change (Sterman, 2000). We used a causal loop diagram to answer RQ3. In the theorizing process, we applied analysis, synthesizing, abstracting, and idealizing. Synthesizing in the manner of abstracting and idealizing resulted in the causal loop diagram. We employed a synthesis process involving abstraction and idealization, culminating in a causal loop diagram. The transition from an inductive approach (in response to RQ1) to a synthesis-driven methodology facilitated the development of a theoretical framework. This emergent product succinctly encapsulates progress while providing direction and serving as a theoretical reference point, effectively integrating the research outcomes in a coherent, scientifically rigorous manner. Causal loop diagrams, when used with stock and flow diagrams, serve as valuable tools for elucidating intricate relationships within complex systems. These diagrams can be employed to model system dynamics and the dynamics of tensions, offering enhanced clarity regarding sequences, varying degrees of determinacy in relationships, and nuances of pathways and influences. By integrating causal loop diagrams and stock and flow diagrams, researchers and practitioners can better understand the interdependencies and causal mechanisms at play within a given system (Weick, 1995). The conceptualization of the solution leverages abstraction to create a comprehensive understanding that transcends specific temporal, spatial, and individual contexts. This approach aligns with principles of generalization and abstraction that are integral to various scientific disciplines.

Following Merton (1968), we assume that middle-range theorizing is an appropriate approach for understanding platforms phenomena since it aims at integrating theory and practical observations to explain such complex phenomena. In addition to middle-range theorizing, we also employ systems thinking to understand complex phenomena by examining the relationships, feedback loops, and dynamics within a system. Using causal loop diagrams in the research process helps us visualize and analyze the causal relationships among variables and the feedback structure of a system. The paradox perspective can respond to tensions by using the value of case studies, action research, systems approaches, and agent-based models to enable more nuanced insights (Smith & Lewis, 2011). It has been asserted that paradoxical thinking epitomizes systems thinking (Wirsbinski, 2008). Systemic thinking seeks to understand phenomena

holistically and elementarily. In contrast, paradoxical thinking is an ontological perspective that appreciates the plurality of phenomena and accepts the notion that underlying explanations require a "*both*" rather than an "*and/or*" commitment to understanding (Glassburner et al., 2018).

THE THEORETICAL CONCEPT OF DIGITAL PLATFORMS

Governance

Platform governance can be interpreted as a mechanism affecting the cooperation and coordination of their members (platform participants) and establishing technological standards for connectivity. Connectivity relates to the technological infrastructure through which information is conveyed, and information sharing links to the quality of the information being shared (Brandon-Jones et al., 2014). Platform governance refers to the mechanisms through which a platform owner exerts influence over other participants in the ecosystem (Tiwana et al., 2010; Hein et al., 2020). The platform ecosystem participants typically involve a central actor (platform owner or hub firm) and complementors. The platform owner orchestrates value creation and value appropriation by engaging complementors to operate in the platform ecosystem (Deilen & Wiesche, 2021). Considering platform governance, we refer to the lead firm primarily responsible for the platform as the platform owner (Tiwana, 2014). Platform complementors provide complementary goods to the ecosystem, defined as any other product or service that enhances the attractiveness of the focal product or services, such as add-ons, extensions, or modules. Hence, the success of a platform depends on active complementors who develop innovative complementary goods to stimulate user demand for the platform (Deilen & Wiesche, 2021).

Governance of platform ecosystems is a process of considerable variation and change in practicing ecosystem-wide rules and values. Governance rules mainly include decision-making power and access ownership of the platform system, participation in the ecosystem, and division of labor rules, platform pricing, and value distribution policy (Yiling et al., 2019).

The platform owner facilitates information sharing between autonomous complementors and consumers in an ecosystem (de Reuver et al., 2018). A platform's governance design encompasses three perspectives: governance by sharing responsibilities and authority, governance by aligning incentives, and governance by sharing stakes (Tiwana et al., 2010). Governance of platform has tangible consequences for co-created value and governance costs. Co-created value is defined as the tangible and intangible benefits resulting from the combination of resources of the partners. Platform owners minimize governance

costs early in the partnership by closely following the rules, and impacting co-created value. Over time, some complementors can increasingly attract the platform owners' attention by demonstrating that the partnership has substantial co-creation potential (Omarini, 2020). Governance costs are the effort borne by the partners arising from planning, adapting, and safeguarding the resources (coordination costs) contributed to the partnership (Huber et al., 2017). They also embrace the costs of transferring the services to the platform and maintaining this platform. They also embrace the costs of employment competencies, costs of time that the individual participants of the platform devote to establish a consensus on the principles of cooperation, costs of platform development, etc. Pricing and revenue sharing has been studied as governance mechanism in platform ecosystems. It refers to payment flows within the platform ecosystem and how they are distributed between the different stakeholders (Schreieck et al., 2016). Researchers agree that platform pricing should follow a divide-and-conquer strategy, meaning that one side of the market is subsidized (divide). In contrast, the other side is priced at a premium to recover losses from the other side (conquer). Even in the absence of profits, platforms are often willing to set very low prices, i.e., predatory pricing. This pricing strategy results in considerable losses for a platform to scale quickly, undercut competitors, and build up market dominance by increasing the platform size (Hermes et al., 2020).

Paradox theory

Paradoxes, by their nature, denote persistent contradictions between interdependent elements. The paradox theory stems from the organizational-research field, which has developed over the last two decades. According to this theory, a paradox is understood as contradictory yet interrelated elements that seem logical in isolation but seem absurd and irrational when they appear simultaneously (Lewis, 2000). Two core characteristics describe a paradox: contradictions and interrelatedness (Schad et al., 2016). This definition emphasizes that the underlying logic for each element may seem rational when dealt with separately but it appears to be inconsistent when contrasted against each other. Thinking in terms of paradox demands that managers accept and work with contradictory elements instead of suppressing one of the elements (Lewis & Smith, 2014). Paradox as a meta-theory offers a powerful lens for management science, providing a deeper understanding of constructs, relationships, and dynamics surrounding organizational tensions, while enriching extant theories and processes of theorizing. Paradox as meta-theory deals with principles of tensions and their management across multiple contexts, theories, methodological approaches, and variables (Lewis & Smith, 2014; Schad et al., 2016).

Paradoxes cause tensions for actors when they try to make sense of them. At the same time, tensions are inherent in every paradox (Smith & Lewis, 2011). Managers should accept rather than deny or suppress the contradictory nature of a paradox and seek to create synergies between the paradoxical elements (Wilhelm & Sydow, 2018). Managing approaches – or responses – to paradoxes; that is, responses are either built on a structural separation of the contradictory elements or the acceptance of the co-existence of these elements and the search for synergies between elements. The synergistic approach is the most favored by paradox researchers but poses high requirements for managers regarding their ability to deal with emotional uncertainties and ambivalence. The synergistic approach thus requires managers to develop a high level of "paradoxical cognition" (Wilhelm & Sydow, 2018).

Tensions in digital platforms

The success of digital industrial platforms largely depends on their ability to attract an active ecosystem of actors. However, motivating actors to join a platform ecosystem is one of the critical challenges in platform establishment, often labeled as the "chicken-or-egg problem" (Tiwana, 2014). Hence, platform governance requires addressing several interdependent tensions, including the need to balance platform openness and control, exerting influence over the quality and range of complements, managing simultaneous collaboration and competition with complementors, and creating ecosystem value while also capturing some of that value (Rietveld & Schilling, 2020). All platform systems exhibit tensions between platform owners and complementors. For multi-sided platforms, the main threat is disintermediation. By replicating or reverse-engineering the platform side of these interfaces, rivals may be able to "clone" the platform itself and compete with it directly (Baldwin & Woodard, 2008). Complementors strive for competitive differentiation, focusing on their portfolio of domain expertise, market mechanisms, relational capital, and sector knowledge to create locally relevant solutions (Saadatman et al., 2019). Managing complementor engagement is rife with contradictions (Wareham et al., 2014). To foster generativity (i.e., evolvability) the independence of complementors, who work autonomously to satisfy customer needs, must be promoted and facilitated. To create and maintain a coherent, shared identity for the platform (i.e., stability), however, complementors' pursuit of their interests must be balanced with the interests of other players in the ecosystem (Eaton et al., 2015; Eisenmann, 2008; Parker et al., 2016). While there is ample research on the challenge of balancing a platform's stability with its evolvability (Dattée, Alexy, & Autio, 2018; Tilson, Lyytinen, & Sørensen, 2010), it focuses predominantly on governance mechanisms as the primary means for

reconciling these competing demands (Lindgren, Eriksson, & Lyytinen, 2015). Platforms thus need to balance the complementarity and competitiveness among complementors (De Reuver et al., 2018), which implies managing the contradiction between a platform's evolvability to foster generativity and its stability to enable efficiency and complementors' value capture (Sarker et al., 2012; Wareham et al., 2014). Tensions in pricing and the provision structure between platform owner and complementor illustrate the asymmetries in the negotiating power between the platform owner and complementor. The imbalances and power asymmetries entail the risk of a loss of trust between a platform owner and complementor. However, trust is a significant factor in the relationship between the platform owner and complementor for the platform's long-term success. A fair and sustainable governance structure has a significant positive impact on the motivation of complementors to engage on the platform (Deilen & Wiesche 2021).

Digital platforms in financial services

Digital platforms are significant in numerous aspects of social lives. This necessitates the characteristics of the platforms. One example of taxonomy for digital platforms recognizes them on the basis of three perspectives: technological, economic and socio-cultural. It divides technological perspective into owner access, user access, technology access, and pricing mechanism dimensions. Economic outlook can be divided into geographic scope, ownership, control, value proposition, transaction content, transaction type, market orientation, primary revenue source, and platform type dimensions. A socio-cultural perspective is related to user constellation, relationship level, and participation mechanism (Freichel et al., 2011). Another dimension of platforms' taxonomy is oriented on aspects such as value creation, platform architecture, and actor ecosystem (Abendroth et al., 2021).

The presented taxonomies are important in the context of platform governance and tensions stemming from the governance. They also shed light on the possible platformization of the banking industry. When considering business-oriented dimension, attention should be paid to such aspects as value creation (platform structure, critical activity or interactions), platform participants, revenue model, and the platform value chain (coordination, accessibility, economies of scale, etc.) (Staub et al., 2021). These platform-related characteristics are considered in the context of digital platforms in the banking ecosystem (Gancarczyk & Rodil-Marzábal, 2022; Omarini, 2018).

The digitalization of financial services characterizes the current stage of the development of financial technology. The process is strictly connected with the emergence of the open application programming interfaces (APIs) economy and

platform business model development (Omarini, 2020; Scardovi, 2017). It must be highlighted that the meaning of "platform" in banking differs from that in the meaning of the IT world. Banking platforms are treated as facilitators for third parties and their customers (Gozman et al., 2018). Nowadays, however, it is very common that some banking services (e.g., credit) are offered by electronic platforms that are not operated beyond the traditional banking sector (Claessens et al., 2018). The platform business models developed in the last few decades have significantly impacted incumbent financial institutions. The models changed the traditional vertical integration of such institutions as banks into a new, more innovation-centric approach to value creation (Zachariadis & Ozcan, 2017). The future trends predictions highlight that the trend will continue and digital platforms will dominate business and financial institutions in the future. Digital platforms in banking rely on innovative activities and offer many practical solutions for individual consumers and SMEs. One of the most important processes is the move towards a customer-centric approach (Moro-Visconti, Rambaud, & López Pascual, 2020). They are more preferred by customers when compared to traditional brick-and-mortar banks (Moro-Visconti et al., 2020).

Banks or non-banking entities create many bank-based services' platforms. They organize typical banking/financial activities like payment, lending, or wealth management (Caron, 2018; Sironi, 2021). Traditionally, banks served as gatekeepers for financial services, but nowadays, strong competition has been observed in the area, leading to disaggregation of the traditional banking value chains (Bartolacci et al., 2022; Pollari, 2018). It should be noted that usually, banks lack the innovative capacity to provide digital platforms. For this reason, they need non-banking FinTech business entities for the creation of such platforms (Bhutto et al., 2023). The growth of technology-based banks or non-bank entities offering banking services is based on the contemporary worldwide trend towards financial inclusion (Kanungo & Gupta, 2021). Technology is empowering financial firms to open previously untapped markets. (Chen et al., 2022) highlight that the application of more advanced technology enriched banking services. Payment or lending services are among those that play a key role in this process (Clarke, 2019). The typical platform is multi-sided, linking customers, financial service providers, and stakeholders. Usually, such platforms connect banks, their clients, and FinTechs, creating a financial intermediation ecosystem (Moro-Visconti et al., 2020). FinTechs have the technology that can increase banks' efficiency.

On the other hand, banks have large customer bases, abundant capital, and legal and regulatory expertise (Pedersen, 2020). There are also platforms based on social contacts (social finance). Such kinds of services emerged in the early 2000s, and lending platforms became one of the most significant players (Clarke, 2019). Currently, consumers spend a lot of their time online on digital

devices, and financial institutions are forced to follow their behavior patterns and offer suitable interaction tools. An example is Lending Club – one of the world's largest peer-to-peer lending platforms (Nicoletti et al., 2017). The global economy is beginning to concentrate around a few large entities, which include companies defined as BigTechs. Among them are names like GAFA (Google, Amazon, Facebook, Apple) and BAT (Baidu, Alibaba, Tencent) (Szpringer, 2020). BigTechs create platforms that provide financial services. The changes show that the crucial aspect of the platformization of the banking industry is who is orchestrating the whole process. In the best scenario, banks should decide whether to create their own digital platform or partner with third-party platform owners (Boot et al., 2017). At the current stage of digital transformation, banks develop collaboration with FinTechs and are transforming their structures into a platform (Stasinakis & Sermpinis, 2020). This is the only solution enabling competitiveness in the future (Murinde et al., 2022). Jackson (2007) predicts that the way to be more competitive in the future is to offer products and services provided by many players instead of one entity(Jackson, 2017).

The entrance of platforms into the banking business is inevitable, and banks must prepare a suitable strategy to defend themselves or cooperate in the platform-based environment (Omarini, 2018). It is essential to consider the possible different roles of banks in the environment. These institutions might be providers of these platforms, but they also can be treated as external participants in platforms created by non-bank institutions. In such cases, platforms might be created by other entities of the services distribution channel or even external, non-financial companies (BigTechs). It is, however, a new process of emerging platforms that connect market participants, bypassing the traditional banking sector. The involvement of the new, non-bank participants may increase the dexterity of the whole service provision process (Kotarba, 2018). Such a situation is possible, especially in these locations, where traditional banks cannot provide banking services to some parts of society (Croxson et al., 2021). The literature highlights that digital platforms (FinTech-based platforms) are not only complementors for traditional banks, but sometimes they also substitute the incumbent financial entities (Bilan et al., 2019).

Banks use platforms to improve their services or services provision. When considering platform structure, they mainly focus on costly, arduous, or repetitive processes (Nicoletti, 2021). The range of banking services that a platform-based model can implement is extensive. There are, however, some determinants of offering services via platforms. The most important is the level of openness to which the platform owner(s) decides. Traditional banks are less willing to set up a comprehensive open banking model, whereas challenger banks quickly accept the platform-based model. However, full-digitalization might be a sub-optimal approach, and banks contrapose volume-oriented product channels with

value-oriented banking relationships. The crucial characteristics defining the capabilities to develop the services based on the platform are transparency about data sources, stakeholder incentives, client costs, and ecosystem consequences. The greater intensity of these elements defines a greater possibility of offering banking services in the form of a platform-based business model (Nicoletti, 2021; Sironi, 2021).

Nowadays, blockchain-based and cloud-based platforms are among the fastest-growing platforms in terms of the use of technology. They bind various participants in the distribution of the banking services (examples are presented in Table 2). Both these platforms link internal and external capabilities and generate additional value for the participants and their customers. The main difference between blockchain and cloud technology is that blockchain relies on decentralization (distributed storage), whereas cloud computing leads to centralization (centralized storage) (Farrow, 2020; Hon & Millard, 2018; Zheng & Lu, 2021).

Table 2. Identification of platform owners, complementors and market participants in blockchain and cloud platforms

Type of services	Platform owner	Complementor(s)	Market
Example 1. Ethereum – blockchain platform for money and new kinds of applications			
Cryptocurrency blockchain platform, banking services	Private owners: Anthony Di Iorio, Charles Hoskinson, Gavin Wood, Joseph Lubin, Mihai Alisie, Vitalik Buterin	Commerce and e-commerce: Amazon, Amalto, BNP Paribas, Citigroup, Hewlett-Packard Enterprise, Samsung, Siemens and many more Exchanges: Ox, Kyber Network, Loopring; Stablecoins: MekerDao's DAI, Circle USDC, Trust Token's TrueUSD Lending: MakerrDao's CDPs, Dharma's lending services, Compound's borrowing pools Asset management: Melonport's asset management platform, Compound's money-market funds, Iconmi's crypto indices Derivatives: CDX's, Augur's various prediction markets	Retail customers, small and medium-sized enterprises

Type of services	Platform owner	Complementor(s)	Market
Example 2. Tink – cloud-based platform as a service			
Lending, payments, and many other services – access aggregated financial data, initiate payments, verify account ownership and use many personal finance management tools	Visa	Ecolytiq (developer of financial transaction platform), Wealthify (digital investment platform), Kivra (Swedish digital mailbox provider), Lydia (payment FinTech), American Express, Google, Sopra Banking Software, ABN AMRO Bank N.V., commercial banks (BNP Paribas, NatWest, Nordea)	Big banks, FinTechs and start-ups in Europe. It integrates more than 3,400 banks in 18 European countries

Source: Own elaboration based on the literature.

The application of blockchain in banking enables a new form of organization of banking services (Kumari & Devi, 2022). Such technology enables connecting consumers and producers directly through the platform, without the need for bank's participation. Moreover, this technology has many benefits, like alleviating information asymmetry and reducing the risk of specific operations (Mehrotra et al., 2020; Wang et al., 2019). The blockchain-based platform presents decentralized decision-making in which the community around the platform suggests changes to the code and rules of the platform but also decides which of these changes will be implemented (Pereira, Tavalaei, & Ozalp, 2019). An example of such a platform is Ethereum, a blockchain platform that supports smart contracts (van der Merwe, 2021). The platform enables transactions to be confirmed (order or validate) without the traditional participants, like banks or credit card companies (Oliva et al., 2020). It provides such advantages for the customers as anonymity, safety, and time-saving. Moreover, the application of blockchain technology positively stimulates the development of banking services in the context of the emergence of new, non-bank forms of financing, especially small and medium-sized enterprises (SMEs). The research in this area shows that in certain circumstances, the use of blockchain banking platforms gives much better financing opportunities for SMEs than independent finance (Liu et al., 2021). They also improve the efficiency of many banking services offered to retail customers.

The second type of technology that plays a significant role in the modern banking industry and its platformization is cloud technology. Cloud computing refers to the creation of on-demand access to a pool of configurable computing resources such as networks, servers, storage, applications, and services. Cloud

technology has experienced rapid growth during the last few years and provides many advantages for incumbent institutions. Cloud-based platforms provide some benefits that blockchain-based platforms do not offer. They allow the combination of data analytics (Big Data) with artificial intelligence. In this way, many services previously provided by banks are automated. Such services are offered via mobile devices (smartphones), making them faster and cheaper than traditional banking services. As Boot et al. (2021) highlighted, the widespread adoption of cloud computing enables large technology firms to create an ecosystem together with banks and other parties. The role of cloud technology as the infrastructure that lowers the entry barriers to the banking sector is significant. It enables the development of new, digital financial products and services that match customer needs and enable banks to cooperate with specialized FinTech firms (Nedelcu et al., 2015). The advantages of this technology come from the fact that this technology enables all collaborating partners to interact effectively, efficiently, and transparently (Nicoletti, 2021; Walker & Morris, 2021). An example of a cloud technology platform is the Swedish platform Tink. It is Europe's leading open banking platform and enables banks and FinTechs to develop data-driven financial services. The platform is based on cloud technology, and is treated as an 'infrastructure provider'. Its primary focus is personal financial management aggregation (Teigland et al., 2018). The company collaborates with over 3,400 incumbent banks and has 250 million customers.

Conceptualizing behavior patterns among platform partners

The application of blockchain and cloud technologies in banking provides many benefits for the industry, the non-bank participants on the platform, and their customers. Platform-based business models utilizing the application of blockchain technology reduce transaction costs through standardization and improved transparency (Perscheid et al., 2020). It also improves the efficiency of internal processes (e.g., the cloud-based HRM platforms in banks' back offices) (Łasak & Gancarczyk, 2022). It is an opportunity for banks to partner with FinTech companies and gain many benefits from such cooperation. Apart from specific economic benefits, like greater efficiency and effectiveness, the platform-based approach creates a new dimension of banking services. It is highlighted in the literature that such a solution enables almost instantly a funnel of innovative value-generating units that accelerate growth (Sironi, 2021).

The current phase of banking services development leads to intense cooperation and competition (coopetition) between different market participants. Diamond et al. (2019) highlight that the strongest competition for banks comes from FinTechs and businesses representing other industries. The coopetition of banks on digital platforms with external partners and between different non-

bank actors entails new risks and threats that banks do not experience when offering their services independently (Arslanian & Fischer, 2019). An example is the possible risks of using private data and negative externalities for consumers from the misuse of personal data (Croxson et al., 2021). All of these adverse outcomes of the bank-non-bank cooperation create costs. Among them are included governance costs.

Closer cooperation between bank and non-bank entities leads to greater connectivity between platform participants, complementors, and their customers (market). Figure 1 shows the pattern of behavior mechanisms between different platform participants. It is a conceptual model showing the mutual interactions of various mechanisms within the framework of a typical platform-based model. It shows relations inside platforms between such aspects as connectivity, information sharing and trust, but on the other hand, governance costs, co-created value, and asymmetry of benefits. The platform-based business model is expected to provide greater information symmetry than other structures of business cooperation (Chen et al., 2022; Sironi, 2021). Better connectivity capabilities increase the willingness to share information. If the trust reinforces connectivity, it results in more intensive information sharing and greater efficiency (Chen et al., 2022). Greater connectivity and more significant information sharing results in higher confidence. It is, however, only a theoretical presumption, and it can happen that some participants and complementors strive for exploitation platform interplay to build asymmetrical power for their benefit. The crucial aspect of our research is the right-hand part as shown on Figure 1.
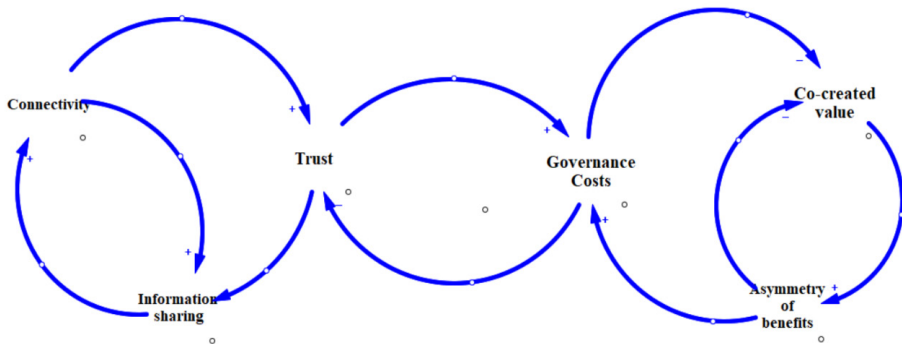
Figure 1. The conceptualization of a pattern of behavior mechanisms emerging amongst platform partners

We observe the relations between governance costs, co-created value and the asymmetry of benefits. When governance costs increase, it results in practices that can reduce co-created value. Costs of coordination and compliance lessen

the co-created value. A decrease in co-created value can result in practices that increase the asymmetry of benefits and risks, as the complementors need to invest in new capabilities to be compliant. Growing asymmetry of benefits and risks can only reduce the co-created value as complementors' willingness to participate in a platform declines. If the asymmetry of benefits increases, it can result in the growth of governance costs because of less willingness of complementors to be platform partners, resulting in opportunistic behaviors. These practices can reduce trust, resulting in a lower willingness for information sharing. Connectivity (the technological infrastructure for conveying information) and the desire for information sharing are positively correlated. Better connectivity capabilities increase the willingness for information sharing. If trust reinforces connectivity, it results in greater levels of information sharing. Extended connectivity capabilities, strengthened with greater information sharing, result in higher confidence. However, a reinforcing path is unfolding only until complementors realize that platform owners strive for exploitation of platform interplay to build asymmetrical power for their benefit. The causal loop diagram (Figure 1) was converted into a stock and flow diagram (Figure 2) to better represent the dynamics of a system involving co-created value. This transformation aimed to provide a clearer representation of the interactions and relationships between various elements in the system. In this stock and flow diagram, the central stock is co-created value, which represents the overall value generated through the collaboration of various stakeholders within the system. The stock is influenced by two primary flows: 'value creation' and 'value reduction.'
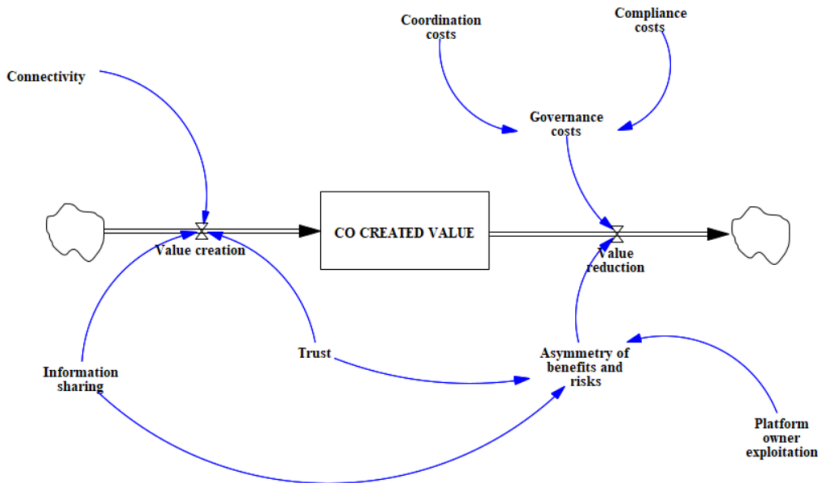
Figure 2. The conceptual model of value co-creation

According to Figure 2, the value creation process involves stakeholders in the system collectively contributing to the overall co-created value. This process is influenced by several factors, including:

- connectivity (the degree of interaction and communication among stakeholders, which enables value creation);
- information sharing (the sharing of knowledge and resources between stakeholders, facilitating collaborative efforts and value generation);
- trust (the presence of confidence and reliability among stakeholders, promoting a collaborative atmosphere for value creation).

Figure 2 shows that the process can also be opposite, which means value reduction. Value reduction signifies a decrease in co-created value resulting from various costs and negative influences within the system. The following factors impact the value reduction process:

- governance costs (expenses related to managing and coordinating the system, which can diminish overall value);
- coordination costs (costs associated with organizing and aligning stakeholders' efforts to achieve common objectives, leading to a decrease in co-created value);
- compliance costs (expenses incurred in adhering to regulations and policies, potentially reducing the total value generated within the system);
- platform owner exploitation (instances where a platform owner leverages its position or stakeholders for personal gain, causing a reduction in co-created value).

By converting the causal loop diagram into a stock and flow diagram, we can more effectively comprehend and analyze the intricate interactions between various factors and their impact on co-created value. This improved understanding enables more informed decision-making and system optimization.

Practices sensitive to governance costs affect trust amongst platform partners. Complementors and platform customers show less confidence in platform owners when governance costs rise. If gains in co-created value are weighed against governance costs, the desirability of different co-creation modes can be better assessed. If a platform owner increases the number of connected partners in its network and governance costs can decrease, it can increase trust, which will result in lower relative governance costs. The central idea behind co-created value is that the platform owner and the complementor combine complementary resources in a process that aims at creating value for their joint clients. Variations in governance practices affect co-created value because different approaches entail differences in resource access (Huber et al., 2017).

The conceptual model allows for analyse of the behavior of individual participants of platforms. Despite the numerous benefits that digital platforms create in banking services, some negative aspects stem from tensions among partners. These tensions are different in the case of blockchain-based platforms and cloud-based platforms. It also should be noted that both platforms are being applied to different banking services, meaning that there are different complementors and markets (customers) (Pedersen, 2020). Whereas blockchain-based platforms are suitable for such services as settlement or payment, cloud-based platforms are typical to work with data processing (e.g., regulatory reporting, building new capabilities, etc.). Concerning our conceptual model of a pattern of behavior mechanisms (Figure 1), we elaborated a theoretical decomposition of the tensions between participants of the banking services in both types, namely, blockchain-based and cloud-based platforms.

Blockchain-based platforms

Blockchain enables decentralized decision-making as a governance framework (Wang et al., 2019). The code defines governance rules implemented within smart contracts and executed automatically, minimizing the governance costs (Vella & Gastaldi, 2021). Deployment of smart contracts enables automating most of the work performed by humans, often without consistency, solid logic, and compliance with formally made agreements. Smart contracts replace human decisions with a selection of simple and infallible algorithms that promote the best interests of platform partners. The smart contract permits more disciplined and automated execution of operations (Oliva et al., 2020), reducing reliance on ad-hoc decisions of humans. Another feature of blockchain-based platforms is the transparency of accomplished transactions. Transparency of executed actions provides the same data version for all the platform partners. A decentralized and automated decision-making process reduces information asymmetry and increases trust (Wang et al., 2019; Zavolokina et al., 2020). Connectivity capabilities ensure cryptographically created confidence that contributes to improving information sharing. Blockchain technology enables the machine-to-machine connection, reducing governance costs and offsets human-to-human trust. All participants are equal, and the consensus mechanism is not based on any central regulator.

According to our analysis, blockchain-based platforms offer a higher number of significant advantages to all participants (platform owners, complementors and markets). Offering the automated execution of operations, they provide greater connectivity, information sharing and trust, as well as reducing costs related to opportunism and uncertainty. Blockchain technologies are treated as safer than cloud-based solutions. However, greater safety and higher convenience trigger some costs in the early stages of platform development. Building platforms on

the blockchain requires the necessary technological solutions and the newest skills to implement in any technology area. Other kinds of costs, especially coordination costs, grow in the open community (Pereira et al., 2019). Blockchain-based platforms are characterized by a very high coordination threshold for core changes, including social and technical processes, to ensure any changes are secure and widely supported by the community. Such entry raises costs of coordination and costs of creating a new structure.

In the long term, the costs of blockchain platforms are lower, which expands the co-created value. Co-created value embraces the positive consequences for both the platform owners and its partners (complementors). The cooperation provides also greater transparency in ownership records while permitting real-time observation of transfers of shares from one owner to another (Yermack, 2017). The benefits offered by the blockchain platforms are asymmetrical for different participants. Higher governance costs reduce the co-created value and thus create an asymmetry of benefits between the platform owner and its complementors. From the platform owners' perspective, applying blockchain technology (application of smart contracts) mitigates the risk and reduces the need for intermediaries (financial institutions as complementors). Lower costs of trading and settlement and higher transparency of the transactions create lower benefits for complementors than for platform owners.

Cloud-based platforms

Cloud-based banking refers to deploying banking infrastructure to control cloud-based core banking operations and financial services without dedicated physical servers. One of the cloud-based platforms' main goals is to enable banking businesses with new tools and techniques. Such platforms host critical applications required for every bank operation. Cloud technology can be implemented in banking on different levels: process, application, platform and infrastructure. The platform (Platforms-as-a-Service, PaaS) offers a cloud-based core banking platform for applications and database development (Malyshev, 2021). In such a solution, the provider (owner) usually delivers a computing platform accessed via web browsers, the operating provider provides a system programming language execution environment, and web servers (Nedelcu et al., 2015). In a private platform, the platform provider can be a bank, whereas in a public platform, it is usually a third-party provider (Hon & Millard, 2018).

One of the advantages of cloud platforms is greater security. Usually, banks use many solutions to their core processes, which need to provide more internet and mobile access to customers. Such solutions are exposed to cyber threats, whereas cloud platforms can offer the same services (processes) in a more secure way (Blazheski, 2016). Moreover, cloud-based technologies provide

a platform for application development and cost reduction, and help banks reach out to their customers more effectively. Banking services can be more customer-centric. Cloud and PaaS offer overwhelming financial and technological benefits for customers versus outdated, traditional on-premise technology, as it shifts the cost to build, maintain and sell the software from the customers to vendors and their investors, who finance this in the PaaS scenario by collecting relatively small periodical subscription fees to cover these costs. There are no limits for activities situated in different locations to access banking systems, and the costs of this access are very low. Cloud computing can scale on demand without processing intensive, expensive infrastructure (Awadallah, 2016). A strict connection exists between the platform, platform technology and its management (platform owners). Cloud platforms link former competitors, which raises protection costs for these participants (technological aspects, regulatory requirements, etc.). As a consequence of these changes, the co-created value is lower. On the other hand, a data structure in a cloud platform is unique, and while it can be retrieved, it cannot be simply re-used with a competitive solution. It means that the platform participants are safer, and there is a greater willingness for information sharing and greater connectivity. Undoubtedly, the connectivity in cloud-based platforms is greater than the connectivity between blockchain-based platforms.

Despite the advantages of cloud-based banking platforms, there are also some negative dimensions. Among such negative aspects should be enumerated costs, especially as technical costs might be included, which embrace the adoption of new technologies and configuration of the incumbent solutions. Also, during the use of cloud platforms, technical skills are needed, which causes additional costs (Mahalle te al., 2021). The other challenges of cloud-based platforms embrace the costs of stronger financial regulations and security (data security), difficulties related to the data migration to the cloud-based infrastructure, possible human errors (humans prepare cloud coding), and some other unpredictable circumstances. There can also be a concern that the platform owners have control over data accuracy and privacy. Counterarguments are that today, cloud providers are better equipped against security threats than most of the other solutions (Blazheski, 2016; Pugliese, 2020). Software providers also provide security that can certify any platform behavior that could potentially misuse customers' data.

DISCUSSION AND CONTRIBUTION TO THEORIZING

Following the aims of our paper, we identified the two most common platforms in banking services, which are blockchain-based and cloud-based platforms. Subsequently, we identified the main participants of digital banking platforms

and described the governance processes within the platform-based structures. In the next step, we elaborated the theoretical framework, which presents the dynamic pattern of behavior among partners stemming from the tensions between governance costs and co-created value within platforms in banking services. According to our expectations, this is an important contribution to the extant literature related to the problems of platformization of banking services.

So far, scholars have conducted little research to understand and analyze heterogeneous complementors and customers in the platform ecosystem. Nevertheless, it can be assumed that high power asymmetries can arise in the relationship between complementor and platform owner. In particular, tensions in pricing and the provision structure between platform owner and complementor illustrate the asymmetries in the negotiating power between the platform owner and complementor. The imbalances and power asymmetries entail the risk of a loss of trust between a platform owner and complementor (Deilen & Wiesche, 2021). Platform owners can strengthen trust between complementors, especially through effective governance mechanisms such as intellectual rights protection. This is important, because trust is a significant factor in the relationship between the platform owner and complementor for the platform's long-term success. A fair and sustainable governance structure has a significant positive impact on the motivation of complementors to engage on the platform (Deilen & Wiesche, 2021).

The mechanisms described in our theoretical concept of behavior lead to the main conclusion that the degree of connection between the platform participants depends on the platform type. The blockchain-based platforms lead to greater interconnectedness of platform participants, whereas cloud-based platform participants are less interconnected (Figure 3). Among the factors that increase the coherence of platforms are lower costs, higher simplicity of transactions, and a greater number of transactions. These features characterize blockchain-based platforms. According to our conception, the platform participants are more interconnected in such types of platforms. The other type, cloud-based platform, is characterized by the lower interconnectedness of platform participants. Higher costs of data protection and technology implementation (such platforms usually link different technologies like AI, Big Data, and cloud technology), together with lower numbers of partners, lower transactions and co-created value, and greater asymmetry of benefits, lead to lower coherence of platform participants.
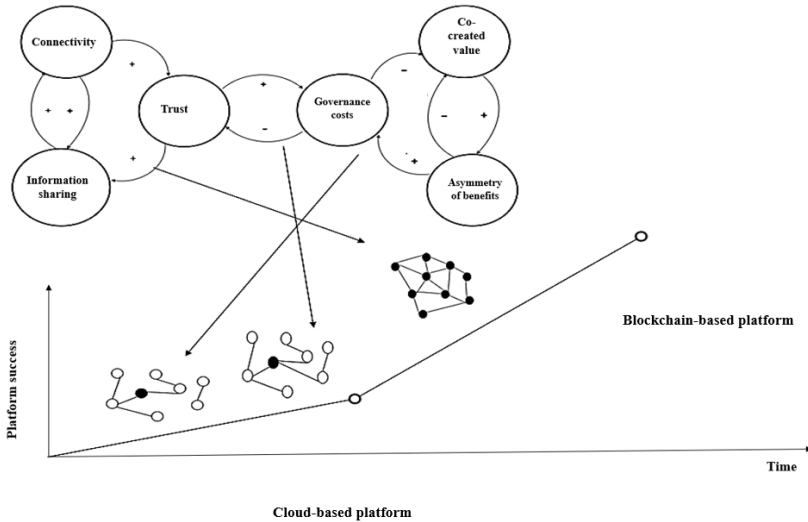
Figure 3. The types of platforms stem from the patterns of behaviors of platform partners

Though vastly improved from earlier generations, current methods for clearing and settling transactions remain costly with many reconciliations and counterparty risks. Furthermore, many financial products have high transaction costs, and financial inclusion is uneven in many parts of the world (Chen et al., 2022). In particular, the duplicative and time-consuming post-trade processes that banks, brokerages, custodians, and clearing houses undertake to reconcile multiple ledgers represent a huge cost of trust embedded in the existing system. Blockchain technology offers a solution for some of these problems. Though there is a need to carefully explore and consider how the adoption of blockchain technologies and DLTs will affect financial stability, it is also worth exploring how these technologies, less reliant on centralized institutions, might help build a more resilient financial sector.

Apart from clearing and settlement, which is typical in banking activity, numerous transactions are accomplished in the performed bank's back-office. Among others, here belong the accounting and reporting processes as well as data collection and analytics. Such activities can be accomplished much more efficiently when artificial intelligence and Big Data technologies can be offered as a part of the cloud service. The application of these technologies in a separate way can be much more difficult and costly than as a part of the cloud platform. The main challenge is the decision of what kind of platform, private, public, or hybrid one, should be implemented.

Our research enables us to provide answers to our research questions.

RQ1) What are the specific types of digital platforms in banking services?

The literature has highlighted that Banking as a Platform (BaaP) has become a new model of banking services (Zachariadis & Ozcan, 2017). Digital platforms are leading to a greater openness of banking services and are creating banking ecosystems (Jackson, 2017; Nicoletti et al., 2017; Omarini, 2018). Different types of banking platforms are presented in the extant literature. For example, Sironi (2021) highlights the division into 1) development platforms, 2) transaction platforms, and 3) hybrid platforms. We narrowed the analysis to two types of platforms (blockchain and cloud) and their impact on banking services. In this context we highlighted that blockchain-based and cloud-based platforms are currently the main platforms in banking services.

RQ2) Who are the partners (owners, complementors, customers) of digital platforms in banking services, and what are their roles?

Platformization is a process triggered by the cooperation between the incumbent institutions and new entrants to the industry (FinTech companies). Khanagha et al. (Khanagha et al., 2022) argue that platforms are sometimes created as a response by incumbent companies to competitors entering the market. According to this approach, platforms are created by banks. In our opinion the reality is more complex. Different types of platforms can be enumerated different roles: platform integrator, platform provider, platform specialist or platform orchestrator (Diamond et al., 2019). Incumbent banks can be both owners and complementors of a platform. They share the roles with other financial and non-financial institutions (FinTech start-ups). The third group of participants is customers of the banking services offered via platforms. We want to highlight that blockchain technology enables greater interdependence of the participants and leads to greater unification of costs and benefits for their participants. Our analysis confirms the suggestion from other research (Pereira et al., 2019) that blockchain-based platforms offer more advantages to customers than other types of platforms in the banking industry.

RQ3) What is the dynamic pattern of behavior among partners stemming from the tensions between governance costs and co-created value within platforms in banking services?

The findings develop the conclusions of Huber et al. (2017) regarding tensions between co-created value and governance practices. The process

model identifies the self-reinforcing dynamics and necessary conditions that explain how managers can navigate the pressure over time. The prerequisite for platform success is that platform owners should not promise more than they can deliver (Huber et al., 2017). Managers can navigate tensions through acceptance, differentiation, and integration. Through spatial separation, tensions might be addressed by clarifying and segregating individual and corporate levels. Tensions and paradoxes might be resolved through temporal separation by focusing on conflicting goals during different periods. From an integrative perspective, tensions can be resolved by transforming into a more manageable situation, for example, by adding new strategic elements to link oppositional demands. Such a synthesis can also occur on spatial or temporal levels. Identifying creative synergies between contradictory elements is a synthesis that can also occur on spatial or temporal levels. Blockchain-based platforms, as such, provide synergy opportunities for time and space integration.

Conclusion

Our research is focused on the blockchain-based and cloud-based platforms as the most significant types of platforms in the banking industry's digital transformation. Platformization is a crucial step leading to the creation of new financial ecosystems and the building of a new potential of hybrid cooperation between different market players. We identified the main participants of these platforms and described the governance processes within their structures. Our analysis showed that blockchain-based platforms lead to greater interconnectedness of platform participants, while cloud-based platform participants are less interconnected. The coherence of platforms is influenced by factors such as costs, simplicity of transactions, and the number of transactions. We highlighted that blockchain-based and cloud-based platforms play a significant role in the transformation of the current banking services, but there are still many areas that should be considered for further research, and challenges remain to be resolved to inform about the implication of the platformization of banking services.

From a paradox theory perspective, our research highlights the dynamic pattern of behavior among platform partners, demonstrating that the degree of connection between platform participants depends on the platform type. Tensions between governance costs and co-created value play a crucial role in shaping the interactions among platform participants. Trust is a significant factor in the relationship between the platform owner and complementor for the platform's long-term success. To manage these tensions, managers can adopt strategies such as acceptance, differentiation, integration, and the identification of creative synergies between contradictory elements.

The critical research problem was to answer the question of whether the use of financial technologies within platforms and the creation of digital platforms lead to the opening or closing of access to these platforms. We also investigated what the conditions for the democratization of platforms (participation of various entities on equal terms) are. In our opinion, blockchain technology provides much greater openness and democratization than cloud technology. Addressing our research questions, we identified blockchain-based and cloud-based platforms as the specific types of digital platforms in banking services, and found that platform partners in banking services include incumbent institutions, FinTech companies, and customers. The roles of these partners vary depending on the platform type, with incumbent banks potentially acting as both owners and complementors. We established that the dynamic behavior pattern among partners in banking services platforms stems from tensions between governance costs and co-created value.

Our findings have important implications for banking institutions and FinTech companies, as the choice of platform type affects their interconnectedness and the distribution of costs and benefits among participants. Blockchain-based platforms offer greater interconnectedness, security, and simplicity of transactions compared to cloud-based platforms, while cloud-based platforms face data protection and technology implementation challenges.

Apart from the abovementioned, we also examined the tensions within the described platforms (between co-created value and governance costs) and answered the question of what to do to remove the indicated problems (practices) in the future. There are different tensions in the platform structure (e.g., cooperation vs. competition, control vs. autonomy, short-term value vs. long-term value creation, stability vs. generativity, etc.). In this context, further research questions arise relating to what should be done to implement the proposed solutions. Among such propositions should be considered the areas related to 1) value realization from platforms and tensions management, 2) development of successful blockchain and cloud-based platforms, 3) relationships amongst platform partners, 4) practice variations in platforms. All of these areas allow us to pose in the future a number of further research questions related to platformization of banking services.

However, our study has limitations, such as focusing on only two types of platforms and not considering other potential platform types in the banking industry. The generalizability of our findings may be limited as a result. Future research could explore the dynamics of other platform types in banking services, investigate the long-term impact of platform choice on banking institutions' performance, and assess the implications of the platformization of banking services on financial stability and inclusion.

The provided conceptual framework is the first approach to the explanation on how the different platform types can enhance the provision of different banking services. Our attention, however, was not focused on the service provider–customer relations, but on the governance mechanisms inside the platform. We argue that different types of applied technology lead to different solutions and they are more suitable for different types of services. Apart from searching for theoretical problem solving, empirical research is needed in this area. We hope that our research will be continued in other studies devoted to the creation of banking ecosystems and implementation of platform-based solutions.

Acknowledgments

References

Abendroth, J., Riefle, L., & Benz, C. (2021). Opening the black box of digital B2B co-creation platforms: A taxonomy. In F. Ahlemann, R. Schutte, & S. Stieglitz (Eds.), *Innovation Through Information Systems* (pp. 596-611). Cham: Springer International Publishing.

Adner, R. (2017). Ecosystem as structure: An actionable construct for strategy. *Journal of Management, 43*(1), 39–58. https://doi.org/10.1177/0149206316678451

Arslanian, H., & Fischer, F. (2019). Fintech and the future of the financial ecosystem. In H. Arslanian, & F. Fischer (Eds.), *The Future of Finance: The Impact of FinTech, AI, and Crypto on Financial Services* (pp. 201-216). Cham: Springer International Publishing.

Avarmaa, M., Torkkeli, L., Laidroo, L., & Koroleva, E. (2022). The interplay of entrepreneurial ecosystem actors and conditions in FinTech ecosystems: An empirical analysis. *Journal of Entrepreneurship, Management and Innovation, 18*(4), 79-113. https://doi.org/10.7341/20221843

Awadallah, N. (2016). Usage of cloud computing in banking system. *International Journal of Computer Science Issues, 13*(1), 49-52. https://doi.org/10.20943/IJCSI-201602-4952

Baldwin, C.Y., & Woodard, C.J. (2008). The architecture of platforms: A unified view. Harvard Business School Finance Working Paper No. 09-034, Harvard Business School, Boston. Retrieved from http://dx.doi.org/10.2139/ssrn.1265155

Bartolacci, F., Cardoni, A., Łasak, P., & Sadkowski, W. (2022). An analytical framework for strategic alliance formation between a cooperative bank and a fintech start-up: An Italian case study. *Journal of Entrepreneurship, Management and Innovation, 18*(4), 115-156. https://doi.org/10.7341/20221844

Bhutto, S. A., Jamal, Y., & Ullah, S. (2023). FinTech adoption, HR competency potential, service innovation and firm growth in banking sector. *Heliyon, 9*(3), 1-13. https://doi.org/10.1016/j.heliyon.2023.e13967

Bilan, A., Degryse, H., O'Flynn, K., & Ongena, S. (Eds.). (2019). *Banking and Financial Markets: How Banks and Financial Technology Are Reshaping Financial Markets.* 1st ed. 2019 edition. Cham: Palgrave Macmillan.

Blazheski, F. (2016). Cloud banking or banking in the clouds? *BBVA Research* 1. Retrieved from https://www.bbvaresearch.com/wp-content/uploads/2016/04/Cloud_Banking_or_Banking_in_the_Clouds1.pdf

Boot, A., Hoffmann, P., Laeven, L., & Ratnovski, L. (2021). Fintech: What's old, what's new? *Journal of Financial Stability, 53*(100836), 1-36. https://doi.org/10.1016/j.jfs.2020.100836

Brandon-Jones, E., Squire, B., Autry, Ch. W., & Petersen, K. J. (2014). A contingent resource-based perspective of supply chain resilience and robustness. *Journal of Supply Chain Management, 50*(3), 55–73. https://doi.org/10.1111/jscm.12050

Caron, F. (2018). The evolving payments landscape: Technological innovation in payment systems. *It Professional, 20*(2), 53–61. https://doi.org/10.1109/MITP.2018.021921651

Chen, S., D'Silva, D., Packer, F., & Tiwari, S. (2022). Virtual banking and beyond. *BIS Papers, 120*, 1-37. Retrieved from https://www.bis.org/publ/bppdf/bispap120.pdf

Claessens, S., Frost, J., Turner, G., & Zhu, F. (2018). Fintech credit markets around the world: Size, drivers and policy issues. *BIS Quarterly Review*, September, 1-21. Retrieved from https://www.bis.org/publ/qtrpdf/r_qt1809e.pdf

Clarke, Ch. (2019). Platform lending and the politics of financial infrastructures. *Review of International Political Economy, 26*(5), 863–885. https://doi.org/10.1080/09692290.2019.1616598

Croxson, K., Frost, J., Gambacorta, L., & Valletti, T. (2021). Platform-based business models and financial inclusion. *BIS Working Papers, 986*, 1-30. Retrieved from https://www.bis.org/publ/work986.pdf

Dattée, B., Alexy, O., & Autio, E. (2018). Maneuvering in poor visibility: How firms play the ecosystem game when uncertainty is high. *Academy of Management Journal, 61*(2), 466–498. https://doi.org/10.5465/amj.2015.0869

De Reuver, M., Sørensen, C., & Basole, R.C. (2018). The digital platform: A research agenda. *Journal of Information Technology, 33*(2), 124–135. https://doi.org/10.1057/s41265-016-0033-3

Deilen, M., & Wiesche, M. (2021). The role of complementors in platform ecosystems. In F. Ahlemann, R., Schütte, & S. Stieglitz (Eds.), *Innovation Through Information Systems* (pp. 473-488). WI 2021. Lecture Notes in Information Systems and Organisation. Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-86800-0_33

Diamond, S., Drury, N., Lipp, A., Marshall, A., Ramamurthy, S., & Wagle, L. (2019). The future of banking in the platform economy. *Strategy & Leadership, 47*(6), 34-42. https://doi.org/10.1108/SL-09-2019-0139

Eaton, B., Elaluf-Calderwood, S., Sørensen, S., & Yoo, Y. (2015). Distributed tuning of boundary resources. *MIS Quarterly, 39*(1), 217–244. Retrieved from http://eprints.lse.ac.uk/63272/

Eisenmann, T.R. (2008). Managing proprietary and shared platforms. *California Management Review, 50*(4), 31–53. https://doi.org/10.2307/41166455

European Banking Authority. (2021). *Report on the use of digital platforms in the EU banking and payment sector.* EBA/REP/2021/26. European Banking Authority, Paris. Retrieved from https://www.eba.europa.eu/sites/default/documents/files/document_library/Publications/Reports/2021/1019865/EBA%20Digital%20platforms%20report%20-%20210921.pdf

Farrow, G.S.D. (2020). Open banking: The rise of the cloud platform. *Journal of Payments Strategy & Systems, 14*(2), 128–146.

Finken, S., & Finkemeyer, D. (2019). The impact of blockchain on the transaction banking business model. *Journal of Digital Banking, 4*(1), 19–34.

Freichel, Ch., Fieger, J., & Winkelmann, A. (2021). Developing a taxonomy for digital platforms – A conceptual approach. In *Proceedings of the 54th Hawaii International Conference on System Sciences* (pp. 5779-5788). Retrieved from http://hdl.handle.net/10125/71321

Gancarczyk, M., & Rodil-Marzábal, O. (2022). Fintech framing ecologies: Conceptual and policy-related implications. *Journal of Entrepreneurship, Management and Innovation, 18*(4), 7-44. https://doi.org/10.7341/20221841

Glassburner, A. V., Nowicki, D.R., Sauser, B., Randall, W.S., & Dickens, J.M. (2018). Theory of paradox within service-dominant logic. *Service Science, 10*(2), 111–123. https://doi.org/10.1287/serv.2018.0206

Gozman, D., Hedman, J., & Olsen, K.S. (2018). Open banking: Emergent roles, risks & opportunities. In *ECIS 2018 Proceedings* Association for Information Systems. AIS Electronic Library (AISeL). Retrieved from https://research.cbs.dk/en/publications/open-banking-emergent-roles-risks-amp-opportunities

Hedman, J., & Henningsson, S. (2015). The new normal: Market cooperation in the mobile payments ecosystem. *Electronic Commerce Research and Applications, 14*(5), 305–318. https://doi.org/10.1016/j.elerap.2015.03.005

Hein, A., Schreieck, M., Riasanow, T., Setzke, D.S., Wiesche, W., Böhm, M., & Krcmar, H. (2020). Digital platform ecosystems. *Electronic Markets, 30*(1), 87–98. https://doi.org/10.1007/s12525-019-00377-4

Hermes, S., Pfab, S., Hein, A., Weking, J., Böhm, M., & Krcmar, H. (2020). Digital platforms and market dominance: Insights from a systematic literature review and avenues for future research. Pacific Asia Conference on Information Systems 2020 Proceedings. 42. Dubai, UAE. Retrieved from https://aisel.aisnet.org/pacis2020/42

Hon, W.K., & Millard, Ch. (2018). Banking in the cloud: Part 1 – Banks' use of cloud services. *Computer Law & Security Review, 34*(1), 4–24. https://doi.org/10.1016/j.clsr.2017.11.005

Huber, T.L., Kude, T., & Dibbern, J. (2017). Governance practices in platform ecosystems: Navigating tensions between cocreated value and governance

costs. *Information Systems Research, 28*(3), 563–584. https://doi.org/10.1287/isre.2017.0701

Jackson, P. (2017). Banks or platforms: The digital future, SUERF Policy Note 14. SUERF - The European Money and Finance Forum. Retrieved from https://www.suerf.org/policynotes/1179/banks-or-platforms-the-digital-future

Jacobides, M.G., Cennamo, C., & Gawer, A. (2018). Towards a theory of ecosystems. *Strategic Management Journal, 39*(8), 2255–2276. https://onlinelibrary.wiley.com/doi/full/10.1002/smj.2904

Kanungo, R.P., & Gupta, S. (2021). Financial inclusion through digitalisation of services for well-being. *Technological Forecasting and Social Change*, 167, 120721, 1-41. https://doi.org/10.1016/j.techfore.2021.120721

Khanagha, S., Ansari, S., Paroutis, S., & Oviedo., L. (2022). Mutualism and the dynamics of new platform creation: A study of Cisco and Fog Computing. *Strategic Management Journal, 43*(3), 476–506. https://doi.org/10.1002/smj.3147

Kotarba, M. (2018). Digital transformation of business models. *Foundations of Management, 10*(1), 123–142. https://doi.org/10.2478/fman-2018-0011

Kumari, A., & Devi, N.Ch. (2022). The impact of FinTech and blockchain technologies on banking and financial services. *Technology Innovation Management Review, 12*(1/2), 1-11. http://doi.org/10.22215/timreview/1481

Langley, P., & Leyshon, A. (2021). The platform political economy of fintech: Reintermediation, consolidation and capitalisation. *New Political Economy, 26*(3), 376–388. https://doi.org/10.1080.13563467.2020.1766432

Lewis, M.W. (2000). Exploring paradox: Toward a more comprehensive guide. *Academy of Management Review, 25*(4), 760–776. https://doi.org/10.5465/amr.2000.3707712

Lewis, M.W., & Smith, W.K. (2014). Paradox as a metatheoretical perspective: Sharpening the focus and widening the scope. *The Journal of Applied Behavioral Science, 50*(2), 127–149. https://doi.org/10.1177/0021886314522322

Lindgren, R., Eriksson, O., & Lyytinen, K. (2015). Managing identity tensions during mobile ecosystem evolution. *Journal of Information Technology, 30*(3), 229–44. https://doi.org/10.1057/jit.2015.8

Liu, L., Li, Y., & Jiang, T. (2021). 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

Łasak, P., & Gancarczyk, M. (2021). Systemizing the impact of fintechs on the efficiency and inclusive growth of banks' services: A literature review. In A. Marszk, & E. Lechman (Eds.), *The Digitalization of Financial Markets*, (pp. 123–142). New York: Routledge.

Łasak, P., & Gancarczyk, M. (2022). Transforming the scope of the bank through fintechs: Toward a modularized network governance. *Journal of Organizational Change Management, 35*(1), 186-208. https://doi.org/10.1108/JOCM-05-2021-0147

Mahalle, A., Yong, J., & Tao, X. (2021). Challenges and mitigation for application deployment over SaaS platform in banking and financial services industry. In *2021 IEEE 24th International Conference on Computer Supported Cooperative Work in Design (CSCWD)* (pp. 288–296). IEEE, Dalian, China. https://doi.org/10.1109/CSCWD49262.2021.9437798

Malyshev, A. (2022). Is cloud-based digital banking the future of banking? *SDK. Finance - White-Label Digital Core Banking Software*. Retrieved from https://sdk.finance/cloud-based-digital-banking/

Mehrotra, P., Sharma, R., Bagrecha, N., & Thakare, B. (2020). A high performance blockchain platform for Indian banking system. In *2nd International Conference on Communication & Information Processing (ICCIP)*. http://dx.doi.org/10.2139/ssrn.3645437

Merton, R.K. (1968). *Social Theory and Social Structure*. New York Free Press.

Moro-Visconti, R., Rambaud, S. C., & Pascual, J.L. (2020). Sustainability in FinTechs: An explanation through business model scalability and market valuation. *Sustainability 12*(24),10316. 1-24. https://doi.org/10.3390/su122410316

Murinde, V., Rizopoulos, E., & Zachariadis, M. (2022). The impact of the FinTech revolution on the future of banking: Opportunities and risks. *International Review of Financial Analysis, 81*,102103, 1-27. https://doi.org./10.1016/j.irfa.2022.102103

Nedelcu, B., Stefanet, M-E., Tamasescu, I-F., Tintoiu, S-E., & Vezeanu, A. (2015). Cloud computing and its challenges and benefits in the bank system. *Database Systems Journal, 6*(1), 44–58.

Nguyen, D.K., Sermpinis, G., & Stasinakis, Ch. (2022). Big Data, artificial intelligence and machine learning: A transformative symbiosis in favour of financial technology. *European Financial Management, 29*(2), 517-548. https://doi.org/10.1111/eufm.12365

Nicoletti, B. (2021). *Banking 5.0: How Fintech Will Change Traditional Banks in the 'New Normal' Post Pandemic.* 1st ed. 2021 edition. Cham: Palgrave Macmillan.

Nicoletti, B.,Nicoletti, W., & Weis, A. (2017). *Future of FinTech. Integrating Finance and Technology in Financial Services.* Cham: Palgrave Macmillan.

Oliva, G.A., Hassan, E.E., & Jiang, Z.M. (2020). An exploratory study of smart contracts in the Ethereum blockchain platform. *Empirical Software Engineering, 25*(3), 1864–1904. https://doi.org/10.1007/s10664-019-09796-5

Omarini, A. (2018). The retail bank of tomorrow: A platform for interactions and financial services. Conceptual and managerial challenges. *Research in Economics and Management, 3*(2), 110-133. https://dx.doi.org/10.22158/rem.v3n2p110

Omarini, A. (2020). FinTech: A new hedge for a financial re-intermediation. Strategy and risk perspectives. *Frontiers in Artificial Intelligence, 3*(63), 1-11. https://doi.org/ 10.3389/frai.2020.00063

Omarini, A. (2021). FinTech and regulation: From start to boost – A new framework in the financial services industry. Where is the market going? Too early to say. In T. King, F.S.S., Lopes, A. Srivastav, & J. Williams (Eds.),

Disruptive Technology in Banking and Finance: An International Perspective on FinTech (pp. 241–262). Cham: Palgrave Macmillan.

Parker, G., Van Alstyne, M.W., & Jiang, X. (2016). Platform ecosystems: How developers invert the firm. *MIS Quarterly, 41*(1), 255-266. https://www.jstor.org/stable/26629646

Pedersen, N. (2020). *Financial Technology: Case Studies in Fintech Innovation.* London: Kogan Page Publishers.

Pereira, J., Tavalaei, M.M., & Ozalp, H. (2019). Blockchain-based platforms: Decentralized infrastructures and its boundary conditions. *Technological Forecasting and Social Change*, 146, 94–102. https://doi.org/10.1016/j.techfore.2019.04.030

Perscheid, G., Ostern, N.K., & Moormann, J. (2020). Determining platform governance: Framework for classifying governance types. In *Forty-First International Conference on Information Systems Preecedings* (pp. 1-16). 8. India, 1-16. Retrieved from https://aisel.aisnet.org/icis2020/governance_is/governance_is/8

Pollari, I. (2018). The rise of digital platforms in financial services. KPMG. Retrieved from https://assets.kpmg.com/content/dam/kpmg/xx/pdf/2018/02/kpmg-rise-of-digital-platforms.pdf

Premchand, A., & Choudhry, A. (2018). Open banking & APIs for transformation in banking. In *2018 International Conference on Communication, Computing and Internet of Things (IC3IoT)* (pp. 25-29). IEEE, Chennai, India. https://doi.org/10.1109/IC3IoT.2018.8668107

Pugliese, V. (2020). Open banking platforms: Minimizing the risk of fintech partnerships. *American Bankers Association. ABA Banking Journal, 112*(1), 51–51.

Rajnak, V., & Puschmann, T. (2021). The impact of blockchain on business models in banking. *Information Systems and E-Business Management, 19*(3), 809–861. https://doi.org/10.1007/s10257-020-00468-2

Rietveld, J., & Schilling, M.A. (2021). Platform competition: A systematic and interdisciplinary review of the literature. *Journal of Management, 47*(6), 1528–1563. https://doi.org/10.1177/0149206320969791

Saadatmand, F., Lindgren, R., & Schultze, U. (2019). Configurations of platform organizations: Implications for complementor engagement. *Research Policy, 48*(8),103770, 1-17. https://doi.org/10.1016/j.respol.2019.03.015

Sarker, S., Saonee Sarker, S., Sahaym, A., & Bjørn-Andersen, N. (2012). Exploring value cocreation in relationships between an ERP vendor and its partners: A revelatory case study. *MIS Quarterly, 36*(1), 317–338. https://doi.org/10.2307/41410419

Scardovi, C. (2017). *Digital Transformation in Financial Services*. Cham: Springer International Publishing.

Schad, J., Lewis, M.W., Raisch, S., & Smith, W.K. (2016). Paradox research in management science: Looking back to move forward. *Academy of Management Annals, 10*(1), 5–64. https://doi.org/10.5465/19416520.2016.1162422

Schreieck, M., Wiesche, M., & Krcmar, H. (2016). Design and governance of platform ecosystems - key concepts and issues for future research. In *ECIS*, Istanbul, Turkey, *16*, 12-15. Retrieved from https://aisel.aisnet.org/ecis2016_rp/76/

Sironi, P. (2021). *Banks and Fintech on Platform Economies: Contextual and Conscious Banking*. 1st edition. Chichester, West Sussex, United Kingdom: Wiley.

Smith, W.K., & Lewis. M.L. (2011). Toward a theory of paradox: A dynamic equilibrium model of organizing. *Academy of Management Review, 36*(2), 381–403. http://doi.org/10.5465/amr.2009.0223

Staub, N., Haki, K., Aier, S., & Winter, R. (2021). Taxonomy of digital platforms: A business model perspective. In *Proceedings of the 54 Hawaii International Conference on System Sciences (HICSS)*. Kauai, USA. Retrieved from https://hdl.handle.net/10125/71364

Sterman, J. (2000). *Business Dynamics: Systems Thinking and Modeling for a Complex World*. Irwin/McGraw-Hill.

Szpringer, W. (2020). *Zarządzanie Przez Algorytmy*. Warszawa: Poltext.

Tanda, A., & Schena, C.M. (Eds.). (2019). Bank strategies in the light of the digitalisation of financial activities. In *FinTech, BigTech and Banks, Palgrave Macmillan Studies in Banking and Financial Institutions* (pp. 51-81). Cham: Springer International Publishing.

Teigland, R., Siri, S. Larsson, A., Puertas, A.M., & Bogusz, C.I. (Eds.). (2018). *The Rise and Development of Fintech: Accounts of Disruption from Sweden and Beyond*. London: Routledge.

Tilson, D., Lyytinen, K., & Sørensen, C. (2010). Research commentary—Digital infrastructures: The missing IS research agenda. *Information Systems Research, 21*(4), 748–59. https://doi.org/10.1287/isre.1100.0318

Tiwana, A. (2014). *Platform Ecosystems: Aligning Architecture, Governance, and Strategy*. Morgan Kaufmann, Waltham, USA.

Tiwana, A., Konsynski, B., & Bush, A.A. (2010). Research commentary — Platform evolution: Coevolution of platform architecture, governance, and environmental dynamics. *Information Systems Research, 21*(4), 675–687. https://doi.org/10.1287/isre.1100.0323

Van der Merwe, A. (2021). Cryptocurrencies and other digital asset investments. In M. Pompella, & R. Matousek (Eds.), *The Palgrave Handbook of FinTech and Blockchain*, (pp. 445–471). Cham: Palgrave Macmillan. https://doi.org/10.1007/978-3-030-66433-6

Vella, G., & Gastaldi, L. (2021). Blockchain platform ecosystem: An empirical analysis on the Italian banking sector. *In 28th Innovation and Product Development Management Conference (IPDMC)* (pp. 1-12). Milan, Italy.

Walker, T., & Morris, L. (2021). *The Handbook of Banking Technology*. John Wiley & Sons, Chichester, United Kingdom.

Wang, R., Lin, Z., & Luo, H. (2019). Blockchain, bank credit and SME financing. *Quality & Quantity, 53*(3),1127–1140. https://doi.org/10.1007/s11135-018-0806-6

Wareham, J. Fox, P.B., & Giner, J.L.C. (2014). Technology ecosystem governance. *Organization Science, 25*(4), 1195–1215. https://doi.org/10.1287/orsc.2014.0895

Weick, K. E. (1995). What theory is not, theorizing is. *Administrative Science Quarterly, 40*(3), 385-390. https://doi.org/10.2307/2393789

Wewege, L., & Thomsett, M.C. (2019). *The Digital Banking Revolution: How Fintech Companies Are Transforming the Retail Banking Industry through Disruptive Financial Innovation*. Walter de Gruyter, Boston/Berlin.

Wilhelm, M., & Sydow, J. (2018). Managing coopetition in supplier networks – A paradox perspective. *Journal of Supply Chain Management, 54*(3), 22–41. https://doi.org/10.1111/jscm.12167

Wirsbinski, J.W. (2008). Paradox: Systems thinking at its best or at its worst. In *2008 IEEE International Conference on System of Systems Engineering* (pp. 1-6). IEEE, Monterey, USA. https://doi.org/10.1109/SYSOSE.2008.4724160

Yermack, D. (2017). Corporate governance and blockchains. *Review of Finance, 21*(1), 7–31. https://doi.org/10.1093/rof/rfw074

Yiling, F., Weili, Z., & Qiaosong, J. (2019). Evolution of digital platform-based ecosystem: A theoretical framework. In *2019 International Conference on Strategic Management* (ICSM 2019) (pp. 241-249), 9. Retrieved from https://webofproceedings.org/proceedings_series/ECOM/ICSM%202019/ICSM022.pdf

Zachariadis, M., & Ozcan, P. (2017). The API economy and digital transformation in financial services: The case of open banking. SWIFT Institute Working Paper, No.2016-001. http://dx.doi.org/10.2139/ssrn.2975199

Zavolokina, L., Miscione, G., & Schwabe, G. (2020). Buyers of "lemons": How can a blockchain platform address buyers' needs in the market for "lemons"? *Electronic Markets, 30*(2), 227–239. https://doi.org/10.1007/s12525-019-00380-9

Zheng, X.R., & Lu, Y. (2021). Blockchain technology – Recent research and future trend. *Enterprise Information Systems, 16*(12), 1–23. https://doi.org/10.1080/17517575.2021.1939895

Abstrakt

CEL: *Sektor bankowy znajduje się pod silną presją cyfryzacji. Jednym z towarzyszących procesów jest rozwój platform cyfrowych i ekosystemów platform oferujących usługi bankowe. Artykuł ma na celu przedstawienie dynamicznego wzorca zachowania partnerów, wynikającego z napięć między kosztami zarządzania a wartością współtworzoną w ramach platform oferujących usługi bankowe.* ***METODYKA:*** *W badaniu zastosowano podejście oparte na systematycznym przeglądzie 54 publikacji wybranych z baz Scopus i Web of Science. Przyjęliśmy podejście składające się z dwóch etapów. Pierwszym był przegląd literatury i krytyczna analiza źródeł, które są związane z naszymi pytaniami badawczymi. W drugim etapie proponujemy procedurę badawczą opartą na diagramie pętli przyczynowych jak również diagram zasobów i przepływów, które są narzędziami badawczymi wykorzystywanymi w modelowaniu dynamiki systemów.* ***WYNIKI:*** *Istnieją różne rodzaje platform, a do najważniejszych należą platformy oparte*

na technologiach blokchain oraz cloud. W obu tych typach platform ważne są relacje między właścicielami, komplemantariuszami i klientami. Napięcia występujące między kosztami zarządzania i współtworzoną wartością kształtują wzorce zachowań wśród partnerów platform. Stopień powiązania między uczestnikami platformy oraz stopień centralizacji usług bankowych zależy od rodzaju platformy. W artykule podkreślono, że platformy oparte na blockchain i technologii chmurowej odgrywają znaczącą role w transformacji obecnych usług bankowych. Wybór typu platformy ma istotne implikacje dla platformizacji usług bankowych. IMPLIKACJE: Wzorce zachowań wśród partnerów platform identyfikują samowzmacniającą się dynamikę, która sugeruje, w jaki sposób menedżerowie mogą radzić sobie z napięciami w sytuacji występowania asymetrii korzyści i ryzyka. Wyniki badań mogą mieć walor informacyjny dla organów nadzorczych nad sektorem finansowym i pomóc w wypracowaniu polityki zmniejszającej asymetrię korzyści i przyczyniającej się do bardziej zrównoważonego rozwoju platform cyfrowych. ORYGINALNOŚĆ I WARTOŚĆ: Artykuł odnosi się do perspektywy teorii paradoksu anal-izowanej w kontekście przekształceń sektora bankowego pod wpływem intensywnych procesów cyfryzacji i kreacji nowych ekosystemów platform. Jest to temat, który do tej pory nie był badany w tym kontekście.

***Słowa kluczowe:** platformy oparte na blockchain, platformy oparte na technologii cloud, teoria paradoksu, transformacja sektora bankowego, usługi bankowe, chmura*

Biographical notes

Piotr Łasak (Ph.D., Hab.) is an Associate Professor at the Institute of Economics, Finance and Management, Jagiellonian University in Krakow, Poland. His research, publication and teaching activities focus on banking, corporate finance and international finance. Among the main research topics are financial market development, regulation and supervision, mechanisms of financial and currency crises, and shadow banking system development. Among his particular research interests is the development of the Chinese financial market. The current, main research area is concerned with financial technology (FinTech) and the banking sector transformation as the consequence of the processes of digitalization and the influence of financial technologies. He is author of several publications on this subject.

Sławomir Wyciślak (Ph.D.) is an Associate Professor at the Institute of Economics, Finance and Management, Jagiellonian University in Krakow, Poland. His research, publication and teaching activities focus on system approach applications in social science, digital technologies' implications for complex systems, risk management, and supply chain management. The current main research area is digital platforms navigation. Parallel to his academic career, Slawomir Wyciślak has worked on digitization projects in multinational companies.

Authorship contribution statement

Piotr Łasak: Conceptualization, Formal Analysis, Investigation, Methodology, Validation, Visualization, Writing - Original Draft, Writing - Review & Editing. **Sławomir Wyciślak:** Conceptualization, Formal Analysis, Investigation, Methodology, Validation, Visualization, Writing - Original Draft, Writing - Review & Editing.

Conflicts of interest

The authors declare no conflict of interest.

Citation (APA Style)

Financial and non–financial factors in companies' adaptation process towards sustainability and sustainable business models

Magdalena Zioło[1] iD*, Elżbieta Szaruga[2]* iD
Anna Spoz[3] iD

Abstract

PURPOSE: *The influence of environmental, social, and governance (ESG) factors on financial performance has been confirmed in the literature. The article aims to examine the relationship between financial and non-financial factors in enterprises and to indicate for which groups of enterprises the relationship of ESG and financial performance is most visible in the context of building sustainable business models and the ability to adapt to sustainability. The article assumes that enterprises' financial and non-financial results determine their adaptability to sustainability, and there is a relationship between financial results, non-financial performance, and companies' sustainable business models.* **METHODOLOGY:** *The analysis encompasses 11 EU countries in the period 2008–2020. The study analyzed 6,864 observations, that is, 96,096 data cells. The data are divided into two groups of variables: financial and non-financial. The research is based on clusters analysis and ANOVA. It was carried out in two stages. In the first step, enterprises were grouped into clusters according to the financial condition criterion, considering the enterprise's size and sector and country in which it operates. In the next step, it was checked whether enterprises with good financial standing also achieve better non-financial results.* **FINDINGS:** *It was found that large enterprises achieve better financial results than small and medium-sized enterprises, even though they operate in the same location and sectors. It can be emphasized there are statistical differences between entities with relatively good financial conditions and those with relatively weaker financial conditions in the context of such values as gender employment gap, total*

1   Magdalena Zioło, Professor, Faculty of Economics and Management, University of Szczecin, Mickiewicza 64, 71-101 Szczecin, Poland, e-mail: magdalena.ziolo@usz.edu.pl (ORCID: https://orcid.org/0000-0003-4136-046X).
2   Elżbieta Szaruga, Assistant Professor, Institute of Management, University of Szczecin, Cukrowa 8, 71-004 Szczecin, Poland, e-mail: elzbieta.szaruga@usz.edu.pl (ORCID: https://orcid.org/0000-0001-6205-1311).
3   Anna Spoz, Assistant Professor, Institute of Economics and Finance, The John Paul II Catholic University of Lublin, Aleje Racławickie 14, 20-950 Lublin, Poland, e-mail aspoz@kul.lublin.pl (ORCID: https://orcid.org/0000-0001-5071-0017).

population living in households considering that they suffer from noise, greenhouse gas emission, Corruption Perceptions Index. The companies with relatively better financial standing achieve a smaller gender employment gap (at the national level) than entities with relatively worse financial conditions. It is similar to referring to the greenhouse gas (GHG) level. **IMPLICATIONS***: The results of this study may be useful for managements of companies in developing strategies of transformation towards sustainability, thanks to the fact that they provide information on what factors should be taken into account in the transformation process.* **ORIGINALITY AND VALUE:** *The originality of this study lies in the fact that it takes into account both financial and non-financial factors and examines the relationships between these factors in the process of companies' adaptation towards sustainability and sustainable business model.*

*Keywords: sustainable business models**, ESG, financial performance, risk, sustainability, adaptation, companies, financial factors, non-financial factors*

INTRODUCTION

The environmental, social, and governance (ESG) risk, and counteracting its effects require adjustment processes that are a challenge for all market participants. The risk of non-financial factors is among the top five in impact strength (Global Risks Report, 2021; KPMG, 2021) and is a global challenge for governments, enterprises, households, and financial markets. The relationship between ESG factors and financial performance is documented and well recognized in the literature (Friede et al., 2015; De Lucia et al., 2020). The impact of ESG on the financial situation of enterprises (but not only) is one of the factors determining the necessity to undertake adaptive actions and change their business models towards sustainable business models. The second important factor determining the transition is the regulations introduced at the national and international level. The European Union, which remains the leader in terms of regulations (176 reported for Europe in 2020, Drei et al., 2019) supporting the implementation of the concept of climate neutrality, has adopted several legal solutions in this area.

The relationship between ESG and financial performance has been analyzed in many contexts for various sectors and types of enterprises (Velte, 2017). There is a lack of in-depth analyses considering typological groups of enterprises and research showing how enterprises from different groups adapt to sustainability. The article fills this gap and attempts to classify enterprises considering financial and non-financial variables, and then examines the specificity of the behavior of these enterprises relating to their adaptation and adjustment activities.

The article aims to investigate whether the financial results of enterprises determine their adaptability to sustainability and whether there is a relationship between financial results and non-financial performance. The main research questions (RQs) are:

RQ1) Is there a relationship between companies' financial condition and their non-financial performance?

RQ2) How do sector, size, country, and financial results matter for companies' ability to adapt to sustainability?

The paper is organized as follows: the introduction in Section 1; Section 2 presents the literature review. In Section 3, the methodological approach, data collection procedure, and description of methods are described. Section 4 discusses the research results, and Section 5 is the conclusion.

LITERATURE REVIEW

The growing interest in the issue of business models among scientists began in the mid-1990s and was related to the dotcom boom. Along with the development of research in this area, new definitions of this concept were created, presenting alternative approaches. Knyphausen-Aufsess and Meinhardt (2002) and Magretta (2002) perceived the business model as a simplified organizational system, the scheme of the functioning of the enterprise. Casadesus-Masanell and Ricart (2010), Massa et al. (2017), and Richardson (2008) drew attention to the relationship between the business model and the company's operating strategy and the achievement of its goals. The latter also emphasizes the role of the business model in creating, delivering and capturing value. A similar approach was presented by Osterwalder and Pigneur (2010), who defined the business model as "the rationale of how an organization creates, delivers, and captures value." Magretta (2002) additionally highlights for whom this value is created and how the value can be delivered at the appropriate cost. The relationship between the value created for the customer and the structure of the company's costs and revenues can also be found in the description of the business model proposed by Teece (2010). Creating value requires an appropriate configuration of the company's resources and technological potential (Chesbrough & Rosenbloom, 2002) and appropriate cooperation with its partners (Zott & Amit, 2010). Business models can contribute to the construction of the techno-economic network of innovation (Doganova & Eyquem-Renault, 2009,) as well as they can be a way to achieve and maintain a competitive advantage (Wirtz et al., 2016).

Scientists and managers are increasingly using business models not only to create economic but also social and environmental value (Dohrmann et al., 2015). The inclusion of ESG factors in the business model means its transformation towards a sustainable business model (SBM). Lüdeke-Freund et al. (2016) note that compared to traditional, sustainable business models expand the possibilities of developing innovative solutions in the field of

environmental and social issues that may be a source of competitive advantage for an enterprise (Porter & Kramer, 2011). They also broaden the concept of value with non-financial values, i.e., social and environmental ones (Bocken et al., 2014), and offer a broader perspective of value creation at the system level – they extend the current perspective focused on customers and shareholders with new groups of stakeholders. Yang et al. (2017) and Goni et al. (2021) perceived the innovation of the SBM model in the expansion of the relationship with stakeholders and the change in this relationship. This relationship should be viewed and shaped in a broad and long-term perspective, enabling them to be mutually beneficial and lasting relationships with key internal and external stakeholders based on trust (Gulati & Kletter, 2005; Evans et al., 2017). As defined by Bocken et al. (2013) "sustainable business models seek to go beyond delivering economic value and include a consideration of other forms of value for a broader range of stakeholders."

Sustainable business models can be created by combining business model patterns (Abdelkafi et al., 2023). Based on a literature review, Ferreira et al. (2021) distinguished five areas of SBM-related issues addressed in scientific publications: SBM implementation, SBM challenges, institutional SBM, circular SBM, and emerging SBM. Mignon and Bankel (2023) point out that companies often struggle to identify, develop and implement sustainable business models that suit them. In the literature on the subject, more and more studies are devoted to patterns of sustainable business models (Schroedel, 2023; Ferreira et al., 2021; Shakeel et al., 2020; Lüdeke-Freund et al., 2018, Bocken 2014).

The transformation of the business model towards a sustainable business model requires adaptation measures. Sustainable adaptation is about redesigning a company's business activities (on a strategic and operational level) in such a way that it is able to create sustainable value for a wide range of stakeholders. Alkaya et al. (2015) emphasize that creating a sustainable business model requires a system of sustainable value flows among multiple stakeholders, including the natural environment and society as primary stakeholder.

In the literature on the subject, two research directions can be distinguished on the adaptation process towards sustainable business models. The first relates to changes introduced to the already existing business models, i.e., adaptation to the new conditions of the company's operation. As a rule, it is a process of adapting the way a company operates, to changes in its environment (and thus triggered by external factors) (Teece, 2010; Demil & Lecocq, 2010). The second direction results from the need to create innovative solutions by implementing an innovative business model (Aspara et al., 2010; Casadesus-Masanell & Zhu, 2013). In this context, changing the business model enables an innovative approach to the problem (including ESG factors in decision-making processes) and is a way to gain a competitive advantage. "At root, business model innovation

refers to the search for new logics of the firm and new ways to create and capture value for its stakeholders" (Aspara et al., 2010).

Many factors influence the company's decision to change its business model to a sustainable one. They may result from the need to adapt to a "new" perception of business or be driven by factors such as the personal values of entrepreneurs and their attitude to change (Rauter et al., 2017). Independent studies by Stoughton and Ludema (2012) and Rauter et al. (2013) show that the organizational culture of the company and the commitment of the leaders and the entire staff determine the possibility of successfully completing the transformation process towards sustainable development. External factors may include legal regulations (Lozano, 2015), pressure from stakeholders (Thorisdottir & Johannsdottir, 2019; Lozano, 2015; Wolf, 2014), and technological innovations (Cheah et al., 2018; Rantala et al., 2018; Evans et al., 2017).

Lüdeke-Freund et al. (2016) point out that each adaptation process towards a sustainable business model is an individual process. Depending on the size of the company, the industry in which it operates and its individual needs, adaptation activities may include: creating a sustainable product offer (Reeves et al., 2012; Joyce & Paquin, 2016), using energy-saving/green technologies (Oghazi & Mostaghel, 2018; Chasin et al., 2020), reducing water consumption (Jamaludin & Yusof, 2013; Bocken et al., 2018), supporting charity campaigns/supporting local community (Zufall et al., 2020; Ball & Lunt, 2020), and applying employee friendly policies (Joyce & Paquin, 2016; Minoja & Romano, 2021). The transformation of the business model towards a sustainable business model requires financial outlays, but its implementation may result in an increase in revenues, e.g., as a result of increasing sales, expanding the group of customers, etc. Despite the growing number of publications in the field of SBM, there is no research on what factors determine the adaptability of enterprises and what is the significance of financial factors in the adaptation process, and whether there is a relationship between financial and non-financial results and sustainable business models of enterprises.

METHODOLOGY

The paper uses several statistical methods, spatial data exploration, and data mining techniques, including ANOVA (Huang, 1998), k-means (standardized by Euclidean distance) (Grandoni et al., 2022), Kruskal-Wallis test (Ruxton & Beauchamp, 2008), the Wilks multivariate significance test (Liu et al., 2011), Mann-Whitney U test (Rosner & Grove, 1999), Bonferroni test (Armstrong, 2014), Scheffé tests (Brown, 2005), Dunnett's test (Brown, 2005), and selected descriptive statistics.

The research procedure was carried out in 7 steps (Figure 1).
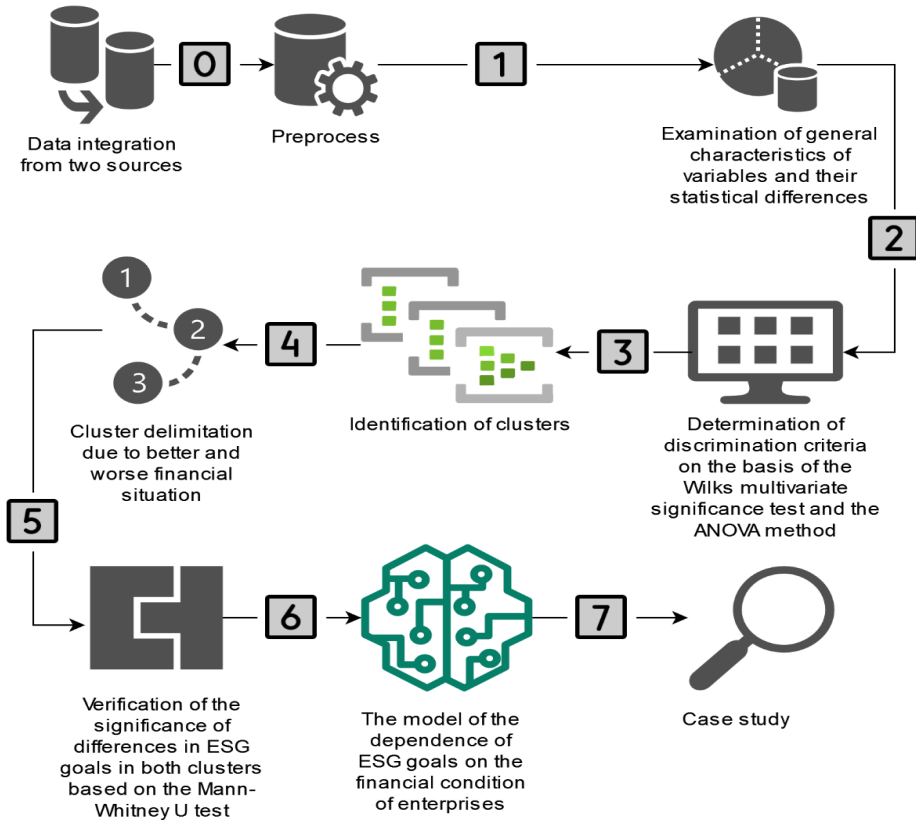
Figure 1. The framework of the authors' research procedure (methodology)

- In stage 1, the general characteristics of the examined financial and non-financial variables and their statistical differences were analyzed using the Kruskal-Wallis test for financial variables from the national perspective (country as a grouping variable).

The Kruskal-Wallis test formula used in step 1 can be written as follows (Hoffman, 2019):

$$H = \frac{12}{N(N+1)} \sum \frac{R_i^2}{n_i} - 3(N+1) \tag{1}$$

where N is the total number; n_i is the number in the i-th group, R_i is the total sum of ranks in the i-th group. All data are ordered in ascending order from lowest to highest. Then they are ranked, summed for each subgroup, and the probability is calculated. Furthermore, the value of H is tested against the chi-square distribution for k-1 degrees of freedom (k is the number of groups). In the case of ties, a correction (introducing a small difference) is applied. If the Kruskal-Wallis test takes into account only two groups for the grouping variable, it would reflect the Mann-Whitney U test.

- In stage 2, the ANOVA method and the Wilks multivariate significance test were used to investigate whether the country, sector, and size of the enterprise (latent variables expressed on a nominal scale) differentiate financial characteristics. At this stage, the criteria for cluster discrimination necessary for stage 3 were identified.

In the second stage, the Wilks lambda (λ) statistic (Marcoulides and Hershberger, 2014) and the F statistic can be written (Richardson, 2011):

$$\lambda = \frac{1}{1 + (k-1)(N-k)F} \tag{2}$$

$$F = \frac{[\eta^2 \cdot (N-k)]}{[(1-\eta^2)(k-1)]} \tag{3}$$

$$\eta^2 = \frac{SS \ (between \ groups)}{SS \ total} \tag{4}$$

where *SS (between groups)* is the sum of the squares of the effect for the independent variable, *SS* total is the total of the sum of squares, *1 − k* and *N − k* are the degrees of freedom (df), N is the number of total observations, and k is the number of groups.

- In stage 3, the k-means method was used to determine clusters. This stage was validated using V-fold cross-validation. However, the cost sequence graph was used to determine the optimal number of clusters.

The Euclidean distance can be represented by the formula (Suchecki & Lewandowska-Gwarda, 2010):

$$d(o_i, o_j) = \left[\sum_{k=1}^{m} (x_{ik} - x_{jk})^2 \right]^{\frac{1}{2}} \tag{5}$$

where x_{ik}, x_{jk} are the normalized values of the k-th variable for the objects o_i and o_j; $d(o_i, o_j)$ is the distance between the two objects to be analyzed.

- In stage 4, the clusters of better and worse financial conditions were delimited to each other based on normalized means. It was also assumed that the cluster number is a hidden variable related to a relatively better or worse financial condition.
- Subsequently, in stage 5, the Mann-Whitney U test (with continuity correction) was used to test whether clusters significantly differentiate ESG indicators (non-financial data at the national level). On its basis, non-financial indicators were identified, which are statistically different due to the cluster (with the relatively better and worse financial condition). In this step, it was legitimate to compare non-financial indicators between the two designated clusters (with the better and worse financial condition).

The statistics of the Mann-Whitney U test were used (Corder & Foreman, 2014):

$$U_i = n_1 n_2 + \frac{n_i(n_i + 1)}{2} - \sum R_i \tag{6}$$

where U_i is the test statistics for the full sample; n_i is a number of values from the full sample; n_1 is a number from the first sample; n_2 is a number from the second sample; $\sum R_i$ is the sum of the ranks from the full sample.

- Then (in stage 6), a model of the dependence of ESG goals (non-financial variables - statistically significant in the previous stage) on the financial condition of enterprises was built (the cluster is a hidden variable). The Bonferroni and Scheffé tests were used when the samples had few but equal variances, and Dunnett's test was used when the samples were few and unequal.
- The last step (stage 7) concerns the example of large companies in the transport and storage sector (a case study). In it, a dedicated ANOVA model was built and the dependence on financial conditions of large companies in the transport and storage sector for sustainable development (partial eta-squared) was verified.

The results from the previous stage determined the criteria for selecting the method and variables in the next stage. The list and definitions of all variables are presented in Table 1.

Table 1. Definitions of variables

	Variable name	Variable definition	Variable calculation
Financial variables			
1	Total assets	Total amount of assets owned by an entity	-
2	Net turnover	Includes sales of goods and services net of returns, deductions and rebates. Sales are net of VAT and Excise taxes	-
3	EBIT	Earnings Before Interest and Taxes	Revenue minus expenses excluding tax and interest
4	EBITDA	Earnings Before Interest, Taxes, Depreciation, and Amortization	EBIT + depreciation + amortization
5	Operating working capital	Operating current assets minus operating current liabilities	Operating current assets minus operating current liabilities
Non-financial variables			
6	Gender employment gap	The disparity in employment rates between men and women aged 20 to 64 (as a percentage of the total population) (Eurostat, 2023a)	The number of employed persons aged 20 to 64, divided by the total population of the same age group (Eurostat, 2023a)
7	Final energy consumption	Energy consumed by end users in the country (in tonnes of equivalent oil per capita) excluding energy used for non-energy purposes. The variable includes only the energy consumed by end users, such as transport, industry, services, households and agriculture; energy consumption by the energy sector itself and losses resulting from energy transformation and distribution is excluded (Eurostat, 2023b)	-
8	Total population living in households considering that they suffer from noise (Eurostat, 2023c)	The percentage of people who claim that noise from the street or from their neighbors negatively affects them (as a percentage of the population) (Eurostat, 2023c)	The number of persons declaring that they are affected either by noise from the street or from their neighbors divided by the total population (Eurostat, 2023c)
9	Greenhouse gas emissions	Total emissions of the country (in tonnes per capita) of the so called 'Kyoto basket' of greenhouse gases, including carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), and the so-called F-gases (perfluorocarbons, hydrofluorocarbons, nitrogen trifluoride (NF_3) and sulfur hexafluoride (SF_6)) from all sectors of the GHG emission inventories (including international aviation and indirect CO_2) (Eurostat, 2023d)	-
10	Corruption Perceptions Index	A rank based on the perception of a country's public sector as corrupt, where a score of 0 represents a very high level of corruption and a score of 100 represents a very clean country (Eurostat, 2023e)	Composite index based on a combination of surveys and evaluation of corruption from 13 distinct sources and scores (Eurostat, 2023e)

Source: Own elaboration based on Eurostat (2023). Retrieved from https://ec.europa.eu/eurostat/en/

Secondary data come from the BACH database and Eurostat database. The spatial scope of the study concerns such countries as Austria, Belgium, Croatia, Czech Republic, France, Germany, Italy, Poland, Portugal, Slovakia, and Spain. They cover the period from 2008 to 2020. The study analyzed 6,864 observations, that is, 96,096 data cells. It gives 624 observations for each country separately. The quantitative data are divided into two groups: financial and non-financial. This dataset has been extended to include qualitative data on a nominal scale:

- Business sector: Agriculture, forestry and fishing; Electricity, gas, steam, and air conditioning supply; Extraction of crude petroleum and natural gas; Manufacture of chemicals and chemical products; Manufacture of computer, electronic and optical products; Manufacture of electrical equipment; Manufacture of motor vehicles, trailers and semi-trailers; Manufacture of other transport equipment; Mining and quarrying; Mining of coal and lignite; Mining of metal ores; Transportation and storage.
- Size of enterprise: Large, medium, small, SMSs.

Table 2 contains annual average values for financial variables and Table 3 contains annual average values for non-financial variables.

Table 2. Annual average values of financial variables from 2008 to 2020

Country	Total assets	Net turnover	EBITDA	EBIT	Operating working capital
Austria	3610.89	2981.09	375.42	208.28	199.51
Belgium	6917.41	3425.65	472.15	288.17	167.67
Croatia	744.19	396.73	57.17	20.65	38.70
Czech Republic	1432.24	1466.84	185.35	117.95	110.81
France	22005.32	14298.36	1531.50	843.87	1208.95
Germany	23318.45	24282.57	1843.24	1090.58	1402.39
Italy	22389.69	13752.62	1761.41	913.66	1842.44
Poland	5235.42	4471.11	563.74	273.57	643.92
Portugal	3186.09	1572.30	281.42	158.57	139.93
Slovakia	675.34	643.53	56.45	25.45	39.47
Spain	11541.35	6294.95	854.57	486.58	742.65
Total	9186.94	6689.61	725.67	402.49	594.22

Note: These means statistically differ from each other (in the sense of the Kruskal-Wallis test) in about 80% of the investigated countries for each variable (multiple comparisons).
Source: Own calculation based on data from the BACH and Eurostat databases.

Based on the analyzed data, it can be concluded that the countries differ statistically from each other in terms of the examined financial and non-financial characteristics. To explore the data pattern, it was verified whether the nominal scale expressions, i.e., country, size, and sector (hidden variables), significantly differentiate the financial characteristics. For this purpose, the ANOVA method and the Wilks multivariate significance test (Table 4) were used.

Table 3. Annual average values for non-financial variables from 2008 to 2020

Country	Gender employment gap	Final energy consumption	Total population living in households considering that they suffer from noise	Greenhouse gas emissions	Corruption Perceptions Index
Austria	9.08	3.21	18.85	9.62	75.54
Belgium	9.98	3.20	17.66	11.27	74.69
Croatia	10.74	1.62	9.72	6.11	46.08
Czech Republic	17.02	2.35	14.99	12.67	52.00
France	6.88	2.25	17.75	7.41	69.69
Germany	9.22	2.62	25.70	11.35	79.77
Italy	19.84	1.99	17.44	7.86	45.85
Poland	14.55	1.75	14.16	10.65	57.08
Portugal	7.52	1.61	23.43	6.80	61.85
Slovakia	14.43	1.98	14.63	7.88	47.85
Spain	11.58	1.80	17.52	7.70	60.62
Total	11.89	2.22	17.44	9.03	61.00

Note: These means statistically differ from each other (in the sense of the Kruskal-Wallis test) in about 90% of the investigated countries for each variable (multiple comparisons).
Source: Own calculation based on data from the BACH and Eurostat databases.

Table 4. The Wilks multivariate significance test for financial characteristics

Effect	Test	Value	F	Effect (df)	Error (df)	p-value
Const	Wilks	0.4004	1896.060	5	6332.00	< 1%
Country	Wilks	0.2913	179.407	50	28881.73	< 1%
Size	Wilks	0.3833	483.948	15	17480.27	< 1%
Sector	Wilks	0.2206	205.783	55	29312.97	< 1%
Country*Size	Wilks	0.1905	83.163	150	31316.31	< 1%
Country*Sector	Wilks	0.0398	52.146	550	31639.42	< 1%
Size*Sector	Wilks	0.1184	102.364	165	31376.11	< 1%
Country*Size*Sector	Wilks	0.0048	36.721	1650	31662.99	< 1%

Source: Own calculation based on data from the BACH and Eurostat databases.

As shown in Table 4, such variables as total assets, net turnover, EBITDA, EBIT, and operating working capital are significantly differentiated by country, sector, and company size. Thus, we can treat these hidden variables as a discrimination

criterion (division into clusters). Taking into account all financial characteristics and hidden variables (country, sector, and size), the optimal number of clusters was determined using the k-means method, equal to 2 (the optimal number of clusters was selected based on a V-fold cross-validation and cost sequence plot). Tables 5 and 6 contain information on the components of clusters, clusters 1 and 2, respectively. Cluster 2 achieves better financial results than cluster 1, as shown in Figure 2.
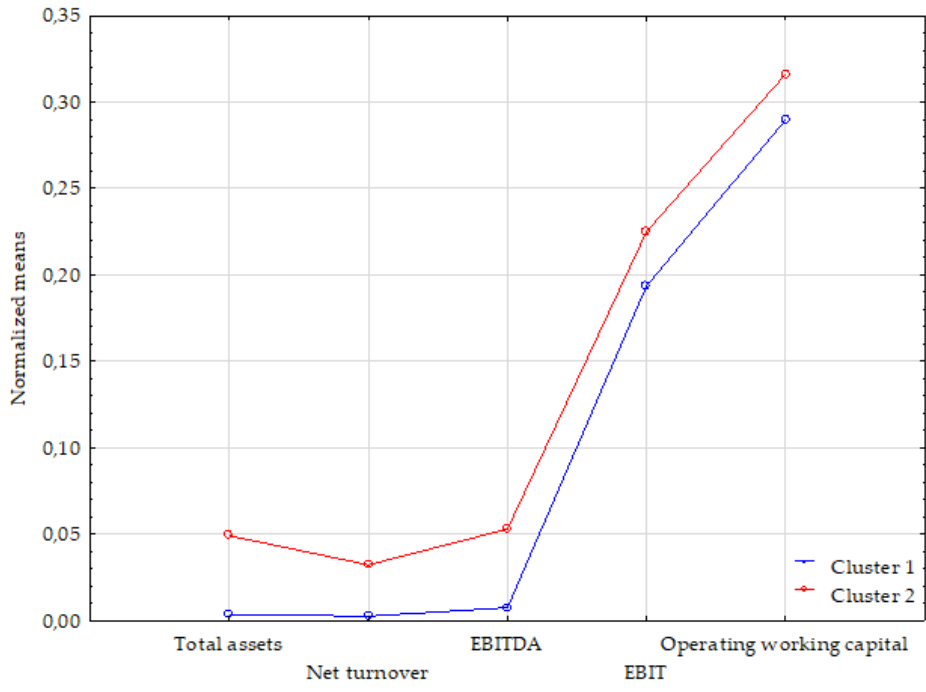
Figure 2. Normalized means of financial characteristics for 2 clusters (k-means)
Source: Own calculation based on data from the BACH and Eurostat databases.

Table 5. Cluster 1 components by the k-means method

Countries	Sectors	Size
Austria, Belgium, Croatia, Germany, Italy, Poland, Portugal, Slovakia, Spain	Agriculture, forestry and fishing	all
Austria, Belgium, Croatia, Germany, Italy, Poland, Portugal, Slovakia, Spain	Extraction of crude petroleum and natural gas; Manufacture of motor vehicles, trailers and semi-trailers; Manufacture of other transport equipment; Mining and quarrying; Mining of coal and lignite; Mining of metal ores	medium, small, SMSs

Countries	Sectors	Size
Austria, Belgium, Croatia, Germany, Poland, Portugal, Slovakia, Spain	Manufacture of chemicals and chemical products; Manufacture of electrical equipment	medium, small, SMSs
Austria, Belgium, Croatia, Poland, Portugal, Slovakia, Spain	Manufacture of computer, electronic and optical products	medium, small, SMSs
Austria, Belgium, Croatia, Germany, Italy, Poland, Portugal, Slovakia, Spain	Electricity, gas, steam and air conditioning supply	medium
Austria, Croatia, Slovakia	Transportation and storage	medium, small, SMSs
Germany, Poland, Portugal, Spain	Transportation and storage	medium, small
Belgium, Italy	Transportation and storage	medium
Germany, Italy	Manufacture of computer, electronic and optical products	medium, small
Czech Republic	Extraction of crude petroleum and natural gas; Manufacture of chemicals and chemical products; Manufacture of computer, electronic and optical products; Manufacture of electrical equipment; Manufacture of motor vehicles, trailers and semi-trailers; Manufacture of other transport equipment; Mining of coal and lignite; Mining of metal ores; Transportation and storage	all
France	Agriculture, forestry and fishing; Extraction of crude petroleum and natural gas; Manufacture of chemicals and chemical products; Manufacture of computer, electronic and optical products; Manufacture of electrical equipment; Manufacture of motor vehicles, trailers and semi-trailers; Manufacture of other transport equipment; Mining and quarrying; Mining of coal and lignite; Mining of metal ores	medium
Italy	Manufacture of chemicals and chemical products; Manufacture of electrical equipment	medium, small

Source: Own calculation based on data from the BACH and Eurostat databases.

Table 6. Cluster 2 components using the k-means method

Countries	Sectors	Size
Austria, Belgium, Croatia, Czech Republic, Germany, Italy, Poland, Portugal, Slovakia, Spain	Manufacture of motor vehicles, trailers and semi-trailers	large
Austria, Belgium, Croatia, Germany, Italy, Poland Portugal, Slovakia, Spain	Manufacture of other transport equipment; Mining and quarrying; Mining of coal and lignite	large
Austria, Belgium, Croatia, Germany, Poland, Portugal, Slovakia, Spain	Manufacture of chemicals and chemical products; Manufacture of electrical equipment	large
Austria, Belgium, Croatia, Germany, Italy, Portugal, Slovakia, Spain	Extraction of crude petroleum and natural gas	large

Countries	Sectors	Size
Austria, Belgium, Croatia, Italy, Poland, Portugal, Slovakia, Spain	Electricity, gas, steam and air conditioning supply	large, small, SMSs
Austria, Belgium, Croatia, Poland, Portugal, Slovakia, Spain	Manufacture of computer, electronic and optical products	large
Austria, Belgium, Croatia, Italy, Slovakia, Spain	Mining of metal ores	large
Austria, Germany, Poland, Portugal	Transportation and storage	large, SMSs
Belgium, Italy, Spain	Transportation and storage	large, small, SMSs
Croatia, Slovakia	Transportation and storage	large
France, Germany	Agriculture, forestry and fishing	large, small, SMSs
Germany, Italy	Manufacture of computer, electronic and optical products	large, SMSs
Czech Republic	Electricity, gas, steam and air conditioning supply	large
France	Extraction of crude petroleum and natural gas; Manufacture of chemicals and chemical products; Manufacture of computer, electronic and optical products; Manufacture of electrical equipment; Manufacture of motor vehicles, trailers and semi-trailers; Manufacture of other transport equipment; Mining and quarrying; Mining of coal and lignite; Mining of metal ores	large, small, SMSs
Italy	Manufacture of chemicals and chemical products; Manufacture of electrical equipment	large, SMSs
France	Transportation and storage	all

Source: Own calculation based on data from the BACH and Eurostat databases.

RESULTS

The division of observations into two clusters allowed the classification of sectors and the economic entities that belong to them with relatively better and relatively worse financial conditions. Cluster 2 is identified with entities with the better financial condition than cluster 1. It can be assumed that the cluster is a hidden variable. In an attempt to answer the question of whether entities with a relatively better/worse financial condition statistically differentiate ESG indicators at the national level (non-financial data), the Mann-Whitney U test (with continuity correction) was used (Table 7).

    Based on the results from Table 7, it can be seen that there are statistical differences between entities with relatively good financial conditions and relatively weaker financial conditions in the context of such values as gender employment

gap, total population living in households considering that they suffer from noise, greenhouse gas emission, Corruption Perceptions Index. It is complemented by box-whisker charts showing the basic positional measures (Figure 3).

Table 7. The Mann-Whitney U test results

Variable	Sum of rang Cluster 1	Sum of rang Cluster 2	U	Z	p	Z (corrected)	p
Gender employment gap	17 078 367	6 482 313	4 003 662	15.07	0.00	15.08	0.00
Final energy consumption	15 803 535	7 757 145	5 045 694	-1.51	0.13	-1.51	0.13
Total population living in households considering that they suffer from noise	15 504 375	8 056 305	4 746 534	-5.41	0.00	-5.41	0.00
Greenhouse gas emissions	16 776 207	6 784 473	4 305 822	11.14	0.00	11.15	0.00
Corruption Perceptions Index	15 244 143	8 316 537	4 486 302	-8.79	0.00	-8.80	0.00

Note: Results that are not statistically significant are marked by underlines.
Source: Own calculation based on data from the BACH and Eurostat databases.

Figure 3. Box-whisker charts for ESG results (non-financial variables)
Source: Own elaboration based on data from the BACH and Eurostat databases.

Based on Figure 3, it can be emphasized that economic entities with relatively better financial conditions achieve a smaller gender employment gap (at the national level) than entities with relatively worse financial conditions. It is similar to the GHG level: economic entities with relatively better financial conditions generate lower GHG emissions (national level) than entities with relatively worse financial results. In the case of the analysis of the Corruption Perceptions Index, it can be concluded that there is a lower level of corruption in companies with better financial results than those with worse financial results. Surprisingly, the population's exposure to noise is higher, where enterprises achieve relatively better financial results than worse financial results.

The obtained results directly relate to the activities of companies. Companies with a better financial position are companies that achieve market success, and therefore respond more effectively to the needs of a wide range of stakeholders, and are more and more sensitive to the issues of sustainable development. The implementation of sustainable development into a company's strategy, or the transformation of the business model towards a sustainable business model, requires financial outlays. It involves modern, more ecological methods of production or provision of services, which directly contributes to reducing greenhouse gas emissions. However, the modernization of production processes is unfortunately associated with an increase in the noise level resulting from the use of extensive installations and the operation of machinery and equipment. Companies with a better financial condition also pay attention to the transparency of their operations. They take care of introducing and observing internal regulations and procedures and their compliance with applicable law, which results in a lower level of the Corruption Perceptions Index. Companies with better financial results are usually open to changes and novelties, which translates into a smaller gender employment gap.

In further analysis, one-way ANOVA was used to examine the impact of the cluster (a hidden variable that expresses the financial condition of the enterprises) on non-financial variables (ESG results). The results (Table 8) are presented at the general level and the detailed level due to the size of the enterprise (using a cross-assessment).

When examining the interdependence of ESG goals, it can be seen that in general, the gender employment gap is 0.68 percentage points lower in financially better enterprises than in less financially healthy enterprises. This difference is statistically significant. The financial condition of enterprises explains the variability of the gender employment gap at around 2.29%. For large companies, better-off companies achieve a 1.6 percentage point lower gender employment gap than less well-off companies; in the case of medium companies the difference is 1.62 percentage points, small companies are 1.37 percentage points and SMSs are 0.85 percentage points.

Table 8. Model of dependence of ESG goals on the financial condition of enterprises

	All companies							
	Effect 1		Effect 2		Effect 3		Effect 4	
Effect	Gender employment gap	p	Population suffering from noise	p	GHG emissions	p	Corruption Perceptions Index	p
const	11.66	< 1%	17.54	< 1%	8.91	< 1%	61.50	< 1%
Cluster = 2	-0.68	< 1%	0.27	< 1%	-0.34	< 1%	1.43	< 1%
Multiple R	15.14%	< 1%	5.33%	< 1%	14.87%	< 1%	10.89%	< 1%
Multiple R2	2.29%	< 1%	0.28%	< 1%	2.21%	< 1%	1.19%	< 1%
Large companies								
const	13.02	< 1%	16.94	< 1%	9.79	< 1%	59.03	< 1%
Cluster = 2	-1.60	< 1%	0.72	< 1%	-1.08	< 1%	2.79	< 1%
Multiple R	26.95%	< 1%	10.57%	< 1%	35.58%	< 1%	16.11%	< 1%
Multiple R2	7.26%	< 1%	1.12%	< 1%	12.66%	< 1%	2.59%	< 1%
Medium companies								
const	10.36	< 1%	18.71	< 1%	8.84	< 1%	65.58	< 1%
Cluster = 2	-1.62	< 1%	1.33	< 1%	-0.19	25%	4.82	< 1%
Multiple R	11.87%	< 1%	8.58%	< 1%	2.79%	25%	12.11%	< 1%
Multiple R2	1.41%	< 1%	0.74%	< 1%	0.08%	25%	1.47%	< 1%
Small companies								
const	11.02	< 1%	17.54	< 1%	8.68	< 1%	62.66	< 1%
Cluster = 2	-1.37	< 1%	0.15	33%	-0.55	< 1%	2.59	< 1%
Multiple R	24.95%	< 1%	2.37%	33%	19.42%	< 1%	16.15%	< 1%
Multiple R2	6.23%	< 1%	0.06%	33%	3.77%	< 1%	2.61%	< 1%
SMSs companies								
const	11.45	< 1%	17.71	< 1%	8.81	< 1%	62.15	< 1%
Cluster = 2	-0.85	< 1%	0.52	< 1%	-0.43	< 1%	2.22	< 1%
Multiple R	17.26%	< 1%	9.35%	< 1%	17.17%	< 1%	15.46%	< 1%
Multiple R2	2.98%	< 1%	0.87%	< 1%	2.95%	< 1%	2.39%	< 1%

Note: Bonferroni and Scheffé tests were used when the samples were few but equal variances and Dunnett's test when the samples were few and unequal variances (so-called corrections). In all the cases analyzed, the desired properties were obtained (significant differences between the groups). Results that are not statistically significant are marked by underlines.
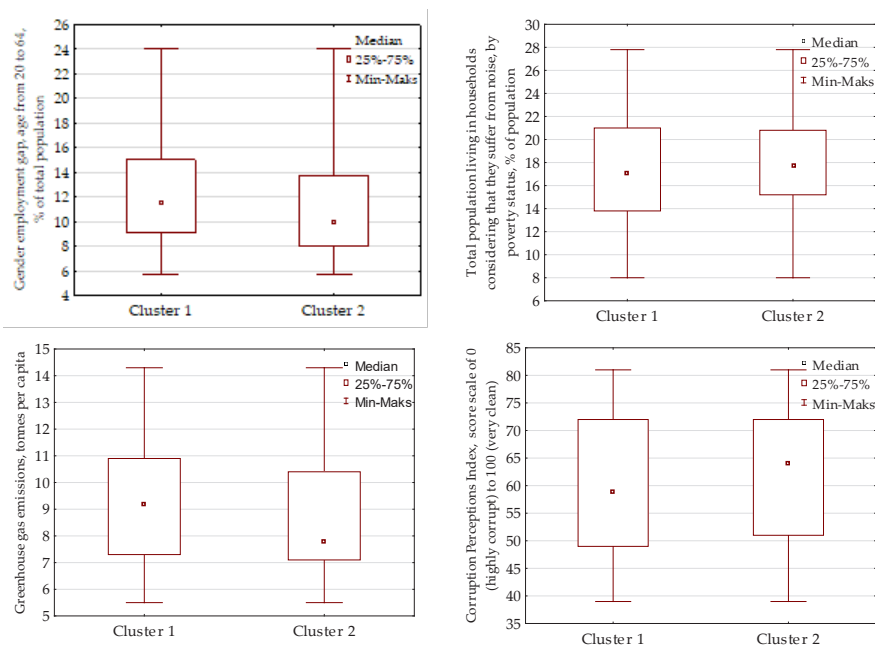**Source:** Own elaboration based on data from the BACH and Eurostat databases.

The financial condition of enterprises explains the variability of the gender employment gap which is approx. 7.26%, 1.41%, 6.23%, and 2.98%, respectively, in small, large, medium, and SMSs companies.

The analysis also shows that enterprises with a better financial condition contribute to a greater emissivity of noise in the perception of the population than enterprises with a worse financial condition. The differences are statistically significant for the general analysis and large, medium, and SMSs companies. This difference is not statistically significant for small companies. Overall, the financial condition explains the population's exposure to noise at 0.28%. The biggest difference was recorded in medium companies, where companies with a better performing business, report a higher noise emission by 1.33 percentage points than less profitable companies. For large enterprises the difference is 0.72 percentage points, for SMSs 0.52 percentage points, and globally 0.27 percentage points.

The second environmental effect, in addition to noise emission, is GHG emission. Globally, the lower emission of GHG is recorded by 0.34 tonnes per capita for companies with better financial conditions than for worse ones. The volatility of GHG emissions is explained in 2.21% by the financial condition of companies worldwide (but it is statistically significant). In the case of large companies, companies with a better financial condition generate 1.08 tonnes per capita less GHG emissions than companies with a worse financial condition; this variability can be explained by the financial condition up to approximately 12.7%. In the case of companies, no statistically significant results were obtained. Enterprises in the segment of small companies that are relatively better prospering achieve lower GHG emissions by 0.55 tonnes per capita compared to enterprises with relatively worse financial results. However, in the SMSs segment, the difference is 0.43 tonnes per capita.

The fourth effect concerns the Corruption Perceptions Index; an increase in its value means the minimization of corrupt practices.

The volatility of the level of the Corruption Perceptions Index is explained by the financial condition of enterprises at 1.19%. The obtained ratio is 1.43 (index) higher in the case of enterprises with better financial conditions than in the case of relatively worse ones. More prospering enterprises achieve a higher level of corruption elimination than enterprises with weaker financial results. The largest such difference was recorded in enterprises in the medium companies segment and amounts to 4.82 (index). Companies that are more prosperous in the large, medium, and SMSs companies segment achieve similar differences in the Corruption Perceptions Index compared to the less prospering ones, respectively, 2.79, 2.59, and 2.22 (index). These differences are statistically significant.

The second part of the analysis is based on the example of large companies from the transport and storage sector. Table 9 shows the dependence of the effects of ESG on the financial results of the companies studied.

Table 9. Influence of the financial condition of large companies from the transport and storage sector on the ESG effects

Effect	Test	Value	F	p	Partial eta-squared
Const	Wilks	0.0070	4898.44	0.00	99.30%
company financial conditions	Wilks	0.4176	48.11	0.00	58.24%

Source: Own elaboration based on data from the BACH and Eurostat databases.

About 58% of the financial results of large enterprises from the transport and storage sector explain all non-financial results in the field of achieving ESG, and it is a statistically significant relationship. The development is to examine the dependence of the achievement of ESG goals on the financial condition of this group of enterprises (Table 10).

Table 10. Model of dependence of ESG goals on the financial condition of enterprises large companies from sector transport and storage sector

Effect	Gender employment gap	p	Population suffering from noise	p	GHG emissions	p	Corruption Perceptions Index	p
const	12.42	< 1%	16.38	< 1%	9.03	< 1%	58.00	< 1%
Cluster = 2	-1.37	< 1%	2.75	< 1%	-0.01	94%	7.80	< 1%
Multiple R	30.04%	< 1%	52.84%	< 1%	0.55%	94%	58.52%	< 1%
Multiple R2	9.03%	< 1%	27.92%	< 1%	0.00%	94%	34.25%	< 1%

Note: Dunnett's test was used when the samples were few and unequal variances (so-called corrections). In all the cases analyzed, the desired properties were obtained (significant differences between the groups). Results that are not statistically significant are marked by underlines.
Source: Own elaboration based on data from the BACH and Eurostat databases.

Based on the above model, it is observed that in the analyzed group of enterprises, those that were in a relatively better financial situation had a lower gender employment gap of 1.37 percentage points compared to less prospering enterprises. The variability of the employment gap for this group of companies was explained by financial results of up to approximately 9%.

At the same time, the wealthiest companies were also 2.75 percentage points higher in terms of noise emissions than the least wealthy. Noise emissivity can be explained by the financial condition of companies by as much as 28%. This can be explained by the fact that the rolling stock and equipment of transport companies or the superstructure of warehouses could be more overloaded, more exploited, or larger, have parameters which, in the subjective opinion of the population, caused more noise than in companies with a worse financial condition.

There were no statistical differences in the GHG emissivity depending on the financial condition of the enterprises. This may be because major transport

companies are obliged to systematically renew their car fleet and vehicle manufacturers are required to produce fewer emission vehicles. Vehicles that do not meet strict environmental standards cannot provide transportation services. At the same time, the fuels used in vehicles have similar parameters, which are the result of the megatrends of modern civilization. Thus, the financial condition of the companies may not differentiate in this case the emissivity of GHG.

Up to 34% of the Corruption Perceptions Index is explained by the financial condition of the surveyed companies. It is noted that the level of corruption is 7.8 percentage points higher in better-than-worse enterprises.

The research results obtained for the transport sector (Tables 9 and 10) will be confronted with the description of the activities of three selected companies, to show how the process of transforming companies towards sustainable development looks in practice.

The scope and nature of adaptation activities will depend on the individual needs of the enterprise. Raben N.V. Group currently operates in 15 European countries, owns a transport network and approximately 1,400,000 m2 of warehouse space in more than 160 locations, delivering over 16 million shipments per year. The company has a sustainable development strategy based on 3 pillars and 9 strategic areas, i.e., environmental protection (climate change, circular economy, and ecological initiatives), social impact (occupational health and safety, employee diversity and integration), responsible organization (Ethics and Compliance, Risk Management, and Sustainable Procurement).

The company is aware of its impact on the natural environment and takes responsibility for it, constantly trying to minimize its impact through activities such as investments in renewable energy sources, and modern transport equipment and efficient warehouses. In addition, the company strives to ensure efficient truck filling, optimal route planning and a reduction in empty runs, and is introducing the first zero- or low-emission trucks into its fleet. Waste is segregated in warehouses and offices, energy-saving technologies and environmentally friendly solutions are introduced, such as low-emission refrigerants, and other solutions supporting the circular economy in warehouses. The company also encourages customers to switch to e-invoicing, supports the digitization of processes and ensures that chemicals are properly handled during transport and storage. The company also maintains good contacts with stakeholders. It takes care of employees and contacts with business partners. The company also uses sustainable financing. In July 2021 it obtained one of the first Sustainability Linked Loans (SLL) in Europe for the logistics sector. The company undertook to reduce the intensity of CO_2 emissions from its facilities by 30% and from transport by 10%, and increase the share of the fleet that meets the Euro 5 / Euro 6 emission standards or has an LNG / CNG / electric / hydrogen drive from 73% to 96%. The company also declares increasing the

proportion of women in management positions to 34% by 2025 and confirms the use of ESG management best practices by gradually improving its EcoVadis rating (Raben Group, 2022).

Garza-Reyes et al. (2016) described the sustainable adaptation of a division of a transportation company's operations center located in Monterrey, Mexico. The center provides online tracking services, cross-border freight services, brokerage services in truck transport and the delivery of government packages, controlled temperature packages, and consolidation and distribution services. It serves around 4,000 customers a day with an average of 4,500 parcels per day. They are delivered on 28–32 routes per day. Sustainable adaptation was carried out as part of the Transporte Limpio (Clean Transport) project, which aimed to promote and support Mexican organizations in their efforts to protect the environment as part of sustainable development. In the case of the discussed center, the adaptation consisted in optimizing the process of loading and transporting shipments to recipients by improving the assignment of customers to routes and better sequencing of customers on each route, which resulted in shortening the routes and thus the delivery time. Based on the experience of companies such as DHL and FedEx, an environmental strategy has been pre-defined to develop more efficient route schemes, use hybrid vehicles, alternative fuels, and to invest in new technologies. The organization of the work of drivers and their assistants has also been improved, thus reducing labor costs and shortening the time of order fulfilment.

The adaptation process towards sustainable logistics introduced by Deutsche Post DHL Group focuses on three key action areas in which the company can achieve the biggest effects: clean operations for climate protection, great company to work for all, and a highly trusted company (Deutsche Post DHL Group, 2022). In the first of those areas, the company focuses on reducing logistics-related greenhouse gas emissions by the use of sustainable technologies and fuels, electrification of its road fleet, developing a green product portfolio, and climate-neutral design of new buildings. The adaptation effectiveness indicator is Realized Decarbonization Effects, which amounted to 728 kilotonnes of CO_2 equivalent in 2021 and is planned to reach 969 kilotonnes of CO_2 equivalent. To make a company a good place to work for all, they aim at improving employee engagement, diversity and inclusion, and occupational health and safety. In order to achieve these goals, the company attracts and retains the best talent, promotes equal opportunities, and creates a healthy and safe work environment. They plan to increase the proportion of women in executive positions from 25.1% in 2021 to at least 30% in 2025. The company has also taken actions to increase employee engagement, and to decrease lost time injury frequency rate (LTIFR) from 3.9 in 2021 to below 3.1 in 2025. Finally, to become a highly trusted company, they focus on cybersecurity, respecting

human rights, and providing services in compliance with current legislation and in accordance with the company's values. To achieve these goals, the company provides compliance-relevant training, improves cybersecurity, and builds sustainable relations with suppliers. The company has implemented a human rights management system and conducts audits related to human rights. The effectiveness in the area of compliance is assessed by the number of valid compliance-relevant training certificates in middle and upper management.

DISCUSSION

The conducted research shows that enterprises with a better financial condition have a higher Corruption Perceptions Index, and therefore are more effective in minimizing corrupt practices. Studies on the relationship between corruption and the financial performance of SMEs were carried out by Van et al. (2018). They showed that corruption negatively affects the financial results of SME enterprises. Similar studies on newly established companies were carried out by Nam et al. (2020). They found that corruption not only impairs the financial performance of these companies, but it also has a detrimental effect on their functioning and their ability to survive. Ojeka et al. (2019) conducted research on the impact of corruption perceptions and the performance of publicly traded companies in Nigeria. Their research shows that corruption negatively affects the market value (TorbinQ) and the return on assets (ROA). Donadelli et al. (2014) showed that the level of corruption has a negative impact on stock returns. Corruption and a weak institutional environment tend to worsen the market and accounting performance of non-financial companies (Ojeka et al., 2019). Hoang et al. (2022) showed that anti-corruption campaigns positively translate into the financial results of private companies. According to this study, counteracting corruption benefits private companies by improving the institutional quality of the country while improving the financial transparency of state-owned companies.

This research shows that the gender difference in employment is lower in enterprises with a better financial condition than in enterprises with a weaker condition. Research on the increase in the number of women on management boards, and their impact on the financial results of enterprises, was carried out by Reguera-Alvarado et al. (2017) on a group of 125 non-financial companies listed on the Madrid Stock Exchange from 2005 to 2009. The research shows that in the analyzed period the number of women on boards increased by 98%, which confirms the effectiveness of the legislation in this area. The presence of women on the management board also had a positive impact on the financial results of enterprises. Similar studies were conducted by Maji and Saha (2021) on 100 Indian corporations. The obtained results confirmed the influence of

the gender diversity of the workforce (including in managerial positions) on the financial results of companies. On a sample of companies from 23 developed countries in 2001–2014, Lopatta et al. (2020) examined the relationship between the presence of employee and female representatives on the management board and the company's performance in the field of environmental protection and CSR, and they confirmed that this relation is positive. Based on an analysis of India's publicly traded companies in 2010–2019, Oware and Mallikarjunapp (2021) showed that an improvement in return on equity prices leads to an increase in female employment.

This research shows that there are two correlations, i.e., companies with a better financial condition have lower greenhouse gas emissions and contribute to higher noise emissions. Such dependencies may result from the fact that enterprises with a better financial condition have more modern, more innovative and, therefore, more ecological machines and equipment. Mensah et al. (2018), based on data from 28 OCED countries between 1990 and 2014, showed that innovation plays a key role in mitigating CO2 emissions in most OECD countries. Similar conclusions were reached by Su and Moaniba (2017), who showed that the development of technology (climate innovation) negatively affects the emission of CO2 and other greenhouse gases. Innovation also contributes to the improvement of the financial results of enterprises. This relationship was demonstrated, among others, by Bigliardi (2012), Černe et al. (2015) and Chouaibi (2021). At this point, however, it is worth mentioning that the introduction of innovations in a company (e.g., new products) does not always translate into an increase in financial results. Such a relationship resulted from a study by de Oliveira et al. (2018).

The vast majority of scientific publications are devoted to the analysis of the negative impact of noise on employee productivity (Hong at al., 2023; Cahyani, 2020). Wang et al. (2020) studied noise levels in a tobacco company and Chabuk et al. (2020) in textile enterprises. From both studies, it appears that the noise level was exceeded and had a negative impact on employees. Farhang et al. (2013) assessed noise exposure and noise nuisance in a petrochemical company. The research shows that 63.2% of employees working in production departments and 17.9% of administrative employees described the noise level as very high. It can therefore be concluded that the main source of noise in enterprises are production machines, and the noise level increases with the development of the machinery park.

CONCLUSIONS

The relationships between ESG and financial performance factors have been well documented in corporate finance. However, no in-depth research indicates the relationship between the financial condition and non-financial results achieved by enterprises. The article tries to fill this research gap. The study attempts to explain the relationships between financial and non-financial factors' impact on enterprises. An attempt was made to group enterprises by sector, size, country, and achieved financial results, to verify the enterprises' profile in terms of adapting business models to sustainability. The analysis encompasses 11 EU countries in the period 2008–2020. The study analyzed 6,864 observations, that is, 96,096 data cells. The data are divided into two groups: financial and non-financial, and the paper is based on clusters analysis and ANOVA. As a result of the study, two clusters of enterprises were obtained.

The first cluster covered large enterprises with a solid financial standing. The second cluster included mainly small and medium-sized enterprises and weaker financial situations. For the first and second clusters, the business sector and the state where the enterprise conducts business did not constitute a differentiating factor. In the next step, it was verified what non-financial performance is obtained by enterprises from the first and second clusters. As a result of the research, it turned out that large enterprises with a solid financial position simultaneously get better non-financial results, i.e., better adapt their business models to sustainability. In each of the analyzed aspects, i.e., values such as gender employment gap, total population living in households considering that they suffer from noise, greenhouse gas emission, and Corruption Perceptions Index, large enterprises with an excellent financial standing did better. One of the reasons for this may be that large enterprises have better access to external financing and a broader scope of cooperation with financial institutions. Therefore, financing the costs of transformation of business models towards sustainability may be easier in these enterprises. Due to their market position, large enterprises can negotiate individual financing conditions with a financial institution, which means that the cost of capital may be lower for this group of enterprises. Small and medium-sized enterprises have a limited negotiating position in cooperation with financial institutions. At the same time, large enterprises are usually listed companies obliged to disclose financial and non-financial information to their stakeholders. Hence these entities have an additional incentive to make decisions on implementing sustainable business models because they have a higher reputation risk for SMEs. Activities in the field of building sustainable business models require financing. Therefore, entities with good financial conditions with access to external funding can implement such models effectively. In these entities, one can see strong relationships between financial and non-financial

factors and financial and non-financial performance factors. SMEs usually have a less stable financial situation than large enterprises, which results from the scale of operations and market position; they are not always listed companies or entities subject to non-financial reporting obligations. The limitations of the study result from the assumptions of the method used. This required researchers to run numerous tests, including robust tests of equality of means for the ESG goals model. The Welch test and the Brown-Forsythe test were used for this purpose. The test result was one of the reasons why final energy consumption was excluded from the business model (supplementary material 1). However, this approach could be extended by dividing the research period into two sub-periods, 2008–2014 and 2015–2020 (supplementary material 2). As a result of extending this analysis by an additional step, additional information could be obtained, and the inclusion of final energy consumption (important ESG goals) in the analysis. Such an analysis would require additional restrictions, i.e., analysis of structural breaks and the selection of sub-periods due to statistical properties. This would be possible by adapting the QLR or Chow test in the pre-analysis. Nevertheless, such an approach would be a direction for future research and extension of the methodology on business models. Future work will focus on deepening the knowledge of enterprises' methods and directions of adaptation activities depending on their size and location.

Acknowledgment

References

Abdelkafi, N., Xu, J., Pero, M., Ciccullo, F., & Masi, A. (2023). Does the combination of sustainable business model patterns lead to truly sustainable business models? Critical analysis of existing frameworks and extensions. *Journal of Business Economics, 93*(4), 597-634. https://doi.org/10.1007/s11573-023-01140-0

Alkaya, E., Bogurcu, M., Ulutas, F., & Demirer, G. N. (2015). Adaptation to climate change in industry: Improving resource efficiency through sustainable production applications. *Water Environment Research, 87*(1), 14-25. https://doi.org/10.2175/106143014X14062131178952

Armstrong, R. A. (2014). When to use the Bonferroni correction. *Ophthalmic and Physiological Optics, 35*(5), 502–508. https://doi.org/10.1111/opo.12131

Ball, P., & Lunt, P. (2020). Lean eco-efficient innovation in operations through the maintenance organisation. *International Journal of Production Economics, 219*, 405-415. https://doi.org/10.1016/j.ijpe.2018.07.007

Bigliardi, B. (2013). The effect of innovation on financial performance: A research study involving SMEs. *Innovation, 15*(2), 245-255. https://doi.org/10.5172/impp.2013.15.2.245

Bocken, N. M., Mugge, R., Bom, C. A., & Lemstra, H. J. (2018). Pay-per-use business models as a driver for sustainable consumption: Evidence from the case of HOMIE. *Journal of Cleaner Production, 198*, 498-510. https://doi.org/10.1016/j.jclepro.2018.07.043

Bocken, N. M., Short, S. W., Rana, P., & Evans, S. (2014). A literature and practice review to develop sustainable business model archetypes. *Journal of Cleaner Production, 65*, 42-56. https://doi.org/10.1016/j.jclepro.2013.11.039

Brown, A. M. (2005). A new software for carrying out one-way ANOVA post hoc tests. *Computer Methods and Programs in Biomedicine, 79*(1), 89–95. https://doi.org/10.1016/j.cmpb.2005.02.007

Cahyani, A. A. (2020). Influence of work environment noise to productivity of employee performance of Sidoarjo District. *Journal of Public Health Science Research, 1*(1), 12-17. http://dx.doi.org/10.30587/jphsr.v1i1.1181

Casadesus-Masanell, R., & Ricart, J. E. (2010). From strategy to business models and onto tactics. *Long Range Planning, 43*, 195-215. https://doi.org/10.1016/j.lrp.2010.01.004

Casadesus-Masanell, R., & Zhu, F. (2013). Business model innovation and competitive imitation: The case of sponsor-based business models. *Strategic Management Journal, 34*(4), 464-482. https://doi.org/10.1002/smj.2022

Černe, M., Jaklič, M., & Škerlavaj, M. (2015). Management innovation enters the game: Re-considering the link between technological innovation and financial performance. *Innovation 17*(4), 429-449. https://doi.org/10.1080/14479338.2015.1126530

Chabuk, A., Hammood, Z. A., Abed, S. A., Kadhim, M. M., Hashim, K., Al-Ansari, N., & Laue, J. (2021, June). Noise level in textile industries: Case study Al-Hillah Textile Factory-Company for Textile Industries, Al-Hillah-Babylon-Iraq. Retrieved from https://iopscience.iop.org/article/10.1088/1755-1315/790/1/012048/pdf

Chasin, F., Paukstadt, U., Gollhardt, T., & Becker, J. (2020). Smart energy driven business model innovation: An analysis of existing business models and implications for business model change in the energy sector. *Journal of Cleaner Production, 269*, 122083. https://doi.org/10.1016/j.jclepro.2020.122083

Cheah, S., Ho, Y. P., & Li, S., (2018). Business model innovation for sustainable performance in retail and hospitality industries. *Sustainability 10*(11), 3952. https://doi.org/10.3390/su10113952

Chesbrough, H., & Rosenbloom, R. S., (2002). The role of the business model in capturing value from innovation: Evidence from Xerox Corporation's technology spin-off companies. *Industrial and Corporate Change, 11*(3), 529-555. https://doi.org/10.1093/icc/11.3.529

Chouaibi, J. (2021). Innovation and financial performance in manufacturing companies: An empirical study Tunisian. *Journal of the Knowledge Economy, 12*(4), 1870-1890. https://doi.org/10.1007/s13132-020-00692-8

Corder, G. W., & Foreman, D. I. (2014). *Nonparametric Statistics: A Step-by-Step Approach*. New Jersey: John Wiley & Sons.

De Lucia, C., Pazienza, P., & Bartlett, M., (2020). Does good ESG lead to better financial performances by firms? Machine learning and logistic regression models of public enterprises in Europe. *Sustainability 12*(13), 5317. https://doi.org/10.3390/su12135317

de Oliveira, J. A. S., Basso, L. F. C., Kimura, H., & Sobreiro, V. A. (2018). Innovation and financial performance of companies doing business in Brazil. *International Journal of Innovation Studies, 2*(4), 153-164. https://doi.org/10.1016/j.ijis.2019.03.001

Demil, B., & Lecocq, X. (2010). Business model evolution: In search of dynamic consistency. *Long Range Planning, 43*(2-3), 227-246. https://doi.org/10.1016/j.lrp.2010.02.004

Deutsche Post DHL Group (2022). 2021 ESG Presentation. ESG Roadmap Progress to Date. Bonn, March 9. Retrieved from https://www.dpdhl.com/content/dam/dpdhl/en/media-center/investors/documents/presentations/2021/DPDHL-ESG-Presentation-2021.pdf

Doganova, L., & Eyquem-Renault, M. (2009). What do business models do? Narratives, calculation and market exploration. *Research Policy, 38*(10), 1559-1570. https://doi.org/ 10.1016/j.respol.2009.08.002

Dohrmann, S.; Raith, M., & Siebold, N. (2015). Monetizing social value creation – A Business model approach. *Entrepreneurship Research Journal, 5*(2), 127–154. https://doi.org/10.1515/erj-2013-0074

Donadelli, M., Fasan, M., & Magnanelli, B. S. (2014). The agency problem, financial performance and corruption: Country, industry and firm level perspectives. *European Management Review, 11*(3-4), 259-272. https://doi.org/10.1111/emre.12038

Drei, A. Le Guenedal, T. Lepetit, F., Mortier, V. Roncalli, T., & Sekine, T. (2019). ESG investing in recent years: New insights from old challenges. *SSRN Electronic Journal*. http://dx.doi.org/10.2139/ssrn.3683469

ESG in banks. Effective strategies to use opportunities and mitigate risks KPMG (2021). Retrieved from https://home.kpmg/xx/en/home/insights/2021/05/esg-risks-in-banks.html

Eurostat. (2023a). *Gender employment gap, by type of employment*. Retrieved from https://ec.europa.eu/eurostat/databrowser/view/SDG_05_30/default/table?lang=en

Eurostat. (2023b). *Final energy consumption*. Retrieved from https://ec.europa.eu/eurostat/databrowser/view/SDG_07_11/default/table?lang=en

Eurostat. (2023c). *Population living in households considering that they suffer from noise*. Retrieved from https://ec.europa.eu/eurostat/databrowser/view/SDG_11_20/default/table?lang=en

Eurostat. (2023d). *Net greenhouse gas emissions*. Retrieved from https://ec.europa.eu/eurostat/databrowser/view/SDG_13_10/default/table?lang=en

Eurostat. (2023e). *Corruption Perceptions Index*. Retrieved from https://ec.europa.eu/eurostat/databrowser/view/SDG_16_50/default/table?lang=en

Evans, S., Vladimirova, D., Holgado, M., Van Fossen, K., Yang, M., Silva, E. A., & Barlow, C. Y. (2017). Business model innovation for sustainability: Towards a unified perspective for creation of sustainable business models. *Business Strategy and the Environment, 26*(5), 597-608. https://doi.org/10.1002/bse.1939

Farhang Dehghan, S., Monazzam, M. R., Nassiri, P., Haghighi Kafash, Z., & Jahangiri, M. (2013). The assessment of noise exposure and noise annoyance at a petrochemical company. *Journal of health and safety at work, 3*(3), 11-24.

Ferreira, J. J., Fernandes, C. I., Veiga, P. M., & Hughes, M. (2021). Prevailing theoretical approaches predicting sustainable business models: A systematic review. *International Journal of Productivity and Performance Management, 71*(3), 790-813. https://doi.org/10.1108/IJPPM-12-2020-0653

Friede, G., Busch, T., & Bassen,A. (2015). ESG and financial performance: Aggregated evidence from more than 2000 empirical studies. *Journal of Sustainable Finance & Investment, 5*(4), 210-233, https://doi.org/10.1080/20430795.2015.1118917

Garza-Reyes, J. A., Villarreal, B., Kumar, V., & Molina Ruiz, P. (2016). Lean and green in the transport and logistics sector–a case study of simultaneous deployment. *Production Planning & Control, 27*(15), 1221-1232. https://doi.org/10.1080/09537287.2016.1197436

Goni, F. A., Gholamzadeh Chofreh, A., Estaki Orakani, Z., Klemeš, J. J., Davoudi, M., & Mardani, A. (2021). Sustainable business model: A review and framework development. *Clean Technologies and Environmental Policy, 23*, 889–897. https://doi.org/10.1007/s10098-020-01886-z

Grandoni, F., Ostrovsky, R., Rabani, Y., Schulman, L. J., & Venkat, R. (2022). A refined approximation for Euclidean k-means. *Information Processing Letters, 176*, 106251. https://doi.org/10.1016/j.ipl.2022.106251

Gulati, R., & Kletter, D. (2005). Shrinking core, expanding periphery: The relational architecture of high-performing organizations. *California Management Review, 47*(3), 77–104. https://doi.org/ https://doi.org/10.2307/41166307

Hoang, K., Doan, H.T., Tran, T.T., Nguyen, T.X., & Le, A.Q. (2022). Anti-corruption campaign and firm financial performance: Evidence from Vietnam firms. *Evaluation Review, 46*(2), 103-137. https://doi.org/10.1177/0193841X211072707

Hoffman, J. I. E. (2019). Analysis of variance. I. One-Way. In J. I. E. Hoffman (Ed.), *Basic Biostatistics for Medical and Biomedical Practitioners* (Second Edition) (pp. 391–417). Cambridge, Massachusetts: Academic Press. https://doi.org/10.1016/B978-0-12-817084-7.00025-5

Hong, J., Choi, J., Lee, J., Cho, S., Hong, T., Han, S., ... & Lee, D. E. (2023). Virtual reality-based analysis of the effect of construction noise exposure on masonry work productivity. *Automation in Construction, 150*, 104844.

Huang, J. Z. (1998). Functional ANOVA models for generalized regression. *Journal of Multivariate Analysis, 67*(1), 49–71. https://doi.org/10.1006/jmva.1998.1753

Jamaludin, M., & Yusof, Z.B. (2013). Best practice of Green Island resorts. P*rocedia - Social and Behavioral Sciences, 105*, 20-29. https://doi.org/10.1016/j.sbspro.2013.11.003

Joyce, A., & Paquin, R. L. (2016). The triple layered business model canvas: A tool to design more sustainable business models. *Journal of Cleaner Production, 135*, 1474-1486. https://doi.org/10.1016/j.jclepro.2016.06.067

Knyphausen-Aufseß, D. Z., & Meinhardt, Y. (2002). Revisiting strategy: Ein Ansatz zur Systematisierung von Geschäftsmodellen. In *Zukünftige geschäftsmodelle* (pp. 63-89). Berlin: Springer, Berlin.

Liu, C., Bathke, A. C., & Harrar, S. W. (2011) A nonparametric version of Wilks' lambda – Asymptotic results and small sample approximations. *Statistics & Probability Letters, 81*(10), 1502–1506. https://doi.org/10.1016/j.spl.2011.04.012

Lopatta, K., Böttcher, K., Lodhia, S.K., & Tideman, S.A. (2020). The relationship between gender diversity and employee representation at the board level and non-financial performance: A cross-country study. *International Journal of Accounting, 55*(01), 2050001. https://doi.org/10.1142/S1094406020500018

Lozano, R. (2015). A holistic perspective on corporate sustainability drivers. *Corporate Social Responsibility and Environmental Management, 22*(1), 32-44. https://doi.org/10.1002/csr.1325

Lüdeke-Freund, F., Bocken, N., Brent, A., Massa, L., & Musango, J. (2016). Business models for shared value: How sustainability-oriented business models contribute to business success and societal progress. Network For Business Sustainability South-Africa NBSSA Review and Synthesis Report. Retrieved from https://redd.nbs.net/s/NBS_SA_BMfSV_Executive_Guide-161128-w5jm.pdf

Lüdeke-Freund, F., Carroux, S., Joyce, A., Massa, L., & Breuer, H. (2018). The sustainable business model pattern taxonomy—45 patterns to support sustainability-oriented business model innovation. *Sustainable Production and Consumption, 15*, 145-162. https://doi.org/10.1016/j.spc.2018.06.004

Magretta, J. (2002). Why business models matter. *Harvard Business Review, 80*, 86-92.

Maji, S. G., & Saha, R. (2021). Gender diversity and financial performance in an emerging economy: Empirical evidence from India. *Management Research Review, 44*(12), 1660-1683. https://doi.org/10.1108/MRR-08-2020-0525

Marcoulides, G. A., & Hershberger, S. L. (2014). *Multivariate statistical methods: A first course*. London: Psychology Press. https://doi.org/10.4324/9781315805771

Massa, L., Tucci, C., & Afuah, A. (2017). A critical assessment of business model research. *Academy of Management Annals, 11*(1), 73–104. https://doi.org/10.5465/annals.2014.0072

Mensah, C. N., Long, X., Boamah, K. B., Bediako, I. A., Dauda, L., & Salman, M. (2018). The effect of innovation on CO2 emissions of OCED countries from 1990 to 2014. *Environmental Science and Pollution Research, 25*(29), 29678-29698. https://doi.org/10.1007/s11356-018-2968-0

Mignon, I., & Bankel, A. (2023). Sustainable business models and innovation strategies to realize them: A review of 87 empirical cases. *Business Strategy and the Environment, 32*(4), 1357-1372. https://doi.org/10.1002/bse.3192

Minoja, M., & Romano, G., (2021). Managing intellectual capital for sustainability: Evidence from a re-municipalized, publicly owned waste management firm. *Journal of Cleaner Production, 279*, 123213. https://doi.org/10.1016/j.jclepro.2020.123213

Nam, V. H., Nguyen, M. N., Nguyen, D. A., & Luu, H. N., 2020. The impact of corruption on the performance of newly established enterprises: Empirical evidence from a transition economy. *Borsa Istanbul Review, 20*(4), 383-395. https://doi.org/10.1016/j.bir.2020.05.006

Oghazi, P., & Mostaghel, R. (2018). Circular business model challenges and lessons learned—An industrial perspective. *Sustainability, 10*(3), 739. https://doi.org/10.3390/su10030739

Ojeka, S., Adegboye, A., Adegboye, K., Umukoro, O., Dahunsi, O., & Ozordi, E. (2019). Corruption perception, institutional quality and performance of listed companies in Nigeria. *Heliyon 5*(10), e02569. https://doi.org/10.1016/j.heliyon.2019.e02569

Osterwalder, A., & Pigneur, Y. (2010). *Business model generation: a handbook for visionaries, game changers, and challengers* (Vol. 1). New Jersey: John Wiley & Sons.

Oware, K. M., & Mallikarjunappa, T. (2021). Financial performance and gender diversity. The effect of family management after a decade attempt. *Society and Business Review, 16*(1), 94-112. https://doi.org/10.1108/SBR-05-2020-0072

Porter M. E., & Kramer M. R. (2011) The big idea: Creating shared value. *Harvard Business Review, 89*(1–2), 62-77.

Raben Group (2022). Raben Group Sustainability Report 2021. A Sustainable Way Forward. Raben. Retrieved from https://api.raben-group.com/fileadmin/CSR/RABEN_Sustainability_Report_2021.pdf

Rantala, T., Ukko, J., Saunila, M., & Havukainen, J. (2018). The effect of sustainability in the adoption of technological, service, and business model innovations. *Journal of Cleaner Production, 172*, 46-55. https://doi.org/10.1016/j.jclepro.2017.10.009

Rauter, R., Jonker, J., & Baumgartner, R. J. (2017). Going one's own way: Drivers in developing business models for sustainability. *Journal of Cleaner Production, 140*, 144-154. https://doi.org/10.1016/j.jclepro.2015.04.104

Reeves, M., Haanaes, K., Love, C., & Levin, S. (2012). Sustainability as adaptability. *Journal of Applied Corporate Finance, 24*(2), 14-22. https://doi.org/10.1111/j.1745-6622.2012.00373.x

Richardson, J. (2008). The business model: An integrative framework for strategy execution. *Strategic Change 17*(5-6), 133-144. https://doi.org/10.1002/jsc.821

Richardson, J. T. E. (2011). Eta squared and partial eta squared as measures of effect size in educational research. *Educational Research Review, 6*(2), 135–147. https://doi.org/10.1016/j.edurev.2010.12.001

Rosner, B., & Grove, D. (1999). Use of the Mann–Whitney U-test for clustered data. *Statistics in Medicine, 18*(11), 1387–1400. https://doi.org/10.1002/(SICI)1097-0258(19990615)18:11<1387::AID-SIM126>3.0.CO;2-V

Ruxton, G. D., & Beauchamp, G. (2008). Some suggestions about appropriate use of the Kruskal–Wallis test. *Animal Behaviour, 76*(3), 1083–1087. https://doi.org/10.1016/j.anbehav.2008.04.011

Schroedel, S. (2023). The sustainable business model database: 92 patterns that enable sustainability in business model innovation. *Sustainability, 15*(10), 8081. https://doi.org/10.3390/su15108081

Shakeel, J., Mardani, A., Chofreh, A. G., Goni, F. A., & Klemeš, J. J. (2020). Anatomy of sustainable business model innovation. *Journal of Cleaner production, 261*, 121201. https://doi.org/10.1016/j.jclepro.2020.121201

Stoughton, A. M., & Ludema, J. (2012). The driving forces of sustainability. *Journal of Organizational Change Management 25*(4), 501-517.

Su, H.-N., & Moaniba, I. M., (2017). Does innovation respond to climate change? Empirical evidence from patents and greenhouse gas emissions. *Technological Forecasting and Social Change, 122*, 49-62. https://doi.org/10.1016/j.techfore.2017.04.017

Suchecki, B., & Lewandowska-Gwarda, K. (2010). Klasyfikacja, wizualizacja i grupowanie danych przestrzennych. In B. Suchecki, (Ed.), *Ekonometria przestrzenna. Metody i modele analizy danych przestrzennych*. Warsaw: C.H. Beck.

Teece, D.J. (2010). Business models, business strategy and innovation. *Long Range Planning, 43*(2-3), 172-194. https://doi.org/10.1016/j.lrp.2009.07.003

Van Vu, H., Tran, T.Q., Van Nguyen, T., & Lim, S. (2018). Corruption, types of corruption and firm financial performance: New evidence from a transitional economy. *Journal of Business Ethics, 148*, 847–858. https://doi.org/10.1007/s10551-016-3016-y

Velte, P. (2017). Does ESG performance have an impact on financial performance? Evidence from Germany. *Journal of Global Responsibility, 8*(2), 169-178. https://doi.org/10.1108/JGR-11-2016-0029

Wang, X., Orelaja, O. A., Ibrahim, D. S., & Ogbonna, S. M. (2020). Evaluation of noise risk level and its consequences on technical operators of tobacco processing equipment in a cigarette producing company in Nigeria. *Scientific African, 8*, e00344. https://doi.org/10.1016/j.sciaf.2020.e00344

Wirtz, B. W., Pistoia, A., Ullrich, S., & Gottel, V. (2016). Business models: origin, development and future research perspectives. *Long Range Planning, 49*(1), 36-54. https:// doi.org/10.1016/j.lrp.2015.04.001

Wolf, J. (2014). The relationship between sustainable supply chain management, stakeholder pressure and corporate sustainability performance. *Journal of Business Ethics, 119*, 317-328. https://doi.org/10.1007/s10551-012-1603-0

Yang, M., Evans, S., Vladimirova, D., & Rana, P. (2017). Value uncaptured perspective for sustainable business model innovation. *Journal of Cleaner Production, 140*, 1794-1804. https://doi.org/10.1016/j.jclepro.2016.07.102

Zott, C., & Amit, R. (2010). Business model design: An activity system perspective. *Long Range Planning, 43*(2-3), 216-226. https://doi.org/10.1016/j.lrp.2009.07.004

Zufall, J., Norris, S., Schaltegger, S., Revellio, F., & Hansen, E. G. (2020). Business model patterns of sustainability pioneers: Analyzing cases across the smartphone life cycle. *Journal of Cleaner Production, 244*, 118651. https://doi.org/10.1016/j.jclepro.2019.118651

Supplementary materials

Supplementary material 1. Robust tests of equality of means for model of dependence of ESG goals on the financial condition of enterprises

Variable	Robust test	Statistica	df1	df2	Sig.
Gender employment gap	Welch	154.988	1	4185.599	<.001
	Brown-Forsythe	154.988	1	4185.599	<.001
Final energy consumption	Welch	0.117	1	4599.784	0.732
	Brown-Forsythe	0.117	1	4599.784	0.732
Total population living in households considering that they suffer from noise	Welch	20.425	1	4644.126	<.001
	Brown-Forsythe	20.425	1	4644.126	<.001
Greenhouse gas emissions	Welch	176.661	1	5198.459	<.001
	Brown-Forsythe	176.661	1	5198.459	<.001
Corruption Perceptions Index	Welch	83.812	1	4488.372	<.001
	Brown-Forsythe	83.812	1	4488.372	<.001

Note: a. Asymptotically F distributed. Results that are not statistically significant are marked by underlines.
Source: Own elaboration based on data from the BACH and Eurostat databases.

Supplementary material 2. Robust tests of equality of means for sub-model of dependence of ESG goals on the financial condition of enterprises with dividing the research period into sub-periods (2008-2014 and 2015-2020)

Variable	Robust test	Statistica	df1	df2	Sig.
Gender employment gap	Welch	107.501	3	2976.594	<.001
	Brown-Forsythe	108.400	3	5147.873	<.001
Final energy consumption	Welch	6.605	3	3068.972	<.001
	Brown-Forsythe	6.579	3	5718.045	<.001
Total population living in households considering that they suffer from noise	Welch	171.276	3	3028.941	<.001
	Brown-Forsythe	177.152	3	5344.205	<.001
Greenhouse gas emissions	Welch	122.123	3	3181.883	<.001
	Brown-Forsythe	122.776	3	6304.179	<.001
Corruption Perceptions Index	Welch	61.814	3	3054.278	<.001
	Brown-Forsythe	63.231	3	5537.427	<.001

Note: a. Asymptotically F distributed.
Source: Own elaboration based on data from the BACH and Eurostat databases.

Abstrakt

CEL: *Wpływ czynników ESG na wyniki finansowe został potwierdzony w literaturze przedmiotu. Celem artykułu jest zbadanie zależności między czynnikami finansowymi i niefinansowymi w przedsiębiorstwach oraz wskazanie, dla których grup przedsiębiorstw relacja wyników finansowych ESG jest najbardziej widoczna w kontekście budowania zrównoważonych modeli biznesowych i zdolności do adaptacji do zrównoważonego rozwoju. W artykule założono, że wyniki finansowe i niefinansowe przedsiębiorstw determinują ich zdolność adaptacji do zrównoważonego rozwoju, oraz że istnieje związek między wynikami finansowymi, wynikami niefinansowymi i zrównoważonymi modelami biznesowymi przedsiębiorstw.* ***METODYKA:*** *Analiza obejmuje 12 krajów UE w latach 2008–2020. W badaniu przeanalizowano 6 864 obserwacje, czyli 96 096 komórek danych. Dane podzielono na dwie grupy zmiennych: finansowe i niefinansowe. Badania opierają się na analizie klastrów i ANOVA. Przeprowadzono je w dwóch etapach. W pierwszym etapie przedsiębiorstwa zostały pogrupowane w klastry według kryterium kondycji finansowej, biorąc pod uwagę wielkość przedsiębiorstwa, sektor i kraj, w którym prowadzi działalność. W kolejnym kroku sprawdzono, czy przedsiębiorstwa o dobrej sytuacji finansowej osiągają również lepsze wyniki pozafinansowe.* ***WYNIKI:*** *Badanie pokazało, że w odniesieniu do danej branży oraz kraju prowadzenia działalności, duże przedsiębiorstwa osiągają lepsze wyniki finansowe niż małe i średnie firmy. Można podkreślić, że istnieją istotne statystyczne różnice pomiędzy podmiotami o relatywnie dobrej sytuacji finansowej a tymi o relatywnie słabej sytuacji finansowymi w kontekście takich wartości jak zróżnicowanie poziomu zatrudnienia ze względu na płeć, odsetek gospodarstwach domowych odczuwających w odniesieniu do swojego miejsca zamieszkania nadmierny hałas, emisja gazów cieplarnianych, Indeks Percepcji Korupcji. Przedsiębiorstwa o relatywnie lepszej sytuacji finansowej charakteryzują się mniejszym zróżnicowaniem poziomu zatrudnienia ze względu na płeć (na poziomie krajowym) niż podmioty o relatywnie gorszej kondycji finansowej. Podobny wynik otrzymano w odniesieniu do poziomu emisji gazów cieplarnianych.* ***IMPLIKACJE:*** *Wyniki tego badania mogą być przydatne dla*

*zarządów firm w opracowywaniu strategii transformacji w kierunku zrównoważonego rozwoju, dzięki temu, że dostarczają informacji o tym, jakie czynniki należy uwzględnić w procesie transformacji. **ORYGINALNOŚĆ I WARTOŚĆ:** Oryginalność tego opracowania polega na tym, że uwzględnia ono zarówno czynniki finansowe, jak i niefinansowe oraz bada związki między tymi czynnikami w procesie adaptacji przedsiębiorstw w kierunku zrównoważonego rozwoju i zrównoważonego modelu biznesowego.*

***Słowa kluczowe:** zrównoważone modele biznesowe, ESG, wyniki finansowe, ryzyko, zrównoważony rozwój, adaptacja, przedsiębiorstwa, czynniki finansowe, czynniki pozafinansowe*

Biographical notes

Magdalena Zioło is Professor at University of Szczecin, Poland. Her research and teaching scope focus on finance, banking and sustainability. She has extensive experience gained in financial institutions. She has received scholarships from the Dekaban-Liddle Foundation (University of Glasgow, Scotland) and Impakt Asia Erasmus + (Ulan Bator, Mongolia). She is a Member of Polish Accreditation Commission, Member of the Financial Sciences Committee of PAS (the Polish Academy of Sciences), Member of the Advisory Scientific Committee of the Financial Ombudsman, Expert of the National Centre for Research and Development, Expert of the National Science Centre and the National Agency for Academic Exchange, Expert of the Accreditation Agency of Curacao. She was a member of State Quality Council, Kosovo Accreditation Agency and visiting professor at University of Prishtina (Kosovo). She is Principal Investigator in the research projects funded by National Science Center, Poland in the field of sustainable finance. She is the author and editor of numerous books, mostly about financing sustainable development.

Elżbieta Szaruga is employed at the University of Szczecin as an Assistant Professor at the Department of Transport Management (Institute of Management). She specializes in Data Science, transport economics, and energy economics. Author of numerous publications on sustainable development and sustainable transport, especially the energy intensity of transport and Data Science. Reviewer in prestigious international journals. Laureate of international competitions (e.g., European Friedrich List Prize for young scientists in European Transport Sciences; 2022 Outstanding Reviewer Award). Expert in numerous research teams. Member of the European Economic Association.

Anna Spoz is an Assistant Professor at the Department of Finance and Accountancy at the John Paul II Catholic University of Lublin, Poland. Her research and teaching scope focus on finance, particularly corporate finance, accounting and tax, and sustainable finance. Author and co-author of numerous publications on finance, accounting, reporting, and management. She is a reviewer of international

publications and she combines teaching and scholarly activities with work in business.

Authorship contribution statement

Magdalena Zioło: Conceptualization, Methodology, Writing – Original Draft Preparation, Writing – Review and Editing, Project Administration, Supervision. **Elżbieta Szaruga:** Methodology, Data Curation, Validation, Software, Writing – Original Draft Preparation, Writing – Review and Editing. **Anna Spoz:** Resources, Writing – Original Draft Preparation, Writing – Review and Editing, Supervision, Revisions.

Conflicts of interest

The authors declare no conflict of interest.

Citation (APA Style)

Zioło, M., Szaruga, E., & Spoz, A. (2023). Financial and non–financial factors in companies' adaptation process towards sustainability and sustainable business models. Journal of Entrepreneurship, Management, and Innovation, *19*(4), 48-82. https://doi.org/10.7341/20231942

Capital structure, profitability, and short-term solvency of nascent SMEs in Ghana: An empirical study

Karikari Amoa-Gyarteng[1] iD, Shepherd Dhliwayo[2] iD

Abstract

PURPOSE: Small and medium enterprises (SMEs) play a vital role in the economic growth of emerging economies. However, many of these businesses fail in their early stages, making it important to investigate factors that influence their short-term solvency. This study aims to examine the impact of capital structure and profitability on the short-term solvency of nascent SMEs in Ghana, building on the liability of newness framework. **METHODOLOGY:** Data for this study were obtained from the Ghana Enterprises Agency, focusing on nascent SMEs that are five years old or less. Financial statements were used to measure the dependent and independent variables, and regression analysis was employed to measure the variance in short-term solvency accounted for by profitability and capital structure. **FINDINGS:** This study demonstrates that financing decisions and financial performance act as crucial mitigating factors for the potential risks of default and failure faced by nascent SMEs. Notably, the study finds that an appropriate balance between debt and equity financing raises the working capital ratio and thus reduces the liability of newness, which is a major challenge faced by nascent SMEs. This highlights the relevance of the trade-off theory, which recommends a combination of debt and equity financing to leverage the advantages of both sources of capital, in the context of nascent SMEs. The intricate relationship between profitability and short-term solvency in nascent SMEs was revealed in this study. The findings illustrate that while return on equity exhibits a direct impact on the short-term solvency of such SMEs, return on assets manifests an opposing effect. Furthermore, net profit after tax demonstrates only a nominal influence on the short-term solvency of nascent SMEs in Ghana. **IMPLICATIONS:** The implications of our study are far-reaching, particularly within the context of Ghana's nascent SMEs. To ensure short-term viability and facilitate a smooth transition to maturity, nascent SMEs must strive for an optimal debt-to-equity ratio. This

1   Karikari Amoa-Gyarteng, Research Fellow, University of Johannesburg, Auckland Park Kingsway Campus, Corner Kingsway and University Road, Auckland Park, South Africa, e-mail: kariamoa1@gmail.com (ORCID https://orcid.org/0000-0002-2232-1169).
2   Shepherd Dhliwayo, Ph.D, Associate Professor, University of Johannesburg, Auckland Park Kingsway Campus, Corner Kingsway and University Road, Auckland Park, South Africa, e-mail: sdhliwayo@uj.ac.za (ORCID: https://orcid.org/0000-0001-7653-2466).

critical insight underscores the importance of managing the capital structure of nascent SMEs, as the improper balance between debt and equity may impede the achievement of short-term solvency and, in turn, hinder the long-term success of the firm. Additionally, while nascent SMEs must prioritize maintaining liquidity to safeguard against unforeseen contingencies, this comes at a high cost in terms of missed opportunities that could significantly enhance the company's long-term return on assets. Thus, it is crucial for small business owners in Ghana to strike a balance between short-term solvency and return on assets by engaging in prudent financial management practices. Overall, our study provides valuable theoretical and practical implications for nascent SMEs in Ghana, emphasizing the need to optimize their capital structure and maximize their long-term return on assets while safeguarding their short-term liquidity. ORIGINALITY AND VALUE: The study's conceptualization that capital structure and profitability relate significantly to short-term solvency and, therefore, buffers the liability of newness is novel. Second, by showing that the trade-off theory's tenets are relevant to the short-term solvency of nascent SMEs, the study demonstrates that capital structure theories apply equally to SMEs, just as much as large firms.

Keywords: capital structure, profitability, liability of newness, liquidity, new firm survival, SMEs, economic growth, emerging economies, short-term solvency

INTRODUCTION

Small and medium enterprises face a higher risk of failure during their nascent stages compared to established ones due to the complex issues that they must contend with, jeopardizing their viability. This notion is well established in the liability of newness framework, first introduced by Stinchcombe (1965). Studies such as Coase and Wang (2011) provide empirical evidence supporting this idea, demonstrating that nascent SMEs have a higher propensity to fail than survive. Further corroborating this view, Hewitt and Roodt (2017) report that 50% of all small businesses fail within two years of their inception, while in emerging countries such as Ghana, the survival rate is even lower, with 60% of entrepreneurial firms not surviving beyond the fifth year (Amaglo, 2019).

The challenges that nascent SMEs face are several. Firstly, they need to learn new tasks, which can be challenging for new businesses. Secondly, they lack a track record with external stakeholders and protocols for effective problem-solving (Yang & Aldrich, 2017). Thirdly, they have difficulties in swiftly converting assets into cash and becoming profitable (Wiklund et al., 2010). These challenges can result in nascent SMEs struggling to transition to maturity and ultimately failing to achieve their objectives (Amaglo, 2019).

SMEs have been widely acknowledged as key drivers of economic growth, creating employment opportunities, increasing income levels, and promoting the emergence of new businesses (Dar & Mishra, 2020; Sopha et al., 2021). The significance of SMEs to global and national economies is indisputable, with

Nieuwenhuizen (2019) estimating that 95% of businesses globally are SMEs. However, a high failure rate of SMEs poses a major challenge to economies, hindering job creation, economic stimulation, and poverty reduction. This highlights the importance of understanding the factors that affect the survival and success of SMEs in their nascency.

Despite the liability of newness, entrepreneurs can adopt various techniques or approaches to help their enterprises transition from nascency to maturity (Rutherford et al., 2017). For example, entrepreneurs can provide adequate financial capital to help their enterprises survive (Yang & Aldrich, 2017). It is not only important to have sufficient funding, but the right capital mix is also essential as it may result in increased net profits, earnings, and liquidity (Dhankar, 2019). Therefore, the financing strategy of an enterprise can significantly influence its chances of survival and success (Abor, 2016).

Undoubtedly, one of the most significant challenges faced by firms is maintaining an optimal balance between debt and equity within their capital structure. This is because a firm's capital structure has a profound impact on its future funding sources, cost of capital, risk profile, liquidity position, investor return, and overall firm valuation (Bajaj et al., 2020). Firms that can identify their optimal capital structure stand to benefit in numerous ways. Efficient financial decision-making empowers small and medium-sized enterprises to leverage their limited resources effectively, resulting in accelerated growth and development (Li et al., 2019). The ability to navigate this delicate balance between capital sources requires a nuanced understanding of market conditions, strategic vision, and a firm's unique risk–return trade-offs. As such, an effective capital structure can serve as a crucial determinant of a firm's success and longevity in a dynamic business environment.

This paper seeks to investigate the impact of capital structure and profitability on the short-term solvency of nascent SMEs in Ghana. The study addresses a relatively under-researched area in the literature on nascent SMEs and capital structure, particularly in emerging economies. Specifically, we aim to fill the gap in the literature by examining the short-term solvency of nascent SMEs in Ghana, and how this is affected by their capital structure and profitability.

As noted by Kumar et al. (2020), there is a paucity of research on capital structure from Africa. Our study seeks to fill the void in existing research by delving into the realm of nascent SMEs in Ghana, recognizing their indispensable contribution to economic expansion. By examining the impact of capital structure and profitability on the short-term solvency of nascent SMEs in Ghana, our study provides a valuable contribution to the literature on nascent SMEs and capital structure. This study is critical for entrepreneurs in Ghana, where the entrepreneurial ecosystem is characterized by a difficult business environment, an unstable regulatory framework, limited access to finance, low productivity of

labor, and insufficient infrastructure (Sheriff & Muffatto, 2015). This adds to the vulnerability of nascent SMEs in Ghana.

The exigency for empirical research that examines the strategies requisite for nascent SMEs to survive in Ghana cannot be overstated. Kumar et al. (2020) highlight a conspicuous knowledge gap in this regard. Prior studies carried out in Ghana have predominantly centered on the performance of SMEs, rather than their survival, as evidenced in the works of Amoa-Gyarteng and Dhliwayo (2022) and Musah and Kong (2019). The limited research on capital structure and its influence on firm survival in Ghana underscores the significance of this study. Not only does it address the knowledge gap, but it also advances our understanding of how nascent SMEs can sustain viability and maturity in the challenging business environment of Ghana.

This paper aims to investigate the hypothesis that the capital structure and profitability of nascent SMEs significantly impact their short-term solvency. Findings from studies, including research conducted by Amoa-Gyarteng (2021), underscore the significance of financial solvency as a protective factor against financial distress, reinforcing the understanding that economically sound firms are better equipped to navigate challenging circumstances. Hence, this study provides valuable insights into how nascent SMEs can mitigate the risk of failure. The study adds to the limited literature on how nascent SMEs can increase their resilience and enhance their longevity. The central thesis posited is that illiquidity challenges faced by nascent SMEs could be attributed to inappropriate capitalization and poor profitability.

This study presents a modest yet meaningful contribution to the scant literature on nascent SMEs. Specifically, the study offers three noteworthy contributions to the existing body of knowledge. Firstly, we introduce a novel concept that highlights the significant impact of capital structure and profitability on the short-term solvency of nascent SMEs, thereby reducing the liability associated with newness. Secondly, the study also showcases the applicability of the trade-off theory to the short-term solvency of recently formed SMEs. Thus, we establish that capital structure theories hold true for small businesses, much like they do for large enterprises. Thirdly, the study adds to the scarce literature on nascent SMEs, particularly within the context of Ghana.

The ensuing sections of this paper are structured as follows. Section 2 provides an exposition of the theoretical underpinnings and expounds upon the broad hypotheses. In Section 3, the research methodology is comprehensively detailed. Subsequently, Section 4 presents the empirical findings that emerged from the research. Finally, in Section 5, we conclude by offering a discussion of the study's implications, highlighting any limitations, and presenting our final observations on the subject matter.

THEORETICAL REVIEW AND HYPOTHESES DEVELOPMENT ⸺

Trade-off theory

The trade-off theory is the foundation of this study. The theory is the most established framework of capital structure and underpins much of the empirical work on capital structure (Abel, 2018). According to the theory, businesses should set a target debt ratio and gingerly work towards achieving it. Thus, the trade-off theory forecasts an optimum financing decision by weighing the advantages and disadvantages of issuing capital and debt (Martinez et al., 2019). The trade-off framework appears to be an extension of the Modigliani and Miller theorem as it inculcates the effects of taxes and bankruptcy costs (Cekrezi, 2013). Since the theory proposes an optimal capital structure, it advocates a trade-off between tax sheltering and bankruptcy costs for firms to reap the benefits of gearing while minimizing debt financing costs (Dierker et al., 2019).

According to Brealey and Myers (2003), businesses with safe, tangible assets and plenty of shield-taxable revenue should have high target debt ratios. Hence, unprofitable companies with vulnerable intangible assets, such as nascent SMEs, should rely primarily on equity financing. If there were no costs associated with adjusting the financing structure, each company should always be at its target debt ratio (Brealey & Myers, 2003). In sum, the trade-off theory develops the capital structure irrelevance theory but moderates the assumption that there is no cost to financial distress in situations where businesses are leveraged. This brings in the optimal point where the firm's value is maximized.

Businesses whose debt levels do not meet their target could change their capital structure if their advantage outweighs the adjustment cost. Thus, according to Dierker et al. (2015), firms should adjust their capital structure if the benefits outweigh the cost. Therefore, the trade-off theory suggests that firms increase their debt levels to benefit from tax shields in the absence of adjustment costs. In such situations, leverage and profitability are positively related (Dierker et al., 2015). Therefore, according to this theoretical perspective, using debt is preferred by owner–managers even when internal funds are available because leverage is seen as advantageous.

Nonetheless, due to the possibility of a considerable adjustment cost, it may be preferable for businesses to be inactive in terms of adding more leverage, as capital can be costly. Adding more debt capital may result in a leverage ratio that may not be desirable (Dierker et al., 2015). Following studies such as Martinez, Scherger, and Guercio (2019), this study advances the view that when nascent SMEs achieve a balance between the costs and benefits of issuing debt and equity capital, their short-term solvency improves. In examining the pecking order theory versus the trade-off theory in the context of SMEs in Ghana,

Agyei et al. (2020), however, found broad support for the pecking order theory by showing that Ghanaian SMEs' funding choices conform to its theoretical predictions in contrast to the perspective of this current study. Nevertheless, this study's viewpoint is consistent with the findings of Yakubu et al. (2021), who found a negative effect of debt on Ghanaian enterprises, validating the trade-off argument. Overall, the trade-off theory provides a useful framework for understanding the capital structure decisions of SMEs, including those in Ghana. It highlights the importance of balancing the benefits and costs of debt and equity financing and emphasizes the need for SMEs to carefully consider the adjustment costs associated with changing their capital structure.

Profitability and short-term solvency

Profitability is a vital sign of SME health and an essential predictor of illiquidity (Boata & Gerdes, 2019). Defaulting businesses are almost always unprofitable (Levratto, 2013). A default describes a situation in which a company is not profitable and its capital is not producing value (Levratto, 2013). To obtain an acceptable return on the amount of risk agreed upon by the owners and lenders, the firm must be profitable (Lamberg & Vlming, 2009). Profits are determined by two factors in any organization, large or small: sales and costs (Stanley & Wasilewski, 2017). Profitable companies earn more money than they spend. Profitability assesses a company's ability to profit through production factors and capital. It indicates how well the company performs in meeting its goals (Issau & Soni, 2019). It becomes significantly worse when bankruptcy is looming (Amoa-Gyarteng, 2019). As a result, large and small firms must be profitable to meet their objectives, remain liquid, and reduce the risk of failure.

In identifying the three phases that firms go through before collapse, Boata and Gerdes (2019) indicate that the first phase is the strategic phase, in which business owners and managers face several strategic choices. Such decisions could be the selection of funding type. Financial distress will escalate if the strategic phase is prolonged. The second phase is the profitability crisis stage, and it manifests an inappropriate strategy, such as an inappropriate capital structure. According to Boata and Gerdes (2019), a profitability crisis reveals itself in diminishing operating profits and contracting cash flows. This acute cash flow shortage leads the company to fall behind on payments and obligations, launching it into financial distress (Culetera & Bredart, 2016).

Chen et al. (2022) found that financial indicators that can better reflect short-term solvency are important for evaluating enterprise profitability. Minemma and Anderson (2018) found a positive relationship between liquidity and profitability. Furthermore, businesses that default on short-term debt are frequently unprofitable (Levratto, 2013). Return on assets, return on equity, and

net profit after tax are the metrics used in this study to determine profitability. We employ the working capital ratio as the short-term solvency indicator. Following on from the key body of research on the subject, we have developed our hypotheses for each metric as follows:

H1: Return on assets has a positive relationship with the short-term solvency of nascent SMEs in Ghana.

H2: Return on equity has a positive significant relationship with the short-term solvency of nascent SMEs in Ghana.

H3: Net profit after tax has a positive relationship with the short-term solvency of nascent SMEs in Ghana.

Capital structure and short-term solvency

The success of nascent SMEs is affected by various factors, including their firm-specific resources. The claim is supported by Masakure et al.'s (2009) study on the performance of microenterprises in Ghana. Hence, the selection of an appropriate funding framework is imperative for promoting the short-term solvency of nascent SMEs in Ghana. Analogous to their larger counterparts, nascent SMEs in Ghana necessitate access to financial resources to facilitate their operations. However, gaining capital in Ghana is challenging (Attrams & Tshehla, 2022). Nascent SMEs in Ghana face difficulties in accessing finance due to high collateral requirements, complex application procedures, and high interest rates. These factors limit their ability to obtain new capital, leading to illiquidity and financial instability (Abe et al., 2015).

Added to this constraint is the cost of capital. Biswas (2014) emphasizes the high cost of external equity for small and medium enterprises while admitting its essence in supporting growth potential and survival. As an enterprise grows, its preferences for various sources of capital change. According to Baker et al. (2020), the preference for long-term funding increases as small businesses progress across the growth stages. In their study, Berger and Udell (1998) conclude that financial institutions are sceptical of younger firms because of information opacity and hence are less creditworthy. Therefore, their capacity to secure credit grows as businesses mature from infancy to maturity.

Nascent SMEs should pay attention to short-term solvency as it is an important indicator of financial health. It indicates the company's ability to run its operations into the future. In effect, businesses are illiquid if they can no longer consistently achieve their corporate, financial, and social objectives at steady intervals (Levratto, 2013). Despite the fact that there are numerous discriminant factors for illiquidity, Levratto (2013) identifies the major financial reasons as capital loss, inability to secure new capital, and high leverage. When firms are

highly leveraged, the risk of default escalates (Almansour, 2015), and liabilities may even be more than assets (Power, 2015). In these instances, the cost of debt rises leading to high financial risks and the possibility of collapse (Boata & Gerdes, 2019). Nascent SMEs can improve liquidity by utilizing the appropriate capital mix (Dhankar, 2019). As a result, the financing strategy may affect the venture's chances of survival and success (Abor, 2016). Since non-equity sources or debt capital are typically used to purchase assets, heavily leveraged nascent SMEs show a higher financial risk.

On the other hand, a low level of leverage indicates a high level of efficiency in the management of equity capital (Situm, 2014). Abor (2016) asserts that a high debt-to-equity ratio increases earnings volatility and raises the risk of insolvency due to high financing costs. Furthermore, a poorly configured capital structure could lead to insolvency, so organizations should consider sustainability in their capital structure framework. As stated by Chung et al. (2013), firms with capital structures close to an economically relevant equilibrium will perform well in competitive markets and be more likely to be solvent and survive than those further afield.

This paper measures capital structure by debt-to-equity ratio, equity ratio, and debt ratio. The working capital ratio measures short-term solvency. Based on the extant literature, we posit the following hypotheses for each measure:

H4: *Debt ratio has an inverse relationship with the short-term solvency of nascent SMEs in Ghana.*
H5: *Debt-to-equity ratio has an inverse relationship with the short-term solvency of nascent SMEs in Ghana.*
H6: *Equity ratio has a positive relationship with the short-term solvency of nascent SMEs in Ghana.*

METHODOLOGY

Research design

This study used a cross-sectional survey and a quantitative approach to establish the relationship between capital structure, profitability, and short-term solvency. A cross-sectional survey design allows for the collection of quantitative data, which can then be quantitatively analyzed using descriptive and inferential statistics (Saunders et al., 2015).

Study setting, population, and sampling

The unit of analysis in this study is small and medium enterprises operating in Ghana's Accra, Kumasi, and Tema metropolitan areas. Ghana's capital city is Accra. Tema and Kumasi are also large cities in Ghana, with numerous small businesses in various industries (Ghana Statistical Service, 2013). The population of this study includes all small and medium enterprises registered with the Ghana Enterprises Agency in Accra, Kumasi, and Tema. The Ghana Enterprises Agency is a government agency under the Ministry of Trade and Industry tasked with promoting and developing Ghana's micro, small, and medium enterprises. SMEs registered with the Ghana Enterprises Agency have defined operational structures and operate within the formal economy. They are legally required to file annual audited returns with the Ghana Revenue Authority (Aryeetey & Ahene, 2005). As a result, to maintain their legal standing, they keep financial records.

The available list from the Ghana Enterprises Agency indicates that for the period 2010 to 2021, there were 7858, 433 and 2045 SMEs in Accra, Kumasi and Tema metropolitan areas, respectively, registered with the agency. This results in a total of 10,368 registered SMEs. While there are 10,368 small and medium-sized businesses, not all are new ventures. This study, like Günzel-Jensen and Holm (2015) and Crawford et al. (2015), focuses on SMEs that have been operating for less than five years. Therefore, for units to be included in this study, they must meet this selection criterion. The required SMEs with this age profile were chosen from the Ghana Enterprises Agency database. This study focused on 1106 SMEs that met the selection criteria. This category of Ghanaian nascent SMEs has the most difficulty surviving (Kusi et al., 2015). In order to examine all nascent SMEs (1106 units) in the metropolises of Accra, Kumasi, and Tema that have been registered with the Ghana Enterprises Agency, this study employs a census strategy. This allowed the researchers to collect information from all available and willing members of the population. The census strategy ensures that there is no sampling error and that accurate sample estimates are obtained (Rungani & Potgieter, 2018).

Data collection and analysis

The data is primarily financial statement information of nascent SMEs obtained from the Ghana Enterprises Agency. The required financial ratios for each SME in the study sample were then calculated using the financial statement data. Ratios are X/Y arithmetic relationships that analysts can control in two ways. First, they limit the size of the financial data. As a result, ratios from various enterprises can be compared even if the underlying financial information on the financial statements is not numerically comparable. Second, ratios account

for industry-specific features (Jewell & Mankin, 2011). The essential financial metrics that measure capital structure, profitability and short-term solvency for each nascent SME in the study sample were then calculated using the formulae stated in Table 1.

All data sources may contain errors and missing values. A data cleaning process addresses such irregularities. The method may include format controls, completeness checks, and a statistical review of the data to identify outliers, among other things (Chapman, 2005). Data cleaning in this study was accomplished using Microsoft Excel and IBM SPSS version 27 for data summarization and data reduction, respectively. Each variable's frequency distribution was run. This ensured that the data stayed within the expected range and that outliers were identified. The Statistics Package for Social Science (SPSS) version 27 was adopted to analyze the data. Specifically, an analysis of descriptive statistics (i.e., skewness and kurtosis) was conducted. A Pearson correlation analysis was also performed. Finally, this study, like previous studies by Abor (2015) and Ayepa et al. (2019), employs the multiple regression technique to test the dependency relationships between the constructs. Multiple regression is the appropriate statistical analysis method when a dependent variable is postulated to be associated with two or more independent variables (Hair et al., 2011).

Measures

Table 1 presents the variables used in the analysis. Following studies such as Kodongo et al. (2015) and Yapa (2015), this study measures capital structure by debt ratio, debt-to-equity ratio and equity ratio. Following Amoa-Gyarteng and Dhliwayo (2022), we measure profitability by return on assets, return on equity and net profit after tax. Short-term solvency is operationalized as the working capital ratio (Brigham & Houston, 2021).

According to Bartov et al. (2000), omitting confounding variables can lead to erroneously rejecting a hypothesis when it should be accepted. We use prior studies to account for other factors that could have an impact on the short-term solvency of nascent SMEs. We control for size (the Log of Total Assets) and sales growth (Current Period Sales- Prior Period Sales/Prior period sales), similar to Abor (2005), who investigated the effect of capital structure on profitability by analyzing listed firms in Ghana. Control variables, size, and sales growth have a positive and significant relationship with firm success (Rajamani, 2021).

Table 1. List of measures and their formulae

Variables	Abbreviation	Formula	Source
Return on Equity	ROE	Net Income / Equity	Ahsan (2012)
Return on Assets	ROA	Net Income / Total Assets	Brigham & Houston (2021)
Net Profit After Tax	NPAT	Revenue - (Expenses + Taxes)	Kemp (2011)
Debt Ratio	DR	Total Liabilities / Total Assets	Quesada-Pineda (2019)
Debt-to-Equity Ratio	DER	Total Liabilities / Shareholder Equity	Gibson (2012)
Equity Ratio	ER	Total Equity / Total Assets	Situm (2014)
Net Worth	NW	Total Assets - Total Liabilities	Brigham & Houston (2021)
Working Capital Ratio	WCR	Current Assets / Current Liabilities	Brigham & Houston (2021)
Solvency Ratio	SR	(Net Profit After Tax + Depreciation) Total Liabilities	Ucal & Oksay (2011)
Size	SIZE	Log of Total Assets	Abor (2005)
Sales Growth	SG	(Current Period Sales - Prior Period Sales) Prior period sales	Abor (2005)

Model estimation

The main objective of this study is to examine the relationship between profitability, capital structure, and short-term solvency of nascent SMEs. Thus, the amount of variance in short-term solvency that is accounted for by the variation in profitability and capital structure is measured by multiple regression analysis. The estimation model is as follows:

$$WCR_i = \beta_o + \beta_1 ROE_{i,1} + \beta_2 ROA_{1,2} + \beta_3 NPAT_{i,3} + \beta_4 DR_{i,4} + \beta_5 DER_{i,5} + \beta_6 ER_{i,6} + \beta_7 SIZE_{i,7} + \beta_8 SG_{i,8} + ë_{,i} \tag{1}$$

Where:
WCR_i is the working capital ratio for nascent SME i in the population,
ROE_i, is the return on equity for nascent SME i in the population,
ROA_i, is the return on assets for nascent SME i in the population,
$NPAT_i$, is the net profit after tax for nascent SME i in the population,
DR_i, is the debt ratio for nascent SME i in the population,
DER_i is the debt-to-equity ratio for nascent SME i in the population,
ER_i, is the equity ratio for nascent SME i in the population,
$SIZE_i$, is the log of total assets for nascent SME i the population,
SG_i, is sales growth for nascent SME i in the population,

ë$_{i,t}$ is the error term,
The β's are the coefficients for every independent variable.

RESULTS AND DISCUSSION

Descriptive analysis

Table 2 presents descriptive statistics for the variables, including the age of the business, gender of the owners or primary principals, industry type, and form of business ownership. The study sample included 1106 nascent small and medium businesses, with the wholesale and retail sector (256 participants) and manufacturing sector (208 participants) having the most participants in terms of sector of the business. They accounted for 42% of the nascent SMEs in this study. This reflects the business environment in Ghana, where wholesale and retail are preferred over other sectors.

Table 2. Descriptive statistics

	Frequency	%
Gender of Owners/Major Directors		
Male	728	66
Female	378	34
Years of Business Operation		
Less than two years	118	11
Two to three years	146	13
Three to four years	302	27
Four to five years	540	49
Business Sector		
Manufacturing	208	19
Wholesale and Retail	256	23
Education	132	12
Construction and Mining	98	9
Agriculture	40	4
Hospitality and Tourism	102	9
General Business Service	104	9
Other	166	15
Forms of Business Ownership		
Sole Proprietorship	268	24
Partnership	72	7
Limited Liability Company	740	67
Other Business Structure	26	2

Males made up nearly twice the number of business owners sampled in this study, as is usually the case. Due to a male conception of entrepreneurship, female entrepreneurship is sometimes given a lower level of legitimacy by the business community. This impacts women-owned businesses' market position and image, limiting the mobilization of critical resources and impeding the full realization of their entrepreneurial potential (Díaz-García & Brush, 2012). The cut-off point was set at five years because the study focused on nascent SMEs. 49% of the sample was between the ages of four and five years. 27% of those who participated in this study were between the ages of three and four years. Nascent SMEs with a lifespan of two years or less made up 11% of participants, while those with a lifespan of two to three years made up 27%. 67% of the nascent SMEs in the survey were limited liability companies. This might be because some sectors, like the pharmaceutical sector, demand that businesses register as such.

Testing the assumptions of multiple regression

Before using multiple regression analysis to analyze the data, a number of assumptions must be taken into account (Laerd, 2015). Multiple regression analysis assumes that there is a continuous dependent variable and two or more independent variables, which can be continuous or categorical (Laerd, 2015). This study investigates the relationship between profitability, capital structure and solvency, all of which were measured on a continuous basis. Multiple regression analysis should have no significant outliers, high leverage points, or extremely influencing points. SPSS Statistics was used in this study to identify potential outliers, high leverage points, and highly influential points. In detecting outliers, a casewise diagnostics table was used to highlight cases where the standardized residual was more than ±3 standard deviations. A cut-off value larger than ±3 is a standard criterion for determining whether a residual is representative of an outlier or not (Laerd, 2015).

Additionally, harmful data points were removed using Cook's distance and leverage values rule of thumb. In regression analysis, Cook's distance (Di) is used to detect significant outliers in a set of predictor variables. It is a technique for identifying negative points in the regression model. Cook's distance is calculated using each observation's leverage and residual values, the greater the leverage and residuals, the greater the Cook's distance. Large values (often greater than 1) indicate that the case substantially impacts the predicted regression coefficients (Field, 2009). Leverage numbers range from 0 to 1, with 0 indicating that the case has no effect and 1 indicating that the case has a significant impact (Field, 2009).

Testing normality

The results of the normality test are shown in Table 3. The skewness and kurtosis values for each measure were -2 or > +2, indicating that the data is normal and suitable for multiple regression analysis. Furthermore, the standard errors for skewness and kurtosis were 0.076 and 0.152, respectively, which are nominal values. According to Hair et al. (2011), values of up to ± 3 are accepted as normal.

Table 3. Normality assessment

Construct	Skewness	Std. Error	Kurtosis	Std. Error
Return on Assets	1.092	0.076	1.514	0.152
Return on Equity	0.878	0.076	0.756	0.152
Net Profit After Tax	1.042	0.076	0.683	0.152
Debt Ratio	-0.219	0.076	-0.534	0.152
Debt-to-Equity Ratio	1.044	0.076	1.091	0.152
Equity Ratio	0.007	0.076	-0.475	0.152
Working Capital Ratio	0.217	0.076	-0.121	0.152

Multicollinearity assessment

Table 4 shows a correlation matrix of the variables to examine the degree of collinearity. Field's (2009) ballpark value was met since none of the predictor values correlated above 0.80. Furthermore, the VIF values ranged from 1.124 to 3.032. Each value met the cut-off point as suggested by Hair et al. (2011).

Table 4. Correlation matrix and Variance Inflation Factor (VIF)

Variables	Correlation coefficients								VIF
	1	2	3	4	5	6	7	8	
ROA	1.00								3.032
ROE	0.705	1.00							2.830
NPAT	0.567	0.531	1.00						1.813
DER	-0.040	0.318	-1.870	1.00					2.502
DR	0.043	0.325	-1.680	0.709	1.00				3.008
ER	0.199	0.186	0.095	-0.037	0.449	1.00			2.829
SIZE	0.230	0.332	0.225	0.220	0.150	0.180	1.00		1.240
SG	0.120	0.180	0.140	0.260	0.210	0.170	0.242	1.00	1.124

Measurement model goodness-of-fit assessment

R^2 was used as one of the statistical measures of goodness of fit. According to Greenlaw (2009), an R^2 of 0.8 is considered excellent for time series regression. However, in a cross-section regression such as this study, an R^2 of 0.4 or higher is considered good. The R^2 value was 0.519, as shown in Table 5. This means that the regression model explained 51.9% of the variability in the working capital ratio when all independent variables were included. The Adjusted R^2 was also used as a measure of goodness of fit because R^2 always increases when new variables are added, regardless of their contribution to the proper specification of the model. The better the model fit, the higher the adjusted R^2 (Figueiredo et al., 2011). The adjusted R^2 was 51.5%, a large effect size as classified by Cohen (1988). The Durbin–Watson test was utilized to identify the presence of autocorrelation in the residuals. With a Durbin–Watson statistic of 1.944, the results indicate a strong indication of independence in the residuals. This suggests that the residual values are largely uncorrelated and exhibit a high degree of independence.

Table 5. Model summary

R	R Square	Adjusted R Square	Durbin–Watson
0.720	0.519	0.515	1.944

Note: Predictors NPAT, ROA, ROE, DR, ER, DER, Size, SG, Dependent Variable: WCR.

Regression results

The regression results obtained in this study are reported in Table 6. The results show that return on assets significantly predicted the working capital ratio, β = -0.078, t= -2.058, $p < 0.05$. The slope coefficient for return on assets is -0.741, and it is statistically significant, $p < 0.05$, indicating that an increase in return on assets of one unit is associated with a decrease in the working capital ratio of 0.741 units. Thus, H1 is supported. Table 6 also shows that return on equity significantly predicted the working capital ratio, β =0.369, t=8.668, $p < 0.05$. As depicted in the table, a one unit increase in return on equity corresponds to a 1.671 unit increase in the working capital ratio. Hence return on equity may help nascent SMEs to meet short-term obligations; thus, H2 is supported. In our results, net profit after tax significantly predicted the working capital ratio, β = 0.084, t= 2.867, $p < 0.05$.

Table 6. Multiple regression results

WCR	B	95% CI for B		SEB	Beta	t	sig	R	R2
		LL	UL						
								0.720	0.519
NPAT	1.025E-5*	0.3E-5	1.7E-6	0.000	0.084*	2.867	0.004		
ROA	-0.741*	-1.447	-0.034	0.360	-0.078*	-2.058	0.040		
ROE	1.671*	1.293	2.049	0.193	0.369*	8.668	0.000		
DR	-1.645*	-1.977	-1.312	0.169	-0.585*	-9.716	0.000		
ER	2.914*	2.671	3.158	3.158	0.124*	0.857	0.000		
DER	0.374*	0.289	0.458	0.043	0.481*	8.679	0.000		
SIZE	1.183*	0.385	2.750	0.749	0.218*	1.580	0.013		
SALES GROWTH	0.144	0.341	0.820	0.275	0.049	0.523	0.606		

Note: B= Unstandardized Regression Coefficient; CI= Confidence Interval; LL= Lower Limit; UL= Upper Limit; SEB= Standard Error of the Coefficient; β= Standardized Regression Coefficients. * p < 0.05.

The slope coefficient for net profit after tax is 1.025E-5, and it is statistically significant, $p < 0.05$. Therefore, an increase in net profit after tax by one unit results in a nominal increase of the working capital ratio by 1.025E-5; hence, H3 is accepted. The results also show that debt ratio significantly predicted the working capital ratio, β = -0.585, t= - 9.716, $p < 0.05$. The slope coefficient for debt ratio is −1.645, and is statistically significant, $p < 0.05$. Therefore, an increase in debt ratio by one unit decreases the working capital ratio by -1.645. This finding indicates that debt ratio has an inverse relationship with the working capital ratio. Hence, H4 is supported. The results further show that the model's debt ratio had the highest beta coefficient. This means that after controlling for the variance explained by all other variables in the model, this variable makes the strongest unique contribution to explaining the working capital ratio (dependent variable). This study shows that debt has the most significant impact, albeit negative, in terms of short-term solvency.

The results show that the debt-to-equity ratio significantly predicted the working capital ratio, β = 0.481, t=8.679, $p < 0.05$. The debt-to-equity ratio slope coefficient is 0.374, as shown in the table. As a result, a one unit increase in debt-to-equity is associated with a 0.374-unit increase in the working capital ratio. Contrary to the hypothesized inverse relationship, the findings do not support H5, as they reveal a positive association instead. The findings indicate that an appropriate debt–equity mix raises the working capital ratio. Finally, the results demonstrate that the equity ratio predicted the working capital ratio significantly, β = 0.124, t=0.857, $p < 0.05$. The multiple regression equation predicts that the higher the equity ratio, the higher the working capital ratio. Consequently, H6 is supported.

Regarding the control variables, size demonstrates statistical significance (p = 0.013) and exhibits a significant relationship with the working capital ratio. This means that as size increases (while holding other variables constant), there is a corresponding increase in the working capital ratio. On the other hand, sales growth does not show statistical significance (p = 0.606) and does not have a significant relationship with the working capital ratio. This implies that changes in sales growth do not significantly impact the working capital ratio.

DISCUSSION, LIMITATIONS, AND CONCLUDING REMARKS

Discussion and implications

Our research has generated substantial evidence that reinforces the trade-off theory. Our findings demonstrate that the debt ratio has a negative relationship with short-term solvency, while the debt-to-equity ratio and equity ratio have positive relationships with short-term solvency. As such, nascent SMEs in Ghana may be better positioned with less debt. Highly-leveraged firms carry a heightened risk of default, as noted by Almansour (2015). Moreover, these firms may face a situation where their liabilities exceed their assets, as highlighted by Power (2015). Such a predicament results in elevated debt costs, exposing firms to significant financial risks and ultimately increasing the likelihood of failure, as indicated by Boata and Gerdes (2019). Our findings suggest that an optimal mix of debt and equity can increase the working capital ratio and reduce the liability of newness associated with nascent SMEs.

Overall, the study supports the trade-off theory, which recommends a blend of debt and equity financing to leverage the benefits of both sources of capital. Employing an appropriate combination of debt and equity can enable nascent SMEs to meet their short-term obligations, maintain their financial stability, and improve their prospects for success. By adhering to this principle, firms can maximize their chances of achieving sustained growth and profitability, while simultaneously mitigating the inherent risks associated with nascent SMEs.

Our study has also identified that return on equity (ROE) is a crucial driver of short-term solvency for nascent SMEs. This is expected as highly profitable businesses are better positioned to mitigate the liability of newness. Profitability is critical to a company's survival, as noted by Amoa-Gyarteng (2019). Firms that default are typically unprofitable, as highlighted by Levratto (2013), and nascent SMEs must maintain profitability to ensure short-term solvency. Thus, solvency is a function of profitability since it enhances the likelihood of nascent SME survival, as emphasized by Nunes et al. (2012). Moreover, declining profitability manifests as a reduction in operating profits and cash flows. The resulting

cash flow shortages can cause the company to fall behind on payments and obligations, leading to a short-term insolvency crisis, as noted by Culetera and Bredart (2016). The company may then be forced to dissolve, liquidate or declare bankruptcy, as highlighted by Salazar (2006).

The study also found only a nominal positive relationship between net profit after tax (NPAT) and short-term solvency of nascent SMEs in Ghana. While NPAT is an important indicator of a company's financial performance, our findings show that it does not directly impact short-term solvency in a significant way. This is because NPAT represents profits earned over a longer period, usually a year. Short-term solvency, on the other hand, is concerned with a company's ability to meet its immediate financial obligations, such as paying bills and salaries. However, NPAT can indirectly affect short-term solvency by influencing a company's cash flow. A company with high NPAT is likely to have more cash on hand, which can help it meet short-term obligations. Conversely, a company with low NPAT may struggle to generate enough cash to pay its bills, which could affect its short-term solvency.

Contrary to the findings regarding ROE, the study found an inverse relationship between return on assets (ROA) and short-term solvency. This is because maintaining high levels of current assets can result in missed opportunities that could have increased the company's return on assets, as emphasized by Bolek and Wiliński (2012). The implication is that firms that hold too much current assets may not allocate sufficient capital to long-term investments that would generate high returns on assets. This explains our study's inverse relationship between ROA and working capital ratio. As such, the study highlights the critical role of profitability in ensuring the short-term solvency of nascent SMEs. By maintaining an optimal debt to equity mix and profitability, nascent SMEs can increase their working capital ratios, improve their financial stability, and enhance their chances of survival.

The present study has several important implications for both theory and practice. Firstly, it contributes to the literature on nascent SMEs by expanding our understanding of the financial decision-making of business owners in emerging economies. This is particularly relevant since the majority of the studies on nascent SMEs is derived from developed economies, such as the United States and the United Kingdom. As such, this study provides valuable insight into how the trade-off theory applies to nascent SMEs and how the optimal capital structure can contribute to their short-term solvency and survival. The study's contribution to the literature lies in demonstrating that the trade-off theory's tenets are relevant to the liquidity and survival of nascent SMEs. As such, capital structure theories apply equally to small and medium businesses as much as they do to large corporations. This highlights the theoretical contribution of the study.

This study also emphasizes the inverse relationship between return on assets (ROA) and working capital ratio from a managerial perspective. This insight has practical implications for entrepreneurs and managers of nascent SMEs. Managers of nascent SMEs should recognize that maintaining liquidity requires keeping a significant portion of current assets, which lowers the risk of bankruptcy. However, excessive current assets could be utilized to invest in fixed assets, resulting in a higher ROA if applied correctly. SMEs should prioritize short-term solvency and ROA by avoiding converting all current assets into fixed assets solely to achieve a high ROA. Such a strategy could result in illiquidity and financial distress. SMEs should also avoid holding too many liquid assets, which would increase the cost of missed opportunities and lower ROA.

Overall, this study contributes to the literature on nascent SMEs, highlighting the importance of an optimal debt-to-equity ratio and the nuanced relationship between profitability and working capital ratio.

Limitations and suggestions for future research

Despite the study's limitations, they could make for interesting future investigation areas. Quantitative studies like this present study focus on numerical representativity and the creation and testing of hypotheses based on statistical significance. However, testing for statistical significance is prone to error, undermining what should be a contemplative exercise (Rothman, 1986). Furthermore, statistical significance does not always imply empirical results' practical or theoretical significance (Schneider, 2013). This represents a limitation in this study as the findings, managerial implications and contribution were reached based on the statistical significance of the relationship between the study constructs. However, as Ochieng (2009) suggested, this study recognized that quantitative data should be based on qualitative judgment. This study accepts that numbers cannot be interpreted without understanding the assumptions underpinning them. As a result, every effort was made to make this study and its findings a contemplative exercise.

This was a cross-sectional study rather than a longitudinal one. It was based on financial statements from nascent SMEs. According to Solem (2015), the primary limitation of a cross-sectional study design is that the predictor and outcome variables are assessed concurrently, making it nearly impossible to establish an actual cause-and-effect relationship. This methodological shortcoming limits the study's generalizability, and future studies should use a longitudinal design to address this limitation.

Another limitation of this study is that the research sample is highly heterogeneous, with companies from different sectors of activity included. As a result, there may be potential impacts on the obtained research results that

are beyond the control of the research model, particularly with regards to sector of the companies being studied. To address the limitation of the heterogeneous sample in future studies, researchers may consider implementing strategies such as stratified sampling or matching to control for the effects of firm sector. Stratified sampling involves dividing the population into subgroups based on relevant characteristics and then randomly selecting participants from each subgroup to create a more representative sample. Matching, on the other hand, involves selecting participants in terms of identifiable characteristics. Additionally, researchers may also consider conducting separate analyses for nascent SMEs of different sectors to better understand the potential impact of these factors on the research results.

Concluding remarks

This study contributes to the literature on nascent SMEs, particularly in emerging economies such as Ghana. The study utilizes financial indicators to better understand the short-term solvency and survival of nascent SMEs in Ghana. The integration of financial indicators provides a new lens through which to examine nascent SMEs and highlights the importance of financial decision-making in nascent SMEs success. The study findings demonstrate that a good mix of capital and profitability is crucial for the survival of nascent SMEs in emerging economies.

The study specifically contributes to the trade-off theory, which has primarily been applied to large corporations. By showing that capital structure theories apply equally to nascent SMEs, this study provides a theoretical contribution to the field. This study offers a unique perspective on the financial management of nascent SMEs and enriches the existing literature on SMEs in emerging economies. By demonstrating the importance of sound financial decision-making, the study provides fresh insights that can aid entrepreneurs and managers in emerging economies in making informed choices that promote their firms' success. Practically, the study highlights the importance of understanding the inverse relationship between return on assets and working capital ratio from a managerial perspective. Managers of nascent SMEs should prioritize short-term solvency while also considering long-term investment opportunities.

The study's focus on Ghana, an emerging economy, provides a unique perspective as most of the existing literature on nascent SMEs concentrates on developed economies. The added value of this work within the scientific debate on nascent SMEs in emerging economies is that it expands the body of knowledge on the subject beyond developed economies and provides a unique perspective on how such businesses in emerging economies can remain solvent. By expanding the body of knowledge on nascent SMEs in emerging economies, this study contributes to a more comprehensive understanding of the challenges and

opportunities facing nascent SMEs in these contexts. The practical implications of this study are relevant for entrepreneurs and SME managers in Ghana, where the entrepreneurial ecosystem is characterized by challenges such as limited access to finance, weak infrastructure, and limited market opportunities, which make nascent SMEs even more vulnerable. In light of these challenges, the study's findings can assist entrepreneurs and nascent SME managers in making informed decisions regarding capital structure and profitability to improve their short-term viability and survival.

Furthermore, policymakers in Ghana should take note of the study's findings and develop policies that promote access to finance for nascent SMEs, as well as provide support for entrepreneurs and nascent SME managers to make informed financial decisions. This can include measures such as developing a credit guarantee scheme for nascent SMEs, improving the infrastructure and market opportunities for nascent SMEs, and providing financial education and training to entrepreneurs and nascent SME managers.

References

Abe, M., Troilo, M., & Batsaikhan, O. (2015). Financing small and medium enterprises in Asia and the Pacific. *Journal of Entrepreneurship and Public Policy, 4*(1), 2-32. https://doi.org/10.1108/JEPP-07-2012-0036

Abel, A. B. (2018). Optimal debt and profitability in the trade-off theory. *The Journal of Finance, 73*(1), 95-143. https://doi.org/10.1111/jofi.12590

Abor, J. (2005). The effect of capital structure on profitability: an empirical analysis of listed firms in Ghana. *The journal of risk finance, 6*(5), 438-445. https://doi.org/10.1108/15265940510633505

Abor, J. Y. (2016). *Entrepreneurial finance for MSMEs: A managerial approach for developing markets*. Cham: Springer. https://doi.org/10.1007/978-3-319-34021-0

Abor, P. A. (2015). The effects of healthcare governance and ownership structure on the performance of hospitals in Ghana. *International Journal of Law and Management, 57*(2), 107-140. https://doi.org/10.1108/IJLMA-04-2014-0031

Agyei, J., Sun, S., & Abrokwah, E. (2020). Trade-off theory versus pecking order theory: Ghanaian evidence. *SAGE Open, 10*(3), 1-13. https://doi.org/10.1177/2158244020940987

Ahsan, A. M. (2012). Can ROE be used to predict portfolio performance? *Economics, Management and Financial Markets, 7*(2), 132-148.

Almansour, B. Y. (2015). Empirical model for predicting financial failure. *American Journal of Economics, Finance and Management, 1*(3), 113-124.

Amaglo, J.K. (2019). *Strategies for Sustainability of Small and Medium Enterprises in Ghana* (Doctoral dissertation, Walden University).

Amoa-Gyarteng, K. (2019). Explanatory and predictive values of the drivers of corporate bankruptcy. *Journal of Finance and Marketing, 3*(2), 01-8

Amoa-Gyarteng, K. (2019). Financial characteristics of distressed firms: An application of the Altman algorithm model. *Journal of Corporate Accounting & Finance, 30*(1), 63-76. https://doi.org/10.1002/jcaf.22367

Amoa-Gyarteng, K., & Dhliwayo, S. (2022). The impact of capital structure on profitability of nascent small and medium enterprises in Ghana. *African Journal of Business & EconomicResearch, 17*(2),275-291.https://doi.org/10.31920/1750-562/2022/v17n2a12

Amoa-Gyarteng, K. (2021). Corporate financial distress: The impact of profitability, liquidity, asset productivity, activity and solvency. J*ournal of Accounting, Business and Management, 28*(2),104-115. https://doi.org/10.31966/jabminternational.v28i2.447

Aryeetey, E., & Ahene, A. A. (2005). Changing regulatory environment for small-medium size enterprises and their performance in Ghana. *Research in Agricultural and Applied Economics(AgEconSearch)*. Retrieved from https://ageconsearch.umn.edu/record/30594/files/cr050103.pdf

Attrams, A. S., & Tshehla, M. (2022). Challenges of services sector SMEs in a developing country: A case of Ghana. *Journal of the International Council for Small Business, 3*(3), 228-236. https://doi.org/10.1080/26437015.2021.1982369

Ayepa, N. A., Boohene, R., & Mensah, M. S. B. (2019). Effects of innovativeness and firm resources on the growth of small enterprises in the Ga South Municipality in Ghana. *Ghana Journal of Development Studies, 16*(1),1-21. https://doi.org/10.4314/gjds.v16i1.1

Bajaj, Y., Kashiramka, S., & Singh, S. (2020). Application of capital structure theories: A systematic review. *Journal of Advances in Management Research, 18*(2),173-199. https://doi.org/10.1108/JAMR-01-2020-0017

Baker, H. K., Kumar, S., & Rao, P. (2020). Financing preferences and practices of Indian SMEs. *Global finance journal, 43*,1-16. https://doi.org/10.1016/j.gfj.2017.10.003

Bartov, E., Gul, F. A., & Tsui, J. S. (2000). Discretionary-accruals models and audit qualifications. *Journal of Accounting and Economics, 30*(3),421-452. https://doi.org/10.1016/S0165-4101(01)00015-5

Berger, A. N., & Udell, G. F. (1998). The economics of small business finance: The roles of private equity and debt markets in the financial growth cycle. *Journal of Banking & Finance, 22*(6-8), 613-673. https://doi.org/10.1016/S0378-4266(98)00038-7

Biswas, A. (2014). Financing constraints for MSME sector. *International Journal of Interdisciplinary and Multidisciplinary Studies*, 1(5), 60–68.

Boata, A., & Gerdes, K. (2019). Three indicators can reveal SME insolvency risk up to four years in advance. *Economic Research*. Retrieved from https://www.eulerhermes.com/englobal/economic-research/

Bolek, M., & Wiliński, W. (2012). The influence of liquidity on profitability of Polish construction sector companies. *E-Finanse: Financial Internet Quarterly, 8*(1), 38-52. https://doi.org/10.12691/jfa-7-1-4

Brealey, R. A., & Myers, S. C. (2003). *Capital investment and valuation*. New York: McGraw Hill Professional.

Brigham, E.F., & Houston, J.F. (2021). *Fundamentals of financial management*. Boston: Cengage Learning

Cekrezi, A. (2013). A literature review of the trade–off theory of capital structure. *Iliria International Review, 3*(1),125-134.

Chapman, A. D. (2005). Principles and methods of data cleaning: Primary species and species-occurrence data, version 1.0. Report for the Global Biodiversity Information Facility, Copenhagen.

Chen, J., Liu, Y., & Zhu, Q. (2022). Enterprise profitability and financial evaluation model based on statistical modeling: Taking tencent music as an example. *Mathematics, 10*(12),1-17. https://doi.org/10.3390/ math10122107

Chung, Y. P., Na, H. S., & Smith, R. (2013). How important is capital structure policy to firm survival? *Journal of Corporate Finance, 22*, 83-103. https://doi.org/10.1016/j.jcorpfin.2013.04.002

Coase, R. H., & Wang, N. (2011). The industrial structure of production: A research agenda for innovation in an entrepreneurial economy. *Entrepreneurship Research Journal, 1*(2), 1-13. https://doi.org/10.2202/2157-5665.1026

Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.

Crawford, G. C., Aguinis, H., Lichtenstein, B., Davidsson, P., & McKelvey, B. (2015). Power law distributions in entrepreneurship: Implications for theory and research. *Journal of Business Venturing, 30*(5), 696-713. https://doi.org/10.1016/j.jbusvent.2015.01.001

Cultrera, L., & Brédart, X. (2016). Bankruptcy prediction: The case of Belgian SMEs. *Review of Accounting and Finance, 15*(1),101-119. https://doi.org/10.1108/RAF-06-2014-0059

Dar, I.A. & Mishra, M. (2020). Dimensional impact of social capital on financial performance of SMEs. *The Journal of Entrepreneurship, 29*(1),38-52. https://doi.org/10.1177/0971355719893499

Dhankar, R. S. (2019). Optimal capital structure and investment decisions. In *Capital Markets and Investment Decision Making* (pp. 197-210). New Delhi: Springer. https://doi.org/10.1007/978-81-322-3748-8_12

Díaz-García, M. C., & Brush, C. (2012). Gender and business ownership: Questioning "what" and "why". *International Journal of Entrepreneurial Behavior & Research, 18*(1), 1-27. https://doi.org/10.1108/13552551211201358

Dierker, M., Lee, I., & Seo, S. W. (2019). Risk changes and external financing activities: Tests of the dynamic trade-off theory of capital structure. *Journal of Empirical Finance, 52*, 178-200. https://doi.org/10.1016/j.jempfin.2019.03.004

Dierker, M. J., Kang, J. K., Lee, I., & Seo, S. W. (2015). Risk changes and the dynamic trade-off theory of capital structure. Seul: Kaist Business School.

Field, A.P. (2009). Discovering statistics using SPSS (3rd ed.). London: Sage

Figueiredo Filho, D. B., Júnior, J. A. S., & Rocha, E. C. (2011). What is R^2 all about? *Leviathan (São Paulo)*, (3), 60-68. https://doi.org/10.11606/issn.2237-4485.lev.2011.132282

Ghana Statistical Service. (2013). 2000 Population and Housing Census. Retrieved from https://statsghana.gov.gh/gssmain/fileupload/pressrelease/2010_phc_national_analytical_report.pdf

Gibson, C. H. (2012). *Financial reporting and analysis*. Cengage Learning: Mason, Ohio.

Greenlaw, C., & Brown-Welty, S. (2009). A comparison of web-based and paper-based survey methods. Evaluation Review, 33(5), 464–480. https://doi.org 10.1177/0193841X09340214

Günzel-Jensen, F., & Holm, A. B. (2015). Freemium business models as the foundation for growing an e-business venture: A multiple case study of industry leaders. *Journal of Entrepreneurship, Management and Innovation, 11*(1), 77-102. https://doi.org/10.7341/20151115

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

Hewitt, L. M. M. & Roodt, G.(2017). The moderating role of antecedents when using entrepreneurial orientation to predict firm performance. 2nd Business and Entrepreneurial Economic Conference. Brijuni, National Park, Croatia.

Issau, K. & Soni, S. (2019). Business orientation and performance of small and medium-sized enterprises: Evidence from Ghana. *African Journal of Business & Economic Research,14*(4).53-79. https://doi.org/10.31920/1750-4562/2019/14n4a3

Jewell, J. J., & Mankin, J. A. (2011). What is your ROA? An investigation of the many formulas for calculating return on assets. *Academy of Educational Leadership Journal, 15*, 79-91.

Kemp, M. (2011, September). Intrinsic value. In *Annual AIA Conference Proceedings, Sydney, Saturday* (Vol. 3).

Kodongo, O., Mokoaleli-Mokoteli, T., & Maina, L. N. (2015). Capital structure, profitability and firm value: Panel evidence of listed firms in Kenya. *African Finance Journal, 17*(1), 1-20. https://doi.org/10.2139/ssrn.2465422

Kumar, S., Sureka, R., & Colombage, S. (2020). Capital structure of SMEs: A systematic literature review and bibliometric analysis. *Management Review Quarterly, 70*(4), 535-565. https://doi.org/10.1007/s11301-019-00175-4

Kusi, A., Opata, C. N., & Narh, T. W. J. (2015). Exploring the factors that hinder the growth and survival of small businesses in Ghana (a case study of small businesses within Kumasi metropolitan area). *American Journal of Industrial and Business Management, 5*(11), 705. https://doi.org/10.4236/ajibm.2015.511070

Laerd Statistics. (2015). Multiple regression using SPSS statistics. Statistical tutorials and software guides. Retrieved from https://statistics.laerd.com/

Lamberg, S., & Vålming, S. (2009). *Impact of Liquidity Management on Profitability: A study of the adaptation of liquidity strategies in a financial crisis.* (Master thesis). Umeå School of Business, Sweden. Retrieved from http://www.diva-portal.org/smash/get/diva2:282882/FULLTEXT01.pdfImpact

Levratto, N. (2013). From failure to corporate bankruptcy: A review. *Journal of Innovation and Entrepreneurship, 2*(1), 1-15. https://doi.org/10.1186/2192-5372-2-20

Li, K., Niskanen, J., & Niskanen, M. (2019). Capital structure and firm performance in European SMEs. *Managerial Finance, 45*(5), 582- 601. https://doi.org/10.1108/MF-01-2017-0018

Martinez, L. B., Scherger, V., & Guercio, M. B. (2019). SMEs capital structure: Trade-off or pecking order theory: A systematic review. *Journal of Small Business and Enterprise Development, 26*(1), 105-132. https://doi.org/10.1108/JSBED-12-2017-0387

Masakure, O., Henson, S., & Cranfield, J. (2009). Performance of microenterprises in Ghana: A resource-based view. *Journal of Small Business and Enterprise Development, 16*(3), 466-484. https://doi.org/10.1108/14626000910977170

Minnema, J. & Andersson, A. (2018). The relationship between leverage and Profitability: A quantitative study of consulting firms in Sweden. Umea School of Business Economics and Statistics, Umea University, Sweden. Retrieved from https://www.diva-portal.org/smash/get/diva2:1234028/FULLTEXT01.pdf

Musah, M., & Kong, Y. (2019). The association between capital structure and the financial performance of non-financial firms listed on the Ghana Stock Exchange (GSE). *International Journal of Research in Social Sciences, 9*(5), 92-123

Nieuwenhuizen, C. (2019). The effect of regulations and legislation on small, micro and medium enterprises in South Africa. *Development Southern Africa, 36*(5), 666-677. https://doi.org/10.1080/0376835X.2019.1581053

Nunes, P. M., Viveiros, A., & Serrasqueiro, Z. (2012). Are the determinants of young SME profitability different? Empirical evidence using dynamic estimators. *Journal of Business Economics and Management, 13*(3), 443-470. https://doi.org/10.3846/16111699.2012.680192

Ochieng, P. A. (2009). An analysis of the strengths and limitation of qualitative and quantitative research paradigms. *Problems of Education in the 21st Century, 13*, 13-18

Power, M. (2015). Building the behavioural balance sheet: An essay on Solvency 2. *Economic Sociology_The European Electronic Newsletter, 17*(1), 45-53

Rajamani, K. (2021). Debt financing and financial performance: Empirical evidence of Indian SMEs listed in BSE-SME Platform. *Eurasian Economic Perspectives*, 217-230. https://doi.org/10.1007/978-3-030-63149-9_14

Rothman, K. J. (1986). Significance questing. *Annals of Internal Medicine, 105*(3), 445–447. https://doi.org/10.7326/0003-4819-105-3-445

Rungani, E. C., & Potgieter, M. (2018). The impact of financial support on the success of small, medium and micro enterprises in the Eastern Cape Province. *Acta Commercii, 18*(1), 1-12. https://doi.org/10.4102/ac.v18i1.591

Rutherford, M. W., Pollack, J. M., Mazzei, M. J., & Sanchez-Ruiz, P. (2017). Bootstrapping: Reviewing the literature, clarifying the construct, and charting a new path forward. *Group & Organization Management, 42*(5), 657-706. https://doi.org/10.1177/1059601117730574

Salazar, A. C. (2006). Failure of high technology firms: A study from near-death experiences. In *Proceedings of 2006 USASBE Conference*. United States Association for Small Business & Entrepreneurship

Saunders, M. N. & Tosey, P. (2015). *Handbook of research methods on human resource development*. London: Edward Elgar Publishing.

Schneider, J. W. (2013). *Caveats for using statistical significance tests in research assessments. Journal of Informetrics, 7*(1), 50–62. https://doi.org/10.1016/j.joi.2012.08.005

Sheriff, M. & Muffatto, M. (2015). The present state of entrepreneurship ecosystems in selected countries in Africa. *African Journal of Economic and Management Studies, 6*(1), 17-54. https://doi.org/10.1108/AJEMS-10-2012-0064

Situm, M. (2014). Inability of gearing-ratio as predictor for early warning systems. *Business Systems Research Journal, 5*(2), 23-45. https://doi.org/10.2478/bsrj-2014-0008

Solem, R. C. (2015). Limitation of a cross-sectional study. *American Journal of Orthodontics and Dentofacial Orthopedics, 148*(2), 205. https://doi.org/10.1016/j.ajodo.2015.05.018

Sopha, B.M., Jie, F. & Himadhani, M. (2021). Analysis of the uncertainty sources and SMEs' performance. *Journal of Small Business & Entrepreneurship, 33*(1),1-27. https://doi.org/10.1080/08276331.2020.1764737

Stanley, D. & Wasilewski, N. (2017). Strategic revenue management: Revenue stability and maximizing shareholder value. *Competition Forum, 15*(1), 141-145.

Stinchcombe, A. (1965). Organization-creating organizations. *Trans-action, 2*(2), 34-35. https://doi.org/10.1007/BF03180801

Ucal, M. & Oksay, S. 2011. The solvency ratio of external debt (SRED) as an indicator of debt crisis: the case of Turkey. *Institutional Journal of Economic Research, 2*(1):166-172.

Wiklund, J., Baker, T., & Shepherd, D. (2010). The age-effect of financial indicators as buffers against the liability of newness. *Journal of Business Venturing, 25*(4), 423-437. https://doi.org/10.1108/17566260910942336

Yakubu, I.N., Kapusuzoglu, A., & Ceylan, N.B. (2021). Trade-off theory versus pecking order theory: The determinants of capital structure decisions for the Ghanaian listed firms. In *Strategic Outlook in Business and Finance Innovation: Multidimensional Policies for Emerging Economies* (pp. 111-122). Bingley, UK: Emerald Publishing. https://doi.org/10.1108/978-1-80043-444-820211011

Yang, T., & Aldrich, H.E. (2017). "The liability of newness" revisited: Theoretical restatement and empirical testing in emergent organizations. *Social Science Research, 63*, 36-53. https://doi.org/10.1016/j.ssresearch.2016.09.006

Yapa Abeywardhana, D. K. (2015). *Financing decision, cost of debt and profitability: Evidence from non-financial SMEs in the UK* (Doctoral dissertation, University of Birmingham).

Abstrakt

CEL: Małe i średnie przedsiębiorstwa (MŚP) odgrywają kluczową rolę we wzroście gospodarczym gospodarek wschodzących. Jednak wiele z tych firm upada na wczesnych etapach, dlatego ważne jest zbadanie czynników, które wpływają na ich krótkoterminową wypłacalność. Niniejsze badanie ma na celu zbadanie wpływu struktury kapitału i rentowności na krótkoterminową wypłacalność powstających MŚP w Ghanie, opierając się na ramach odpowiedzialności za nowość. METODYKA: Dane do tego badania uzyskano z Ghana Enterprises Agency, koncentrując się na powstających MŚP, które mają pięć lat lub mniej. Sprawozdania finansowe wykorzystano do pomiaru zmiennych zależnych i niezależnych, a analizę regresji wykorzystano do pomiaru wariancji krótkoterminowej wypłacalności wynikającej z rentowności i struktury kapitału. WYNIKI: Niniejsze badanie pokazuje, że decyzje finansowe i wyniki finansowe działają jako kluczowe czynniki łagodzące potencjalne ryzyko niewypłacalności i niepowodzeń, z jakimi borykają się powstające MŚP. W szczególności badanie wykazało, że odpowiednia równowaga między finansowaniem długiem i kapitałem własnym podnosi wskaźnik kapitału obrotowego, a tym samym zmniejsza odpowiedzialność za nowość, co jest głównym wyzwaniem dla powstających MŚP. Podkreśla to znaczenie teorii kompromisu, która zaleca połączenie finansowania dłużnego i kapitałowego w celu wykorzystania zalet obu źródeł kapitału w kontekście powstających MŚP. W tym badaniu ujawniono skomplikowany związek między rentownością a krótkoterminową wypłacalnością powstających MŚP. Ustalenia pokazują, że podczas gdy zwrot z kapitału własnego ma bezpośredni wpływ na krótkoterminową wypłacalność takich MŚP, zwrot z aktywów wykazuje efekt przeciwny. Ponadto zysk netto po opodatkowaniu wykazuje jedynie nominalny wpływ na krótkoterminową wypłacalność powstających MŚP w Ghanie. IMPLIKACJE: Aby zapewnić krótkoterminową rentowność i ułatwić płynne przejście do dojrzałości, powstające MŚP muszą dążyć do optymalnego stosunku zadłużenia do kapitału własnego. To krytyczne spostrzeżenie podkreśla znaczenie zarządzania strukturą kapitałową powstających MŚP, ponieważ niewłaściwa równowaga między zadłużeniem a kapitałem własnym może utrudniać osiągnięcie krótkoterminowej wypłacalności i długoterminowy sukces firmy. Ponadto, podczas gdy powstające MŚP muszą priorytetowo traktować utrzymanie płynności w celu zabezpieczenia się przed nieprzewidzianymi sytuacjami, wiąże się to z wysokimi kosztami w postaci straconych szans, które mogą znacznie zwiększyć długoterminowy zwrot z aktywów firmy. Dlatego dla właścicieli małych firm w Ghanie kluczowe znaczenie ma znalezienie równowagi między krótkoterminową wypłacalnością a zwrotem z aktywów poprzez rozważne praktyki zarządzania finansami. Ogólnie rzecz biorąc, nasze badanie dostarcza cennych implikacji teoretycznych i praktycznych dla powstających MŚP w Ghanie, podkreślając potrzebę optymalizacji ich struktury kapitałowej i maksymalizacji dłu-

goterminowego zwrotu z aktywów przy jednoczesnym zabezpieczeniu krótkoterminowej płynności. **ORYGINALNOŚĆ I WARTOŚĆ:** *Koncepcja badania, zgodnie z którą struktura kapitału i rentowność są w znacznym stopniu powiązane z krótkoterminową wypłacalnością, a tym samym buforuje odpowiedzialność za nowość, jest nowatorska. Po drugie, wykazując, że założenia teorii kompromisu mają znaczenie dla krótkoterminowej wypłacalności powstających MŚP, badanie pokazuje, że teorie struktury kapitału mają zastosowanie zarówno do MŚP, jak i do dużych firm.*
Słowa kluczowe: *struktura kapitału, rentowność, zobowiązanie nowości, płynność, przetrwanie nowych firm, MŚP, wzrost gospodarczy, gospodarki wschodzące, wypłacalność krótkoterminowa*

Biographical notes

Karikari Amoa-Gyarteng is currently serving as a Research Fellow in the Department of Business Management at the University of Johannesburg. He obtained his PhD in Business Management from the same institution. Additionally, he holds an MBA from Grand Canyon University in Phoenix, Arizona. His research interest includes entrepreneurship and the financial management of both small and large firms.

Shepherd Dhliwayo holds the position of Associate Professor at the Department of Business Management at the University of Johannesburg. In addition, he serves as the Campus Coordinator for Doorenfontein Campus within the same university. He earned his PhD in Entrepreneurship from the University of Pretoria. His primary research focus revolves around the field of entrepreneurship.

Authorship contribution statement

Karikari Amoa-Gyarteng: Conceptualization, Data Curation, Formal Analysis, Software, Methodology, Writing Original Draft. **Shepherd Dhliwayo:** Validation, Investigation, Visualization, Writing - Review & Editing, Supervision.

Conflicts of interest

The authors declare no conflict of interest.

Citation (APA Style)

Amoa-Gyarteng, K., & Dhliwayo, S. (2023). Capital structure, profitability, and short-term solvency of nascent SMEs in Ghana: An empirical study. Journal of Entrepreneurship, Management, and Innovation, *19*(4), 83-110. https://doi.org/10.7341/20231943

Examination of the factors determining the operational and financial performance of airlines: The case of the Turkish international airline market

Mehmet Yaşar[1] (iD), Ender Gerede[2] (iD)

Abstract

PURPOSE: *Firms that want to obtain an advantageous market position and a sustainable long-term competitive advantage in a competitive market place are engaged in competitive behavior in order to realize these goals. Competitive behavior is realized by competitive moves that they have made under real market conditions or by reactions (retaliation) against these moves. Those who initiate the action (Actors), those who respond to the actions (Responders) and competitive actions constitute the competitive dynamics of an industry. The results of the competitive actions carried out within the scope of competitive dynamics are monitored within the scope of market performance. The aim of this study is to reveal the factors that affect the operational and financial market performance of airline companies competing in the Turkish international airline market.* **METHODOLOGY:** *In this context, 26 airlines competing in the Turkish international airline market were evaluated in the context of rival pairs between 2009 and 2018. The analysis of the models designed in the study was carried out by panel regression analysis.* **FINDINGS:** *The findings obtained in the study show the relative market share gain of airlines is positively influenced by their firm maturity, relative size, financial resources, total number of flights, and fleet homogeneity, it is negatively impacted by their capability to deploy resources. According to research, the relative Revenue Passenger Kilometers is positively impacted by the relative size of the airlines, the same business model, and Load Factor, but negatively impacted by resource deployment capability and competing in the same alliance. While the resource allocation capability and efficiency of the airlines have a positive effect on the net result, firm maturity and total number of flights have a negative effect. It has been revealed that the resource deployment capability of airlines*

1   Mehmet Yaşar, Assistant Professor, School of Civil Aviation, Kastamonu University, Kuzeykent Mahallesi, Kastamonu Universitesi Sivil Havacılık Yüksekokulu, Kat: 2, 37150, Kastamonu-Türkiye, e-mail: myasar@kastamonu.edu.tr (ORCID: https://orcid.org/0000-0001-7237-4069).
2   Ender Gerede, Professor, Faculty of Aeronautics and Astronautics, Eskisehir Technical University, Gazipaşa Mahallesi, Eskişehir Teknik Üniversitesi, İki Eylül Kampüsü, 26555, Eskişehir-Türkiye, e-mail: egerede@eskisehir.edu.tr (ORCID: https://orcid.org/0000-0002-8211-8875).

and efficiency of airline firm have a positive effect on financial performance, while firm maturity, the total number of flights, and slack resources have a negative effect. **IMPLICATIONS:** *By introducing additional variables—such as fleet homogeneity, business model, strategic alliances, and codesharing – to the variables utilized in prior studies, this research is expected to add to the body of knowledge on competitive dynamics. Airlines will be guided in and before their actions in a competitive marketplace by understanding the circumstances in which they will demonstrate greater operational and financial performance than their rivals.* **ORIGINALITY AND VALUE:** *Knowing in which situations airlines will show better operational and financial performance against their competitors will guide them in and before their actions in a competitive marketplace.*
Keywords: *competitive dynamics, competition, strategic management, airline companies, panel data analysis, financial performance, operational performance*

INTRODUCTION

Competitive dynamics is a field of research that studies all firms competing in the market and the competitive actions performed by these firms, the antecedents, and the result of these actions. Competitive dynamics, which took its place in strategic management research and where the first studies emerged in the second half of the 1980s (MacMillan et al., 1985; Bettis & Weeks, 1987; Smith et al., 1989), made important contributions to the paradigm transformation that Porter (1980; 1985) brought to strategy, as it examines the concrete, observable and measurable actions taken in the market place.

Being able to predict the actions and reactions of competitors has a positive effect on the market position and financial performance of the firm (Lim, 2013; Bou & Satorra, 2007). For this reason, firms try to catch some clues by monitoring the competitive actions of their competitors in order to improve their market performance. To capture these clues, some tools and models have been developed. The inter-firm rivalry model is one of the mentioned methods. According to this model, firms analyze the degree of overlap by comparing their resources and markets with competitors. After this analysis, it is understood which firm (or firms) is really a competitor, and which one is more confronted with, and this shapes competitive behavior. The actions and retaliations carried out within the scope of competitive behaviors also determine market performance (Hitt et al., 2016). The evaluation of the factors included in the inter-firm rivalry model among the firms will guide their competitive actions and these firms will have the chance to perform better in operational and financial terms than their competitors with the competitive actions they will take. As an illustration, if two airlines that compete with one another in multiple markets and have comparable resources decide to engage in competitive action against one another, they will do so after carefully weighing the extent to which their

markets and resources overlap (Chen, 1996). These two significant aspects of competitor analysis will help them perform better in this situation.

In the studies carried out in the context of competitive dynamics, it is seen that the components of inter-firm rivalry are the subject of research in different research and contexts. In these studies, competitor analysis (Chen, 1996; Chen et al., 2007; Tsai et al., 2011; Yaşar & Gerede, 2020), factors that lead to competitive moves (Gündüz & Semerciöz, 2012; Semerciöz, 2013; Albers & Heuermann, 2013; Yaşar, 2017), competitive actions that take place directly between firms (MacMillan et al., 1985; Bettis & Weeks, 1987; Smith el al., 1991; Chen & Hambrick, 1995) and the performance that presents us with the results of these actions (Chen & Miller, 1994; Boyd & Bresser, 2008) were examined. This research aimed to reveal the factors that are decisive in the results of competitive actions of firms – in other words, market performance. The relevant performance variables consist of both airline-specific operational parameters proposed by the literature and financial parameters. Market cooperation; business models that affects the way of doing business of the company; and fleet homogeneity, which is considered to be effective on the market performance unlike the previous research, are also discussed within the scope of the research. The primary research question (RQ) in this study is given below:

RQ) What are the factors that have an impact on the relative operational and financial performance of airline companies?

The secondary research questions (RQs) are presented below:

RQ1) What are the factors determining the relative market share gain?
RQ2) What are the factors that are effective for airlines to produce fewer/more Revenue Passenger Kilometers (RPK) compared to their competitors?
RQ3) What are the factors that are effective for airlines to make more profit and/ or loss compared to its competitor?

In order to answer the main and sub-research questions, the scope of this research consists of the competitor pairs formed by the 26 airline companies operating with the third and fourth traffic rights in the Turkish international airline market. Panel data analyzes were performed with 650 competitor pair observations obtained with 26 airlines.

Inter-firm rivalry model

Competitive interaction was developed from the action and retaliation model, in which a firm's competitive actions have noticeable effects on competitors and

receive competitive responses from them (Abebe & Angriawan, 2014; Rindova et al., 2010; Yu & Cannella, 2007). This model states that firms are mutually interdependent and are influenced by each other's actions and reactions (Bass & Chakrabarty, 2014; Villanueva et al., 2012). The results of the studies show that competitive interaction can have an impact on the financial performance and market position of the firm (Miller & Chen, 1996a; Ferrier, 2001; Chen et al., 2010; Ferrier et al., 2002; Ndofor et al., 2011). For example, studies show that intense competition within an industry leads to a decrease in the average profitability of competing firms (Gimeno & Woo, 1999; Sirmon et al., 2010; Ellram et al., 2013; Chang & Wu, 2014).

Firms want to achieve an advantageous market position by using their talents, competitive actions, and reactions they perform (Kor & Mahoney, 2005). Being able to predict the actions and reactions of competitors in advance has a positive effect on the market position and financial performance of the firm (Lim, 2013; Bou & Satorra, 2007). The inter-firm rivalry model (Figure 1) was developed to show how firms would predict a competitor's behavior (Zhang et al., 2014). This model presents the sequence of activities that are commonly involved in the competition between a firm and its competitors. The sum of all firm-level competitive interactions that occur in a particular market, modeled in Figure 1, reflects the competitive dynamics in that market.
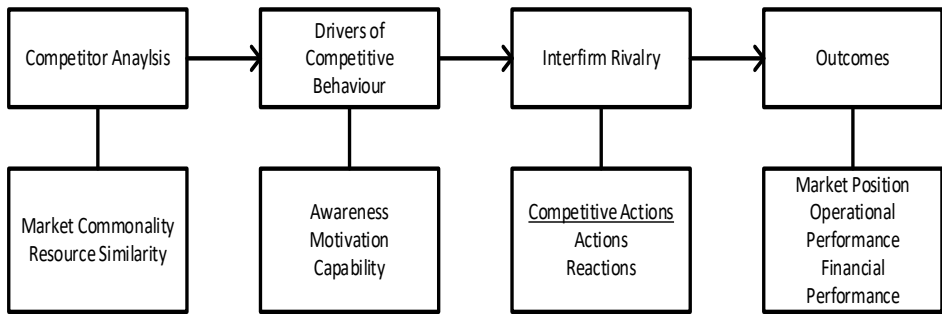
Figure 1. Inter-firm rivalry model
Source: Adapted from Hitt et al. (2016, p. 146).

Competitor analysis is the first step taken by a firm to be able to estimate the scope and nature of its competition with each competitor (Gnyawali & Madhavan, 2001). Competitor analysis is carried out, in particular, before the firm makes a decision to enter a new market, because companies need to understand the current competition and competitors in the market they want to enter (Hitt & Xu, 2016; Arregle et al., 2013). It is claimed that if firms enter

a market without conducting competitor analysis, their success will decrease (Zajac & Bazerman, 1991).

Chen suggests that competitor analysis should be carried out in two dimensions. The first of these is market commonality, which shows the degree of overlap of market in which firms compete with each other at the same time. The other is resource similarity, which shows the degree of similarity of resources with those of its competitor in terms of type and quantity (Chen, 1996). Major studies have compared the fleets of airlines while looking at the degree of similarity of resources within the scope of competitor analysis. In some studies from different industries, it is seen that different resources are compared as well as fleet similarity (Pei et al., 2015). Although aircraft are seen as the most important resources for airline companies, the financial resources to obtain them, the flight crew and technical team that enable the planes to fly are among the important resources of these companies. These two dimensions of competition determine the extent to which firms are competitors. Firms with high market commonality and similar resources are direct competitors of each other. However, some studies show that such firms are wary of initiating competitive action against each other for fear of possible retaliation (Chen, 1996). The drivers of competitive behavior are the factors that influence the likelihood that a competitor will initiate competitive actions and respond to the actions of its competitors. These factors affect the intensity of the competition (Alexy et al., 2013).

After the competitor analysis is done, firms begin to understand their competitors in the market they compete in or want to enter, and this process affects their awareness and motivation to initiate or not action. If the firm's resources are favorable, the firm's capability can provide the initiation of competitive action (Hitt et al., 2016). These three concepts, which are also called the factors that lead to competitive behavior or the driving forces of competition, are examined under the heading of the Awareness-Motivation-Capability (AMC) perspective (Albers & Heuermann, 2013). Awareness refers to the degree to which firms are aware of the degree of interdependence and the consequences of their competitive actions (Hsieh et al., 2015). The relative size of airline companies can be seen as a factor that increases or decreases awareness. Motivation relates to the firm's impulse to take action or react to a competitor's move. The degree of motivation is influenced by the gains that the firm will achieve when it performs competitive action. When the firm takes action, if it thinks that it will bring a positive enough advantage for itself, its motivation and, consequently, the likelihood of initiating the action will increase (Compagni et al., 2015). Capability is related to the firm's resources and the flexibility that these resources provide to the firm (Albers & Heuermann, 2013). Even if the firm's awareness and motivation are high, if its resources are not

suitable for starting an action, this move it wants to initiate may not give the desired results. For example, when an airline wants to enter a market that it considers profitable, or when it wants to increase the frequency in one of its existing markets, then the number of aircraft in its fleet and the number of flight and cabin crew should be sufficient.

Competitive moves and reactions between a firm and a competitor affect the performance of both firms (Cusumano et al., 2015; Alcácer et al., 2013). A competitive move is a strategic or tactical action that the firm takes to create a competitive advantage, maintain its existing advantage, or improve its market position. A competitive response is the strategic or tactical action taken by the focal firm against the competitive action of the rival firm (Hitt et al., 2016). In terms of airline companies, increasing the frequency of an existing route can be given as a tactic, and starting a new service that no airline company has done before can be given as an example of strategic action.

The purpose of competitive interaction between firms is undoubtedly to achieve competitive gains. It is clear that whether this goal is achieved or not, competitive interactions will have various outcomes for competitors (Smith et al., 2001). These are the firm's advantageous market position and financial results. In the airline industry, it is observed that the unique performance criteria of the sector, such as operating revenues per seat-km, load factor, and revenue passenger kilometers are used (Chen & Hambrick, 1995; Miller & Chen, 1994, 1996a; 1996b). It is seen that parameters such as return on investments, net income, and return on equity (Young et al., 1996; Smith et al., 2001) and stock returns (Lee et al., 2000) are used to measure financial performance.

LITERATURE REVIEW

It is observed that the first studies in the field of competitive dynamics began in the second half of the 1980s. From these studies, MacMillan et al. (1985) examined competitor reactions to easily imitated products in the banking sector. This research was followed by a study by Bettis and Weeks (1987) in which they examined the actions and retaliations of Polaroid and Kodak, two major companies involved in the photography industry. Smith et al. (1989) discussed the factors that affect the duration of retaliation in more than one industry. Since the 1990s, competitive dynamics has become a research topic in the airline industry. From these studies, Smith et al. (1991) examined the attacks in the US airline industry and the reactions to them, Chen and Hambrick (1995) examined the role of firm size in competitive interaction. A number of long-held beliefs concerning the competitive behavior of very small enterprises in an industry were put to the test by Chen and Hambrick in 1995. Small

firms tend to launch more attacks, execute them more quickly, and maintain a low profile throughout these attacks, which in some ways resemble guerilla warfare. Additionally, these firms operate better when they behave in a way that is normal for firms of their size; performance seems to suffer when these companies deviate from these norms. For the purpose of achieving specific competitive outcomes, firms interact with one another. Common performance measures, such as changes in market share (Ferrier et al., 1999), cumulative abnormal returns to shareholders (Lee et al., 2000), sales growth (Ferrier, 2000), and return on investment, have typically been used in competitive dynamics as the dependent variable (Young et al., 1996). However, a number of studies on the effects of action on performance in the airline industry employ an industry-specific performance measure – operating revenue per available seat kilometers – that takes into consideration efficiency, aircraft load factors, and revenue (Chen and Hambrick, 1995; Miller and Chen, 1994).

Chen (1996) developed the competitor analysis, which is a tool that companies in the sector can use before competitive interactions. Evans and Kessides (1996) describe the multi-market relationships of US airlines, which have to compete in more than one market at the same time, Baum and Korn (1996, 1999) also evaluated the market entry and exit of firms competing in the US airline market in the context of competitive dynamics. Young et al. (2000) examined the effects of various market relationships and a variety of resources on the industry's competitive dynamics within the setting of the software sector. According to Silverman and Baum (2002), who connected ecological and economic studies on organizations, the degree to which a focus firm restricts alliance opportunities and raises industry carrying capacity, determines the consequences of horizontal, upward, and downward alliances of competitors. Stiroh and Strahan (2003) discovered that, as a result of competitive reallocation effects that transfer assets to better performers, the relationship between a bank's relative performance and its subsequent gain in market share becomes substantially stronger after deregulation.

The competitor analysis developed in the mid-1990s was later given different interpretations, and Chen et al. (2007) placed the human dimension into competitor analysis with competitive tension. Tsai et al. (2011) stated that competition should also be evaluated from the perspective of the competitor. In this context, with the competitor acumen they developed, they both brought this concept to the competitive dynamics literature and offered a new tool to the sector managers that they could use in competitor analysis.

When the studies in the context of Turkey are examined, it is seen that Gündüz and Semerciöz (2012) examined the relationship between strategic innovation and competitive tension in the Turkish domestic market, and Gündüz (2013) examined the effect of competitive tension on strategic innovation decisions. Açar and

Sarvan (2016) investigated the competitive actions developed by international cigarette firms in the face of public health policies and the competitive repertoires of these firms. Yaşar (2017) analyzed cross-competition involving more than one mode of transport in the context of the Ankara–Istanbul route, while Sönmez and Eroğlu (2017) discussed the characteristics of competitive moves and retaliations in the Turkish airline domestic air transport market, and Yaşar and Gerede (2020) focused on the determinants of competitive tension in the same market. Sönmez and Eroğlu (2021) developed a sector-specific typology proposal by classifying competitive actions.

The operational and financial outcomes of competitive dynamics are presented within the context of competitor pairs in this study, in contrast to earlier studies. Few studies have been discovered in the literature that discuss the consequences of the firms' competitive behaviors in the context of rival pairs, although it is evident that the premises stated are constrained. As a result, additional factors will be incorporated into the research unlike prior studies, and more comprehensive models will be constructed. The revenue passenger kilometers variable, one of the outcome variables taken into account in the context of operational performance, has also not been found to be considered as a performance output in any research. On the other hand, it is considered that the research is distinctive from previous studies, since the impacts of the same variables on operational and financial results are analyzed concurrently.

METHODOLOGY

In the study, three models were developed to determine the factors affecting the results of competitive actions. In the first model, the factors determining the relative market share gain of airlines are examined. In the second model, revenue passenger kilometers, which is an output of operational performance, was used as a dependent variable, and factors determining the operational results of competitive actions of airlines were studied. In the last model, the net profit/loss of the airlines compared to the rival is used as the dependent variable and the factors determining the financial results of the competitive actions of the airlines are examined. Figure 2 shows an illustration that includes the adaptation of the competition model between firms to the research.

The independent variables used in the research consist of both the variables used in previous studies and the variables that will be used for the first time. Variables used for the first time in the inter-firm rivalry model (explained in detail in the next section), like strategic alliances, codeshare agreements, business models, and frequency, are being utilized for the first time.
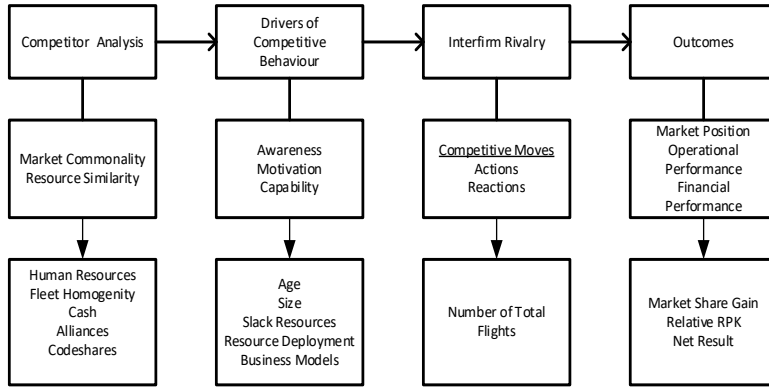
Figure 2. Integration of inter-firm rivalry model into research
Source: Authors own elaboration adapted from Hitt et al. (2016, p. 146).

For airline firms to expand and widen their flight networks, strategic alliances are crucial. By joining international alliances, airline firms have the opportunity to maintain a continuous worldwide flight network. Additionally, alliance members have access to a variety of exclusive lounges across the globe that they can utilize, and when frequent flyer programs are combined, customers flying with an alliance member airline are given benefits like priority check-in and boarding. In the light of this information, it is thought that the airline companies' being in these alliances has an impact on financial and operational performance.

Airlines occasionally engage in both competition and collaboration. Codeshare flights are one of these methods of collaboration. Airlines may offer tickets for the same flight on codeshare flights in accordance with the arrangements they have established. As a result, it occurs in the market without the need for physical resources. It is believed that this will have an impact on operational and financial performance when a codeshare flight is made.

When examining the business models of the airlines, it becomes clear that low cost carriers provide point-to-point flights on relatively short-haul routes, whereas charter airlines fly to tourist destinations that are typically visited for vacations. The vast and varied flight network of traditional airlines, on the other hand, also offers a worldwide service. As a result, it is expected that the results of these businesses, which have various flight network configurations and cater to various market segments, may vary.

Data and variables

The variables used in the research, their abbreviations in the model and references are given in Table 1.

Table 1. Data and variables

Variable type	Variable name	Abv.	Data used	References
DM	Alliances	AL	Strategic Alliances	Gudmundsson and Lechner (2006)
DM	Business Model	BM	Business Model	Buck and Lei (2004); Gillen (2006)
DM	Codeshare	CD	Codeshare Agreements	Hooper (2005)
I	Firm Maturity	AG	Age	Chen et al. (2007); Tsai et al. (2011)
I	Relative Size	ASK	ASK	Taneja (1989); Baum and Korn (1999); Chen and Hambrick (1995)
I	Efficiency	LF	Load Factor	Dai et al. (2005); Davila and Venkatachalam (2004)
I	Slack Resources	CR	Current Ratio	Young et al. (1996); Chen et al. (2007)
I	Staff	SF	Number of Employees	Petrović et al. (2018); Taneja (2002)
I	Financial Resources	CH	Cash and equivalents	Haleblian et al. (2012)
I	Resource Similarity	RS	Airline Fleets	Chen (1996)
I	Fleet Homogenity	FH	Fleet Homogenity Index	Klophaus et al. (2012)
I	Market Commonality	MC	O-D Pax Numbers	Chen (1996); Baum and Korn (1999); Gimeno (1999); Tsai et al. (2011)
I	Capability	RD	Avg. O-D Market Share	Tsai et al. (2011)
I	Frequency	FQ	Number of Flights	Doganis (2006); Burghouwt (2007)
D	Market Share Gain	RM	Total Market Share	Tsai et al. (2011)
D	Revenue Passenger Kilometer	RPK	RPK	Doganis (2006); Abel (2021)
D	Net Result	NR	Net Profit/Loss	Gimeno and Woo (1999); Boyd and Bresser (2008)

Note: DM: Dummy; I: Independent; D: Dependent.

Independent variables

Within the scope of the research, the following independent variables, three of which were dummies, were used as explanatory variables:

1) **Strategic Alliances (AL):** In order to understand whether the market performances of the airlines that cooperate while competing are affected by this situation, the strategic alliance variable was included in the research as a dummy variable. Strategic alliances were examined in three groups

and firstly, it was determined whether the airline is included in a strategic alliance. Then, it was determined which global alliance the airline is in (Star Alliance, Sky Team and One World). If the rival pairs are in the same alliance, the variable will take the value of one (1), otherwise zero (0).

2) **Business Model (BM):** In order to understand whether the business model has an effect on market performance, the business model was included in the study as a dummy variable. Business models are discussed in three groups (traditional, low cost and charter) in this research. The competitor's business model variable is a dummy variable, and if rival pairs are performing their activities with the same business model, the variable will take the value of one (1), otherwise zero (0).

3) **Codeshare Agreements (CD):** Code sharing agreements are important in terms of affecting competition and cooperation between airline companies (Ivaldi et al., 2022). When code sharing is done, the airline will be able to enter the relevant market by using the resources of the airline (fleet, crew, slot, etc.) without using its own physical resources (Gayle, 2008, p. 746). In this context, the codeshare agreements variable is a dummy variable and if two competitors are performing codeshare flights, the variable gets the value of one (1), otherwise zero (0).

4) **Firm Maturity (AG):** Firm maturity is measured by expressing the time elapsed from the establishment of the airline to the present day in years. It can also be expressed as firm age. It can be said that airlines with higher maturity than their competitors are those that know the conditions of the market better, can be defined as incumbent firm for the market, and create barriers for potential competitors to enter the market (Ismail & Jenatabadi, 2014, p. 213). Based on these facts, it is thought that the age of the firm has an effect on the firm performance. This variable, which can also be expressed as age, is found by dividing the focal and the rival age of the airlines at the rival-dyad level.

5) **Relative Size (ASK):** The available seat kilometers (ASK) value of the airline was used for the size. It is thought that the relatively larger airlines will perform better in the competitive market. The relative size variable value is obtained by proportioning the ASK of the focal and the rival firm to each other.

6) **Efficiency (LF):** The load factor (LF) of the airlines was used for the efficiency variable. The LF is obtained by dividing the revenue passenger kilometers (RPK) value by the ASK value. It is thought that the airlines, whose LF is higher than its competitor, will perform better, because airlines operating with a high LF will be able to produce more RPK and thus they will have the opportunity to reduce their unit costs. After obtaining the LF of each airline, these values are compared to each other as a focal and rival airline on the basis of competitor pairs.

7) **Slack Resources (CR):** The current ratio (CR) value of the firm (current assets / short-term liabilities) will be used for slack resources. It will not be remiss

to say that the higher the CR, the less the cash shortage of the firm, but at the same time, the more its available resources. It is believed that more resources will provide more opportunities for competitive actions, and therefore the firm will perform better than its competitor (Chen et al., 2007, p. 109). The value of this variable is obtained by dividing the CR values of the focal and the rival firm by each other.

8) **Staff (SF):** It is thought that human resources in firms will be effective in competitive actions and therefore in market performance. The variable obtained by the ratio of number of employees of the focal and the rival at the firm-pair level reflects the state of the human resources of the two airlines relative to each other.

9) **Financial Resources (CH):** It is important whether the financial resources are sufficient for the firm to carry out its competitive actions (McGrath et al., 1998, p. 728). The purchase or lease of an aircraft, the development of a new service, advertising or carrying out promotional activities can be given as examples of competitive actions that require financial resources. This value is calculated by dividing the financial resources of the focal and rival firm. For the financial resources data, cash and cash equivalents of firms were used.

10) **Resource Similarity (RS):** The formula given below is used to measure resource similarity in competitive dynamics research (Chen, 1996; Chen et al., 2007, p. 109; Tsai et al., 2011, p. 769):

$$RS_{ij} = \sum_{m:1}^{n}[(A_{im} / A_i)(A_{jm} / A_m)] \tag{1}$$

where:

RS_{ij}: Resource similarity between firm i and j,

A_{im} : Number of aircraft of type m of firm i,

A_i : Number of all aircraft of the firm i,

A_{jm} : Number of aircraft of type m of firm j,

A_m : Number of all aircraft of type m.

The resource type considered when calculating resource similarity is aircraft. It is calculated how similar the number of different types of aircraft in the fleets of airlines is. In the research, airplanes with similar range and seat capacity produced by different companies (such as the Airbus A320 and Boeing 737) were accepted as the same type of aircraft (Chen, 1996; Chen et al., 2007; Tsai et al., 2011). In other studies, only aircraft of the same type of the same company are seen as having the same resources. However, in this research, airplanes produced by different manufacturers, but with similar characteristics, are also defined as the

same source, because it is thought that seeing such aircraft as different resources, despite having similar characteristics, will lead to erroneous results.

11) **Fleet Homogeneity (FH):** Fleet homogeneity refers to how many of the fleets of airlines consist of the same type and characteristics of aircraft. If all aircraft of an airline are of the same type and characteristics, the fleet homogeneity takes the value of one (1). As the diversity within the fleet increases, this value decreases (Klophaus et al., 2012, p. 55).

12) **Market Commonality (MC):** Market commonality gives the degree of overlap of the common markets in all markets in which the firms operate from the point of view of the focal company. Market commonality, which is the independent variable, is asymmetric. When calculating, an assessment is made separately from the eyes of each company. The market commonality is calculated as follows (Chen, 1996, p.118):

$$\text{M}_{ij}: \sum_{k:1}^{n}[(\frac{P_{ik}}{p_i})(\frac{P_{jk}}{P_k})] \tag{2}$$

where:
M_{ij}: Market commonality between firm i and j,
P_{ik}: The number of passengers carried by the airline i on route k or on the airport pair market (route),
P_i: Total number of passengers carried by airline i on all routes,
P_{jk}: The number of passengers carried by airline j on k route,
P_k: The number of passengers carried by all airline operators on the k route.

Market commonality is calculated separately for all competitors by considering each firm as a focal firm. A total of 26x25=650 competitor pairs were obtained for the 26 airline operators included in the study.

13) **Capability (RD):** To measure resource deployment capability, the logarithm of the ratio between the focal firm's average, endpoint, market share and the competitor's average, endpoint, market share is taken. The ability of an airline to transfer resources has been evaluated by looking at the degree to which it is dominant or how active it is compared to a certain competitor at the start and destination points (Tsai et al., 2011, p. 770). An airline with a large number of passengers (active) at the origin–destination points of a flight route can allocate more resources to that route to compete with rival airlines on that point (Borenstein, 1989; Gimeno, 1999). It is thought that airlines that transfer their resources more comfortably will show better market performance.

14) **Frequency (FQ):** The total number of flights refers to the number of all flights that the airline has made in one calendar year. This variable, calculated on

the basis of competitor pairs, also indicates how much product the two competitors offer to the market relative to each other. In this context, it is thought that an airline operating more flights than its competitors will perform better, because the number of flights reduces the total travel time included in the tariff-based components of the airline product. The fact is that short travel time is important for time-sensitive passengers (Doganis, 2006, p. 87).

Dependent variables

There are three separate dependent variables related to each model. These are relative market share gain and RPK, representing operational performance and net result representing financial performance.

1) **Relative Market Share Gain (RM):** Relative market share gain shows the increase or decrease in the market share of the airline compared to its competitor compared to the previous year. To calculate the relative market share gain, the change in the airline's market shares is logarithmically divided by the competitor's market share value. In the following formula, the equation for calculating the variable in question is given (Tsai et al., 2011, p. 769).

$$\text{RM} = \text{Ln}\, \frac{M17_{rival\,j}}{M17_{focal\,i}} - \text{Ln}\, \frac{M18_{rival\,j}}{M18_{focal\,i}} \tag{3}$$

The formula reflects the difference between the market share gap in 2017 and the market share decimation in 2018. When the market share gap is smaller in 2018 than in 2017, a positive value emerges and shows that the focal firm has gained more market share compared to the competitor. A negative value represents the opposite situation.

2) **Revenue Passenger Kilometers (RPK):** The revenue passenger kilometers value is obtained by multiplying the number of passengers carried by airline operators for tickets and how far they are transported (Gerede, 2015, p. 32). One of the most important consequences of the competitive actions of airlines and the competitive dynamics of the industry is the amount of production performed by the airline. In this context, another dependent variable of the research is the revenue passenger kilometer, which we can evaluate as the output of operational performance. This variable is obtained by dividing the paid passenger kilometer values of the airlines on the basis of the competitor pair.

3) **Net Result (NR):** Net profit/loss is obtained from net income by subtracting the cost of goods sold, operating expenses, depreciation it allocates,

interest it pays, and taxes (Glew, 2017). Profitability, which is important for the sustainability of the firm, is an important component of performance, which is the output of the inter-firm rivalry model. In this context, another dependent variable of the research is the net result, which we can evaluate as the output of financial performance. This variable is obtained by subtracting the profit/loss situations of the airlines on the basis of the rival pair. Thus, the relative profitability levels of airlines are revealed at the end of the relevant calendar year.

Data set and models

This study aims to examine the factors that determine the results of competitive actions and panel data analysis was used to reveal these factors. The models developed within the scope of the study are as follows:

Model 1: $RM_{it} = \beta_0 + \beta_1 ASK_{it} + \beta_2 LF_{it} + \beta_3 AG_{it} + \beta_4 OD_{it} + \beta_5 MC_{it} + \beta_6 RS_{it} + \beta_7 FH_{it} + \beta_8 DummyBM_{it} + \beta_9 DummyAL_{it} + \beta_{10} DummyCD_{it} + \beta_{11} CR_{it} + \beta_{12} FQ_{it} + \beta_{13} CH_{it} + \beta_{14} SF_{it} + \varepsilon_{it}$ (4)

Model 2: $RPK_{it} = \beta_0 + \beta_1 ASK_{it} + \beta_2 LF_{it} + \beta_3 AG_{it} + \beta_4 OD_{it} + \beta_5 MC_{it} + \beta_6 RS_{it} + \beta_7 FH_{it} + \beta_8 DummyBM_{it} + \beta_9 DummyAL_{it} + \beta_{10} DummyCD_{it} + \beta_{11} CR_{it} + \beta_{12} FQ_{it} + \beta_{13} CH_{it} + \beta_{14} SF_{it} + \varepsilon_{it}$ (5)

Model 3: $NR_{it} = \beta_0 + \beta_1 ASK_{it} + \beta_2 LF_{it} + \beta_3 AG_{it} + \beta_4 OD_{it} + \beta_5 MC_{it} + \beta_6 RS_{it} + \beta_7 FH_{it} + \beta_8 DummyBM_{it} + \beta_9 DummyAL_{it} + \beta_{10} DummyCD_{it} + \beta_{11} CR_{it} + \beta_{12} FQ_{it} + \beta_{13} CH_{it} + \beta_{14} SF_{it} + \varepsilon_{it}$ (6)

The models developed to determine the factors affecting the results of competitive actions are seen in equations (4), (5) and (6) above. Model 1 and Model 2, respectively, aimed to reveal the relative market share gain (RM) and revenue passenger kilometer (RPK), while Model 3 aimed to reveal the factors determining net profit/loss (NR).

This study aims to explore the factors that determine the results of competitive actions. The study examines 26 international airlines that operated in Turkish international airline market between 2009 and 2018 and whose data were available (In Appendix 1, a list of airlines is provided). These airlines use the third and fourth traffic rights in the Turkish international market to transport passenger, cargo, and mail. However, these are not the only areas in which they operate. Since the research is carried out at the level of competitor pairs, competitor pairs formed by international companies (for example, Lufthansa and British Airways) that organize flights to Turkey also include

different international markets within the scope of the research. These 26 airline companies are among the top 50 in terms of passenger ranking in the Turkish international airline market in all of the determined years and their data can be accessed. In addition, the sum of RPK values constitutes 20 percent of the global RPK. Among the reasons for limiting the research data to 2018 is the accessibility of the data. Another reason is the Covid-19 pandemic, which started at the end of 2019 and affected the whole world in 2020, causing flights to be stopped in many countries.

The research data were obtained from the annual activity and financial reports of airlines and FlightGlobal, OAG, Eurostata, and EMIS Store. Panel data analysis was used as a method with STATA-13. In panel data analysis, panel data models are created using horizontal cross-sectional data with a time dimension. In these models, economic or financial relations are estimated with the help of panel data (Yerdelen Tatoğlu, 2016). The panel data equation is an equation in which the cross-sectional units i (i=1,...,N), the change of t with respect to time (t=1,...,N), the dependent variable Y and the independent variable(s) are shown as X. $Y_{it}=\alpha_{it}+\beta_{it}X_{it}+\varepsilon_{it}$ here ε_{it} shows error terms. Before the panel data analysis, the horizontal cross-sectional dependence and stationarity of the series were determined. In the next stage, some preliminary tests were carried out to determine which panel data model is suitable. After selecting the appropriate panel data model, variance and autocorrelation tests were performed.

RESULTS AND DISCUSSION

In Table 2, the Pearson-correlation matrix, which provides information about the relationship between the independent variables, is given.

Table 2. Correlation matrix of independent variables

	AG	ASK	AL	BM	CD	CH	CR	FH	FQ	LF	OD	MC	RS	SF
AG	1													
ASK	0.362	1												
AL	-0.067	-0.041	1											
BM	-0.107	-0.008	0.283	1										
CD	-0.057	-0.021	0.722	0.291	1									
CH	0.003	0.094	-0.015	-0.028	-0.014	1								
CR	-0.200	-0.103	-0.019	-0.035	-0.029	-0.009	1							
FH	-0.385	-0.279	-0.015	-0.059	-0.008	-0.046	0.130	1						
FQ	0.163	0.324	-0.033	-0.095	-0.027	0.012	-0.032	-0.094	1					
LF	-0.083	0.148	-0.007	-0.027	-0.004	0.075	-0.018	0.161	0.056	1				
OD	0.435	0.591	-2.02E	0.002	-0.008	0.075	-0.106	-0.366	0.364	0.168	1			

	AG	ASK	AL	BM	CD	CH	CR	FH	FQ	LF	OD	MC	RS	SF
MC	0.018	0.043	0.008	-0.055	-0.005	-0.063	0.002	-0.050	0.003	0.025	0.088	1		
RS	-0.226	-0.266	0.120	0.167	0.143	-0.043	0.067	0.209	-0.118	-0.112	-0.446	-0.120	1	
SF	0.412	0.840	-0.050	-0.099	-0.037	0.130	-0.143	-0.302	0.431	0.059	0.550	0.050	-0.240	1

Table 2 shows the Pearson correlation matrix between the independent variables. The presence of a high correlation (over 0.80) between the independent variables in the regression model causes the problem of multicollinearity. When the correlation matrix of the independent variables is examined, it is seen that the correlation coefficients between the variables are decisively below the critical value. For this reason, the problem of multi-collinearity (multiple linear correlations) is not seen in the data set formed by independent variables.

It should be also decided which model will be appropriate to use among the Classical Model, Fixed Effects Model and Random Effects Model for the series. In this context, the F-test to test the validity of the classical model, in other words the presence of unit and/or time effects, the Breusch-Pagan LM test to test the compatibility of the classical model with the random effects model, and the Hausman test was used to choose between fixed effects and random effects models. The results of these tests are given in Table 3.

Table 3. Model identification test results

Models	F-Test		LM Test		Hausman		Model used
	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	
Model 1	0.56	0.8310	309.78	1.000	4.92	0.9351	Random-Effects
Model 2	7.73	0.0000	39.36	0.000	N/A	N/A	Classical Model
Model 3	9.6476	0.9624	943.31	1.000	2.95	0.9914	Random-Effects

Source: Authors own elaboration

The random effects model is considered suitable for Models 1 and 3. It has been revealed that the classic model is suitable for Model 2. Table 4 shows the test results for heteroscedasticity.

According to the information in Table 4, the heteroscedasticity in Models 1 and 3 could not be calculated. In Model 2, the H0 hypothesis is rejected. This shows that there is a heteroscedasticity in the context of Model 2. Table 5 shows the autocorrelation test results.

Table 4. Heteroscedasticity test results

Models	Test	Test hypothesis	Stat.	Prob.	Decision
Model 1	W0 W50 W10	No heteroscedasticity	Heteroscedasticity cannot be calculated.		
Model 2	BP/CW Chi2(1)	No heteroscedasticity	43041.84	0.0000	H0 Rejected
	White Testi		1557.38	0.0000	H0 Rejected
	Cameron and Trivedi's decomposition of IM-test		1557.38	0.0000	H0 Rejected
Model 3	W0 W50 W10	No heteroscedasticity	Heteroscedasticity cannot be calculated.		

Table 5 shows the results of the tests carried out to test the autocorrelation of Model 1 and Model 3 estimated using the random effects model. These tests are Narendranathan's DW autocorrelation test, and Baltagi and Wu's LBI autocorrelation test. Although no critical value is specified in the literature for DW and LBI autocorrelation tests, the fact that the statistical values of DW and LBI are less than 2 indicates the existence of autocorrelation (Gündüz & Duyar, 2018; Kiraci & Aydin, 2018). The test statistics show that the values obtained in both tests are less than 2. This shows that there is autocorrelation in Models 1 and 3. The results of the Wooldridge test for classical models show that the H0 hypothesis, which established that there is no autocorrelation, is rejected. For this reason, it is seen that there is autocorrelation in Model 2 as well.

Table 5. Autocorrelation Test Results for Classical and Random-Effects Model

Models	Test	Stat.	Prob.	Decision
Model 1	Baltagi-Wu LBI	1.9693452	-	-
	Durbin-Watson	1.3027593	-	-
Model 2	Wooldridge test	50.824	0.0000	H0 Rejected
Model 3	Baltagi-Wu LBI	1.9220193	-	-
	Durbin-Watson	1.6410302	-	-

In the study, it is seen that there are heteroscedasticity and autocorrelation problems for all three models estimated using the classical model and the random effects model. Therefore, modified standard error terms should be obtained for all three models. The method of Driscoll and Kraay (1998) makes a change

such as Newey–West for the cross-sectional averaged series. Modified standard error estimates ensure the consistency of matrix estimators regardless of the cross-sectional size N (even N→∞). The method of Driscoll and Kraay (1998) was developed as an alternative to the Parks–Kmenta or PCSE approaches, which are particularly weak when the cross-sectional size of microeconomic panels is large and produce consistency, covariance, matrix estimators only when the time dimension T is large. In this method, consistency is ensured even if N is infinite. On the other hand, it is resistant to the most general spatial and periodic correlation forms of standard errors obtained from the predicted covariance matrix (Driscoll & Kraay, 1998). In order to obtain the robust standard errors of Driscoll and Kraay in the models, the modification of Driscoll and Kraay (1998) was used. Table 6 shows the robust estimator results of Model 1.

Table 6. Driscoll–Kraay robust estimator results (Model-1)

Variable	Coefficient	Robust Std.Err	z	P>|z|	95% Conf. Interval	
AG	0.0083844	0.0012631	6.64	0.000	0.0059088	0.01086
ASK	0.0052747	0.0014591	3.62	0.000	0.0024149	0.0081345
AL	0.0112239	0.0180333	0.62	0.534	-0.0241207	0.0465684
BM	0.0042785	0.0075627	0.57	0.572	-0.0105441	0.0191011
CD	-0.005295	0.0159425	-0.33	0.740	-0.0365416	0.0259517
CH	-3.07e-06	3.44e-06	-0.89	0.373	-9.82e-06	3.68e-06
CR	0.0214228	0.0048386	4.43	0.000	0.0119394	0.0309062
FH	0.0812213	0.0060218	13.49	0.000	0.0694189	0.0930238
FQ	0.0002761	0.0001024	2.70	0.007	0.0000754	0.0004767
LF	-0.0383991	0.0354279	-1.08	0.278	-0.1078365	0.0310382
MC	0.0990001	0.1113794	0.89	0.374	-0.1192995	0.3172997
OD	-0.0121935	0.0064418	-1.89	0.058	-0.0248193	0.0004322
RS	-0.0221734	0.09773	-0.23	0.821	-0.2137206	0.1693739
SF	-0.0041503	0.000745	-5.57	0.000	-0.0056105	-0.0026901
constant	-0.1534549	0.0709083	-2.16	0.030	-0.2924326	-0.0144772

Observations = 6500	Wald χ2(14) = 302.50	R² = 0.2550 (within group)
Number of groups = 650	Prob > χ2 = 0.0000	

Table 6 shows the results of the robust estimation of Model 1, in which relative market share gain is used as a dependent variable. According to the results of the random effects model, in which the factors determining the relative market share gain are examined, the firm maturity, relative size, financial resources, total number of flights and fleet homogeneity of the airlines positively affect the relative market share gain at the 1% significance level. The

resource deployment capability of the airline has a negative effect at the level of 5%, and the number of employees has also a negative effect at the level of 1% significance. There was no significant relationship found between the other independent variables of the research and the relative market share gain.

Relative market share gain, which is the dependent variable of Model 1, is a concept that represents the increase or decrease in market share relative to the competitor, and is considered as a result of the inter-firm rivalry model. When an evaluation is made about the statistical results of Model 1, it has been revealed that airlines that are older than their competitors, have more capacity to offer to the market, have more cash resources, fly more and have a homogeneous fleet show better market performance than their competitors. On the other hand, it has been revealed that the relative market share gain of airlines with higher resource deployment capability and having more employees than their competitors is lower. Incumbent firms sometimes exhibit predatory behaviors in order to prevent their competitors from entering the market and to protect their market positions (Hanlon, 2007). They can do this both by price moves and by increasing their market capacity to such an extent that their competitors who want to enter the market cannot increase it (Hanlon, 2007). In order to increase the frequency, as mentioned earlier, it is necessary to offer more flights to the market, in other words, increase the capacity. This increase in capacity brings with it an increase in ASK, which reveals the relative size of the firm. When predatory behaviors are exhibited, it is thought that the operational performance of airlines will increase due to the above reasons. In this context, the positive relationship between the firm maturity, the total number of flights, and relative size of the airlines revealed by the research findings and the relative market share gain, coincides with the explanations mentioned above. In previous studies, it was seen that some of the similar factors that were thought to be effective on the difference between the market shares of the competitors produced similar results to this research (Tsai et al., 2011), while some of them had different findings from this research (Chen et al., 2007). For example, contrary to this research, Tsai et al. revealed that the age of the airline has a negative effect on the relative market share gain. However, no significant effect of relative size was observed in the same study. Gündüz and Semerciöz (2012) also revealed in their research on the Turkish domestic airline market that the structural tension measured by market partnership has a negative effect on the volume of moves. Yaşar and Gerede (2020), in their research on the Turkish domestic airline market, revealed that the high level of market commonality increases the tension between the competitors. The effects of market commonality on action volume and competitive tension were not obtained in this research and no significant effect on performance was observed.

Another factor that has been shown to have an impact on the relative market share gain is the level of cash resources owned by the firm. From the AMC perspective, it is not enough for firms to be aware of their environment and be motivated to initiate action or retaliate. At the same time, they must have the necessary ability to initiate or respond to the move (Smith et al., 2001). From the point of view of airlines, the element that determines the capability is the aircraft, which is the most important part of the operational processes of airlines. Airlines need money to buy or lease planes. In this context, it can be said that airlines with sufficient financial resources can use this to strengthen their fleets and thus realize competitive moves that will increase operational performance. In this context, the positive relationship between the cash resources of the firms and the relative market share gain revealed by the research findings coincides with the explanations mentioned above.

It is among the findings obtained in the research that the operational performance of the airlines, which have a more homogeneous fleet than their competitors, is higher decisively compared to their competitors. Airlines operating with a more homogeneous fleet are able to respond more quickly to operational changes (Bélanger et al., 2006). For example, if an aircraft cannot be dispatched to the flight due to a technical failure, an airline with a high fleet homogeneity can swap an aircraft that is available and has similar characteristics. Thus, an airline company, which can respond quickly to changes, is less likely to encounter problems such as delays and flight cancellations that will disrupt operational processes. In the research, it has been revealed that fleet homogeneity has a positive effect on operational performance. It is seen that the above-mentioned elements and the research findings are consistent.

The average market share of the airlines in all destinations represents the resource deployment capability. Airlines with a high ability to transfer resources can transfer their resources to other markets more easily (Tsai et al., 2011). For capacity-building activities such as frequency increase and new route opening, not only aircraft are needed, but also the flight crew and cabin crew to operate them. This will also bring an increase in the number of employees. The findings revealed in the research contradict the elements mentioned above. This may be re-evaluated in future research.

Table 7 shows the robust estimation results of Model 2, in which the relative revenue passenger kilometer is used as a dependent variable.

According to the results of the pooled classical model, in which the factors determining the revenue passenger kilometer (RPK) value were examined, it was found that the relative sizes of airlines, the same business model and the load factor (LF) had a positive effect on RPK at the level of 1%, and the total number of flights at the level of 5% significance. On the other hand, resources deployment capability and competing in the same strategic alliance

has a negative impact on the RPK at the level of 5% significance. There was no significant relationship found between the other independent variables of the research and the relative RPK.

Table 7. Driscoll–Kraay Robust Estimator Results (Model-2)

Variable	Coefficient	Drisc/Kraay Std. Err	t	P>|t|	95% Conf Interval	
AG	0.0418792	0.0296404	1.41	0.191	-0.025172	0.1089304
ASK	1.036315	0.049036	21.13	0.000	0.9253875	1.147242
AL	-0.2222317	0.1008752	-2.20	0.055	-0.4504272	0.0059639
BM	0.444232	0.0746739	5.95	0.000	0.275308	0.613156
CD	0.0896745	0.0506372	1.77	0.110	-0.0248748	0.2042238
CH	-0.0000109	9.79e-06	-1.11	0.295	-0.000033	0.0000113
CR	0.0247182	0.0304271	0.81	0.438	-0.0441126	0.093549
FH	0.0638744	0.0569024	1.12	0.291	-0.0648478	0.1925966
FQ	0.0038163	0.0019666	1.94	0.084	-0.0006325	0.008265
LF	4.495644	0.6599499	6.81	0.000	3.002733	5.988554
MC	1.089396	1.079922	1.01	0.339	-1.353558	353.235
OD	-0.3255157	0.1177383	-2.76	0.022	-0.5918582	-0.0591731
RS	0.2807676	0.7243778	0.39	0.707	-1.357889	1.919424
SF	0.0233175	0.0176742	1.32	0.220	-0.0166644	0.0632995
_cons	-5.605504	1.308348	-4.28	0.002	-8.565192	-2.645816
Observations= 6500			F(14, 9)	= 190601.96		R^2 = 0.9780
Number of groups = 650			Prob > F	= 0.0000		Max Lag = 2

The RPK value, which is the dependent variable of Model 2, is a variable that represents the operational performance of airlines, and is considered as a result of the inter-firm rivalry model. When an evaluation was made regarding the statistical results of Model 2, it was revealed that the airlines that offer more capacity to the market than their competitors, and make more flights and have a high LF compared to their competitors, show better market performance compared to their competitors. On the other hand, it has been revealed that airline companies with a high resource transfer capability, and who are in the same strategic alliance, have lower RPK values than their competitors and there is an inverse relationship between operational performances. The available seat kilometers (ASK), the number of flights, and the high LF also increase the RPK value. Airlines that offer more capacity to the market can do so by increasing the frequency of flights with high-capacity aircraft or by organizing flights on long-haul routes (Doganis, 2005). Increasing capacity alone is not effective in

increasing RPK. It is also necessary to adapt the existing capacity to the demand by making the airline product components appropriate to the dynamics of the market (Hsu & Wen, 2003). However, when airlines want to achieve a higher RPK, increasing the capacity they offer to the market will prepare the ground for this. In line with this information, it was seen that the positive relationship between RPK, which is the other operational performance parameter of the research, and relative size, making more flights than its competitor and keeping LF high, coincides with the aforementioned situations. On the other hand, fleet homogeneity also has a positive impact on operational performance. As in the relative market share gain, it was found that the airline companies that produce more RPK compared to competitors have a more homogeneous fleet compared to their competitors. The factors that are effective in the formation of this situation are similar to the elements in the relative market share gain and the research findings coincide with these elements. There is also a negative relationship between the ability to transfer resources, as well as in the relative market share gain. This relationship is in the opposite direction of expectation and can be re-evaluated in different contexts in subsequent research.

Table 8. Driscoll–Kraay robust estimator results (Model-3)

Variable	Coefficient	Robust Std.Err	z	P>|z|	95% Conf. Interval	
AG	-13.80655	4.950336	-2.79	0.005	-23.50903	-4.104073
ASK	-0.0235798	3.310294	-0.01	0.994	-6.511636	6.464477
AL	1.145664	117.7173	0.01	0.992	-229.5759	231.8673
BM	-32.43057	37.90279	-0.86	0.392	-106.7187	41.85753
CD	-14.23382	68.73348	-0.21	0.836	-148.949	120.4813
CH	-0.0011187	0.0018641	-0.60	0.548	-0.0047724	0.0025349
CR	-20.99196	11.29192	-1.86	0.063	-43.12372	1.139788
FH	-25.17698	20.86501	-1.21	0.228	-66.07164	15.71769
FQ	-1.851808	0.5514201	-3.36	0.001	-2.932571	-0.771044
LF	625.8482	76.25133	3.36	0.000	476.3984	775.2981
MC	4.21976	71.32029	0.06	0.953	-135.5654	144.005
OD	194.761	30.0868	6.47	0.000	135.792	253.7301
RS	241.5085	473.9993	0.51	0.610	-687.5131	1170.53
SF	-3.16.2252	2.264821	-1.40	0.163	-7.601218	1.276715
constant	-512.9811	94.21227	-5.44	0.000	-697.6338	-328.3285

Observations = 6500	Wald χ2(14) = 154.18	R² = 0.2036
Number of groups = 650	Prob > χ2 = 0.0000	(within group)

Table 8 shows the robust estimation results of Model 3, in which net result is used as a dependent variable. The results of the random effects model show that the (resource deployment) capability and efficiency of airlines have a positive effect on the net result at the level of 1% significance. On the other hand, firm maturity and the total number of flights have a negative effect at the level of 1% significance. Slack resources of the airline have a negative impact at the significance level of 5%. There was no significant relationship found between the other independent variables of the research and the net result.

Net result, which is the dependent variable of Model 3, represents the financial performance of airlines. It has been revealed that airlines with less firm maturity and slack resources than their competitors, which make fewer flights than their competitors and have a higher resource transfer ability and LF, have better financial performance than their competitors. It is observed that the financial performance of airlines with a high LF is better. It was argued that capacity expansion alone is not a sufficient factor in achieving an advantageous market position. At the same time, it is necessary to fill the increased capacity. This may become possible by arranging the service delivery (product) components of the airlines according to their market positions. The positive effect of the high LF revealed within the scope of the research on financial performance compared to the competitor supports the above-mentioned situation. Another element that has a positive impact on financial performance is the ability to transfer resources. Airlines with a high market share in their final destinations can transfer their resources more easily than their competitors. It is thought that having a higher market share compared to competitors will bring better financial performance and this situation coincides with the research findings. There are also variables that have a negative impact on financial performance. Of these, slack resources are represented in the current ratio (CR) and they represent the resources that the firm has, but does not use. It is thought that a firm with a high CR compared to its competitor will actually show better financial performance, but the opposite situation has emerged in the research. In the occurrence of this situation, the idea that the resources that the firm keeps on the side but does not use are idle and this may reduce performance may be effective. Another variable that has a negative impact on financial performance is the total number of flights. The total number of flights is an element that increases the capacity of the airlines. If the airline can meet the capacity with the demand, its efficiency will increase and it will reduce its unit costs in this way (Doganis, 2005; Doganis, 2006). In the opposite case, with the decrease in the LF, productivity will decrease, unit costs will increase and financial performance will be negatively affected. The findings of the study support the inverse relationship between the number of flights and financial performance.

CONCLUSIONS

It is important for firms to predict the moves or retaliation from their competitors in gaining an advantageous market position. In this context, an inter-firm rivalry model has been developed that firms can use to understand how to predict a competitor's behavior and to reduce the associated uncertainty. In this context, the factors that have an impact on operational and financial performance, which represent the performance that is the output of the inter-firm rivalry model, have been revealed in the research. The findings obtained in the study show that firm maturity, relative size, slack resources, fleet homogeneity, and the total number of flights have a positive effect on operational performance, while the human resources and resource deployment capability of the firm has a negative effect. On the other hand, it has been revealed that the capabilities and efficiencies of airlines have a positive effect on financial performance, while firm maturity, the total number of flights, and slack resources all have a negative effect.

Airlines whose establishment date is older than their competitors had the opportunity to enter the market earlier than newer ones. When airlines that were established later want to enter the market of airlines with higher maturity, incumbent firms may show predatory behaviors to their competitors in order not to lose their current market position. Predatory behavior can occur in various forms. Of these, price reduction is more convenient to apply than other moves, but it is seen as an action that harms the firm when it is constantly applied, because constantly realizing the mutual price reduction move may lead to prices falling below costs after a while. In addition, in tightly regulated markets, airlines may not be able to regulate their prices as they wish. For this reason, predatory behavior is not limited only to price reductions. On the other hand, institutions responsible for maintaining competition in free markets can more easily prove predatory behavior on price. Since frequency is an important determinant of demand, airline companies can also use flight frequencies as a barrier to market entry. In this context, the frequency and thus capacity increase, which comes with market maturity and can only be realized with the permission of the resources, increase the operational performance of the airlines. The AMC perspective suggests that firms that are aware of what is happening in the market in terms of initiating competitive action or retaliation, have the necessary motivation to take competitive action, and have the necessary ability to initiate moves that can take competitive action. The findings obtained in the research support the propositions put forward by the AMC perspective.

The Turkish market was the scope of the research. It is obvious that every market has unique requirements for how an organization should operate. There is talk of a form of universalism more and more, yet each market has a unique operating culture, which influences the culture of the firms that

operate on it. Even if the research focuses on the competitive dynamics of the airlines in the Turkish international airline market, when we take into account the airline companies' primary regions of operation, we may speak about the generalizability of the research findings.

It is thought that this research will contribute to the competitive dynamics literature in aspects such as the context, the form of analysis, and the differentiation of the variables used in previous research by adding new variables and obtaining models that are more comprehensive. Strategic alliances are essential for airline companies to grow and diversify their route networks. Joining multinational alliances gives airline companies the chance to keep up a continuous global flight network. This research shows that the participation of airline firms in these alliances have an effect on their operational results. Sometimes airlines work together and other times they compete. One of these forms of cooperation is the use of codeshare flights. According to the agreements they have created, airlines may offer tickets for the same flight on codeshare flights. No discernible impact of code sharing on operational and financial performance was seen in this study. Future research should revisit this impact using different contexts and datasets. When comparing the different airlines' business models, it is evident that low cost carriers offer point-to-point flights on relatively short-haul routes while charter airlines travel to popular tourist locations that are often visited on vacations. Traditional airlines, on the other hand, offer worldwide service through their extensive and diverse flight networks. This study demonstrates how using the same business model might affect an airline's operational outcomes.

Knowing in which situations airlines will show better operational and financial performance against their competitors will guide them in and before their actions in a competitive marketplace. For this reason, it is recommended that managers analyze their competitive interaction in the context of dimensions such as source and market overlap, competitive environment, the way their competitors do business, and other airlines with which they cooperate.

There are also various limitations to this study. Firstly, only 26 airline companies are included in the study. This constraint was effectively created by the fact that the research was based on competitor pairs and equated to 650 observations on the basis of 26 competitor pairs. The number of observations will grow too large as the number of rival increases, and as 26 airline operators account for a sizable portion of the market, the airline industry is constrained to the number in question. The years that were covered by the research are yet another limitation. The study spans the ten-year period between 2009 and 2018. The data set's accessibility and Covid-19, which began in 2019 and spread globally in 2020, both played significant roles in the formation of this situation, because most of the airline firms had to stop their operations during

the pandemic. It is advised that future studies look into the market's competitive environment following the Covid-19 outbreak, as well as its impacts and those of the most recent Ukraine–Russian war.

In future research, the inter-firm rivalry model can be expanded by including different variables in the models. In addition, by collecting primary data, more in-depth information on the causes of the occurrence of these effects can be obtained. In addition, it is recommended to examine the mediating role of competitive moves in the relationship between the antecedents and performance in the inter-firm competition model in future research and to expand the research in this direction.

References

Abebe, M. A., & Angriawan, A. (2014). Organizational and competitive influences of exploration and exploitation activities in small firms. *Journal of Business Research*, *67*(3), 339-345. http://dx.doi.org/10.1016/j.jbusres.2013.01.015

Abel, L. F. (2021). *Competitive dynamics of air transport in Brazil: 2008-2014*. Clube de Autores, Sao Paulo.

Açar, A., & Sarvan, E. F. D. (2016). Halk sağlığı politikaları karşısında uluslararası sigara firmalarının rekabetçi dinamikleri. *Yönetim Araştırmaları Dergisi*, *13*(1-2), 68-117.

Albers, S., & Heuermann, C. (2013). Competitive dynamics across industries: An analysis of inter-industry competition in German passenger transportation. *Schmalenbach Business Review*, *65*(4), 431-453. http://dx.doi.org/10.1007/BF03396865

Alcácer, J., Dezső, C. L., & Zhao, M. (2013). Firm rivalry, knowledge accumulation, and MNE location choices. *Journal of International Business Studies*, *44*(5), 504-520. http://dx.doi.org/10.1057/jibs.2013.18

Alexy, O., George, G., & Salter, A. J. (2013). Cui bono? The selective revealing of knowledge and its implications for innovative activity. *Academy of Management Review*, *38*(2), 270-291. http://dx.doi.org/10.5465/amr.2011.0193

Arregle, J. L., Miller, T. L., Hitt, M. A., & Beamish, P. W. (2013). Do regions matter? An integrated institutional and semiglobalization perspective on the internationalization of MNEs. *Strategic Management Journal*, *34*(8), 910-934. http://dx.doi.org/10.1002/smj.2051

Bass, A. E., & Chakrabarty, S. (2014). Resource security: Competition for global resources, strategic intent, and governments as owners. *Journal of International Business Studies*, *45*(8), 961-979. http://dx.doi.org/10.1057/jibs.2014.28

Baum, J. A., & Korn, H. J. (1999). Dynamics of dyadic competitive interaction. *Strategic Management Journal*, *20*(3), 251-278. http://dx.doi.org/10.1002/(SICI)1097-0266(199903)20:3%3C251::AID-SMJ23%3E3.0.CO;2-H

Baum, J. A., & Korn, H. J. (1996). Competitive dynamics of interfirm rivalry. *Academy of Management Journal*, *39*(2), 255-291. http://dx.doi.org/10.2307/256781

Bélanger, N., Desaulniers, G., Soumis, F., Desrosiers, J., & Lavigne, J. (2006). Weekly airline fleet assignment with homogeneity. *Transportation Research Part B: Methodological*, *40*(4), 306-318. http://dx.doi.org/10.1016/j.trb.2005.03.004

Bettis, R. A., & Weeks, D. (1987). Financial returns and strategic interaction: The case for instant photography. *Strategic Management Journal*, *8*(6), 549-563. http://dx.doi.org/10.1002/smj.4250080605

Borenstein, S. (1989). Hubs and high fares: Dominance and market power in the U.S. airline industry. *RAND Journal of Economics*, *20*(3), 344–365. http://dx.doi.org/10.2307/2555575

Bou, J. C., & Satorra, A. (2007). The persistence of abnormal returns at industry and firm levels: Evidence from Spain. *Strategic Management Journal*, *28*(7), 707-722. http://dx.doi.org/10.1002/smj.586

Boyd, J. L., & Bresser, R. K. F. (2008). Performance implications of delayed competitive responses: Evidence from the U.S. retail industry. *Strategic Management Journal*, *29*(10), 1077-1096. http://dx.doi.org/10.1002/smj.710

Buck, S., & Lei, Z. (2004). Charter airlines: Have they a future? *Tourism and Hospitality Research*, *5*(1), 72-78. http://dx.doi.org/10.1057/palgrave.thr.6040007

Burghouwt, G. (2007). *Airline network development in Europe and its implications for airport planning*. Farnham: Ashgate Publishing, Ltd.

Chang, S. J., & Wu, B. (2014). Institutional barriers and industry dynamics. *Strategic Management Journal*, *35*(8), 1103-1123. http://dx.doi.org/10.1002/smj.2152

Chen, E. L., Katila, R., McDonald, R., & Eisenhardt, K. M. (2010). Life in the fast lane: Origins of competitive interaction in new vs. established markets. *Strategic Management Journal*, *31*(13), 1527-1547. http://dx.doi.org/10.1002/smj.894

Chen, M. J. (1996). Competitor analysis and interfirm rivalry: Toward a theoretical integration. *Academy of Management Review*, *21*(1), 100-134. http://dx.doi.org/10.2307/258631

Chen, M. J., & Hambrick, D. C. (1995). Speed, stealth, and selective attack: How small firms differ from large firms in competitive behavior. *Academy of Management Journal*, *38*(2), 453-482.

Chen, M. J., & Miller, D. (1994). Competitive attack, retaliation and performance: An expectancy-valence framework. *Strategic Management Journal*, *15*(2), 85-102. http://dx.doi.org/10.1002/smj.4250150202

Chen, M. J., Su, K. H. & Tsai, W. (2007). Competitive tension: The awareness-motivation-capability perspective. *Academy of Management Journal*, *50*(1), 101-118. http://dx.doi.org/10.5465/amj.2007.24162081

Compagni, A., Mele, V., & Ravasi, D. (2015). How early implementations influence later adoptions of innovation: Social positioning and skill reproduction in

the diffusion of robotic surgery. *Academy of Management Journal*, *58*(1), 242-278. http://dx.doi.org/10.5465/amj.2011.1184

Cusumano, M. A., Kahl, S. J., & Suarez, F. F. (2015). Services, industry evolution, and the competitive strategies of product firms. *Strategic Management Journal*, *36*(4), 559-575. http://dx.doi.org/10.1002/smj.2235

Doganis, R. (2005). *Flying off-course*. New York, London: Routledge, Taylor & Francis Group.

Doganis, R. (2006). *The airline business*. New York, London: Routledge, Taylor & Francis Group.

Ellram, L. M., Tate, W. L., & Feitzinger, E. G. (2013). Factor-market rivalry and competition for supply chain resources. *Journal of Supply Chain Management*, *49*(1), 29-46. http://dx.doi.org/10.1111/jscm.12001

Ferrier, W. (2000) Playing to win: The role of competitive disruption and aggressiveness. In M. Hitt, R. Bresser, D. Heuskel, & R. Nixon (Eds.), *Winning Strategies in a Deconstructing World* (pp. 317-327). New York: John Wiley & Sons.

Ferrier, W. J. (2001). Navigating the competitive landscape: The drivers and consequences of competitive aggressiveness. *Academy of Management Journal*, *44*(4), 858-877. http://dx.doi.org/10.2307/3069419

Ferrier, W., Smith, K., & Grimm, C. (1999). The role of competition in market share erosion and dethronement: A study of industry leaders and challengers. *Academy of Management Journal*, *42*(4), 372–388. https://doi.org/10.5465/257009

Ferrier, W. J., MacFhionnlaoich, C., Smith, K., & Grimm, C. (2002). The impact of performance distress on aggressive competitive behavior: A reconciliation of competing views. *Managerial and Decision Economics*, *23*(4-5), 301-316. http://dx.doi.org/10.1002/mde.1067

Francis, G., Humphreys. I., & Fry, F. (2005). The nature and prevalence of the use of performance measurement techniques by airlines", *Journal of Air Transport Management*, *11*(4), 207-217. http://dx.doi.org/10.1016/j.jairtraman.2004.10.003

Gayle, P. G. (2008). An empirical analysis of the competitive effects of the delta/continental/northwest code-share alliance. *The Journal of Law and Economics*, *51*(4), 743-766. http://dx.doi.org/10.1086/595865

Gerede, E. (2015). Havayolu İşletmeciliğine İlişkin Temel Kavramlar. In *Havayolu Taşımacılığı ve Ekonomik Düzenlemeler Teori ve Türkiye Uygulaması* (pp. 1-46).

Gillen, D. (2006). Airline business models and networks: Regulation, competition and evolution in aviation markets. *Review of Network Economics*, *5*(4), 366-385. http://dx.doi.org/10.2202/1446-9022.1103

Gimeno, J. (1999). Reciprocal threats in multimarket rivalry: Staking out "spheres of influence" in the U.S. airlines industry. *Strategic Management Journal*, *20*(2), 101–128. http://dx.doi.org/10.1002/(SICI)1097-0266(199902)20:2%3C101::AID-SMJ12%3E3.0.CO;2-4

Gimeno, J., & Woo, C. Y. (1996). Hypercompetition in a multimarket environment: The role of strategic similarity and multimarket contact in competitive de-escalation. *Organization Science*, *7*(3), 322-341. http://dx.doi.org/10.1287/orsc.7.3.322

Glew. (2017). *What is net profit and how to calculate it?* Retrieved from https://glew.io/tip/net-profit-calculate

Gnyawali, D. R., & Madhavan, R. (2001). Cooperative networks and competitive dynamics: A structural embeddedness perspective. *Academy of Management Review*, *26*(3), 431-445. http://dx.doi.org/10.2307/259186

Gudmundsson, S.V., & Lechner, C. (2006). Multilateral airline alliances: Balancing strategic constraints and opportunities. *Journal of Air Transport Management*, *12*(3), 153-158. http://dx.doi.org/10.1016/j.jairtraman.2005.11.007

Gündüz, Ç., & Duyar, M. (2018). Küçülten demokrasi: Sahraaltı Afrika ülkeleri. *Süleyman Demirel* Üniversitesi *Sosyal Bilimler Enstitüsü Dergisi*, (31), 213-233.

Gündüz, E. (2013). The competitive tension as a moderator for strategic innovation. *Procedia-Social and Behavioral Sciences*, *99,* 553-561. http://dx.doi.org/10.1016/j.sbspro.2013.10.525

Gündüz, E., & Semerciöz, F. (2012). The relation between competitive tension and strategic innovation. *Procedia-Social and Behavioral Sciences*, *58*, 29-39. http://dx.doi.org/10.1016/j.sbspro.2012.09.975

Haleblian, J., McNamara, G., Kolev, K., & Dykes, B. J. (2012). Exploring firm characteristics that differentiate leaders from followers in industry merger waves: A competitive dynamics perspective. *Strategic Management Journal*, *33*(9), 1037-1052. http://dx.doi.org/10.1002/smj.1961

Hanlon, P. (2007). *Global airlines*. Oxford: Butterworth-Heinemann.

Hitt, M. A., & Xu, K. (2016). The transformation of China: Effects of the institutional environment on business actions. *Long Range Planning*, *49*(5), 589-593. http://dx.doi.org/10.1016/j.lrp.2015.02.006

Hitt, M. A., Hoskisson, R. E., & Ireland, R. D. (2016). *Strategic Management: Competitiveness & Globalization Concepts and Cases.* Boston: Cengage Learning.

Hooper, P. (2005). The environment for Southeast Asia's new and evolving airlines. *Journal of Air Transport Management*, *11*(5), 335-347. http://dx.doi.org/10.1016/j.jairtraman.2005.07.004

Hsieh, K. Y., Tsai, W., & Chen, M. J. (2015). If they can do it, why not us? Competitors as reference points for justifying escalation of commitment. *Academy of Management Journal*, *58*(1), 38-58. http://dx.doi.org/10.5465/amj.2011.0869

Hsu, C. I., & Wen, Y. H. (2003). Determining flight frequencies on an airline network with demand–supply interactions. *Transportation Research Part E: Logistics and Transportation Review*, *39*(6), 417-441. http://dx.doi.org/10.1016/S1366-5545(02)00060-1

Ismail, N. A., & Jenatabadi, H. S. (2014). The influence of firm age on the relationships of airline performance, economic situation and internal

operation. *Transportation Research Part A: Policy and Practice*, *67*, 212-224. http://dx.doi.org/10.1016/j.tra.2014.06.010

Ivaldi, M., Petrova, M., & Urdanoz, M. (2022). Airline cooperation effects on airfare distribution: An auction-model-based approach. *Transport Policy*, *115*, 239-250. http://dx.doi.org/10.1016/j.tranpol.2021.11.006

Kagan, J. (2020). *Interest Expense*. Investopedia. Retrieved from https://www.investopedia.com/terms/i/interestexpense.asp#:~:text=Interest%20expense%20is%20a%20non,principal%20amount%20of%20the%20debt

Klophaus, R., Conrady, R., & Fichert, F. (2012). Low cost carriers going hybrid: Evidence from Europe. *Journal of Air Transport Management*, *23*, 54-58. http://dx.doi.org/10.1016/j.jairtraman.2012.01.015

Kor, Y. Y., & Mahoney, J. T. (2005). How dynamics, management, and governance of resource deployments influence firm-level performance. *Strategic Management Journal*, *26*(5), 489-496. http://dx.doi.org/10.1002/smj.459

Lee, H., Smith, K., Grimm, C., & Schomburg, A. (2000). Timing, order and durability of new product advantages with imitation. *Strategic Management Journal*, *21*(1), 23-30. http://dx.doi.org/10.1002/(SICI)1097-0266(200001)21:1%3C23::AID-SMJ64%3E3.0.CO;2-0

Lim, L. K. (2013). Mapping competitive prediction capability: Construct conceptualization and performance payoffs. *Journal of Business Research*, *66*(9), 1576-1586. http://dx.doi.org/10.1016/j.jbusres.2012.09.021

MacMillan, I., McCaffery, M. L., & Wijk, G. V. (1985). Competitors' responses to easily imitated new products—exploring commercial banking product introductions. *Strategic Management Journal*, *6*(1), 75-86. http://dx.doi.org/10.1002/smj.4250060106

McGrath, R. G., Chen, M. J., & MacMillan, I. C. (1998). Multimarket maneuvering in uncertain spheres of influence: Resource diversion strategies. *Academy of Management Review*, *23*(4), 724-740. http://dx.doi.org/10.2307/259059

Miller, D., & Chen, M (1994). Sources and consequences of competitive inertia. *Administrative Science Quarterly*, *39*(1), 1-23.

Miller, D., & Chen, M. J. (1996a). Nonconformity in competitive repertoires: A sociological view of markets. *Social Forces*, *74*(4), 1209-1234. http://dx.doi.org/10.2307/2580349

Miller, D., & Chen, M.J. (1996b). The simplicity of competitive repertoires: An empirical analysis. *Strategic Management Journal,* *17*(6), 419-440. http://dx.doi.org/10.1002/(SICI)1097-0266(199606)17:6%3C419::AID-SMJ818%3E3.0.CO;2-Z

Ndofor, H. A., Sirmon, D. G., & He, X. (2011). Firm resources, competitive actions and performance: Investigating a mediated model with evidence from the in-vitro diagnostics industry. *Strategic Management Journal*, *32*(6), 640-657. http://dx.doi.org/10.1002/smj.901

Pei, W., Li, J.-H., & Tan, B.-L. (2015). A Study of the application of competitive dynamics theory integrated with Ahp - A case study of Taiwan's listed automakers. *International Journal of Organizational Innovation*, *7*(3), 145-161.

Petrović, D., Puharić, M., & Kastratović, E. (2018). Defining of necessary number of employees in airline by using artificial intelligence tools. *International Review,* (3-4), 77-89. http://dx.doi.org/10.5937/IntRev1804077P

Porter, M. (1980). *Competitive Strategy: Techniques for Analyzing Industries and Competitors.* New York: The Free Press.

Porter, M. (1985). *Competitive Advantage: Creating and Sustaining Superior Performance.* New York: The Free Press.

Rindova, V., Ferrier, W. J., & Wiltbank, R. (2010). Value from gestalt: how sequences of competitive actions create advantage for firms in nascent markets. *Strategic Management Journal*, *31*(13), 1474-1497. http://dx.doi.org/10.1002/smj.892

Silverman, B. S., & Baum, J. A. (2002). Alliance-based competitive dynamics. *Academy of Management Journal*, *45*(4), 791-806.

Sirmon, D. G., Hitt, M. A., Arregle, J. L., & Campbell, J. T. (2010). The dynamic interplay of capability strengths and weaknesses: investigating the bases of temporary competitive advantage. *Strategic Management Journal*, *31*(13), 1386-1409. http://dx.doi.org/10.1002/smj.893

Smith K. G., Ferrier, W. J. & Ndofor, H. (2001). *Competitive Dynamics research: Critique and future directions.* In M. A. Hitt, E. F. Freeman, & J. S. Harrison (Eds.), *The Blackwell Handbook of Strategic Management* (pp. 315–361). Oxford: Blackwell.

Smith, K. G., Grimm, C. M., Chen, M. J., & Gannon, M. J. (1989). Predictors of response time to competitive strategic actions: Preliminary theory and evidence. *Journal of Business Research*, *18*(3), 245-258. http://dx.doi.org/10.1016/0148-2963(89)90048-9

Smith, K. G., Grimm, C. M., Gannon, M. J., & Chen, M.-J. (1991). Organizational information processing, competitive responses, and performance in the U.S. domestic airline industry. *Academy of Management Journal*, *34*(1), 60-85. http://dx.doi.org/10.2307/256302

Sönmez, R., & ve Eroğlu, U. (2017). Firmalar arası rekabetçi etkileşim: Rekabetçi hamlelerin özellikleri ve misilleme arasındaki ilişki. *Yönetim Araştırmaları Dergisi*, *13*(1-2), 41-69.

Sönmez, R., & Eroğlu, U. (2021). Havayolu sektöründe rekabetçi hamlelerin belirlenmesi: Sektöre özgü bir tipoloji önerisi. *Ege Stratejik Araştırmalar Dergisi*, *12*(1), 52-69.

Stiroh, K. J., & Strahan, P. E. (2003). Competitive dynamics of deregulation: Evidence from US banking. *Journal of Money, Credit and Banking*, *35*(5), 801-828.

Taneja, N. K. (1989). *Introduction to civil aviation*. Lexington, MA: Lexington Books.

Taneja, N. K. (2002). *Driving airline business strategies through emerging technology.* Farnham: Asghate.

Tsai, W., Su, K. H., & Chen, M. J. (2011). Seeing through the eyes of a rival: Competitor acumen based on rival-centric perceptions. *Academy*

of Management Journal, *54*(4), 761-778. http://dx.doi.org/10.5465/amj.2011.64870138

Villanueva, J., Van de Ven, A. H., & Sapienza, H. J. (2012). Resource mobilization in entrepreneurial firms. *Journal of Business Venturing*, *27*(1), 19-30. http://dx.doi.org/10.1016/j.jbusvent.2010.09.001

Yaşar, M. (2017). Analysis of the competition between transportation modes from the perspective of competitive dynamics: A study on Ankara-İstanbul transportation line. *The International Journal of Transport & Logistics*, *17*(42), 9-19.

Yaşar, M., & Gerede E. (2020). Identification of factors affecting competitive tension in the domestic air transport market in Turkey. *International Journal of Management and Economics*, *56*(2), 118–139.

Yerdelen Tatoğlu, F. (2016). *Panel Zaman Serileri Analizi Stata Uygulamalı*. İstanbul: Beta Basım Yayım Dağıtım.

Young, G., Smith, K. G., Grimm, C. M., & Simon, D. (2000). Multimarket contact and resource dissimilarity: A competitive dynamics perspective. *Journal of Management*, *26*(6), 1217-123.

Young, G., Smith, K.G., & Grimm, C. (1996). "Austrian" and industrial organization perspectives on firm-level competitive activity and performance. *Organization Science*, *7*(3), 243-254. http://dx.doi.org/10.1287/orsc.7.3.243

Yu, T., & Cannella Jr, A. A. (2007). Rivalry between multinational enterprises: An event history approach. *Academy of Management Journal*, *50*(3), 665-686. http://dx.doi.org/10.5465/amj.2007.25527425

Zajac, E., & Bazerman, M. (1991). Blind spots in industry and competitor analysis: Implications of interfirm (mis)perceptions for strategic decisions. *The Academy of Management Review, 16*(1), 37-56. Retrieved from http://www.jstor.org/stable/258606

Zhang, Y. A., Li, Y., & Li, H. (2014). FDI spillovers over time in an emerging market: The roles of entry tenure and barriers to imitation. *Academy of Management Journal*, *57*(3), 698-722. http://dx.doi.org/10.5465/amj.2011.0351

Appendix 1. List of airlines in the study

Airline name	Country	IATA Code
Turkish Airlines	Turkey	TK
Pegasus Airlines	Turkey	PC
Sun Express	Turkey	XQ
Corendon Airlines	Turkey	XC
Atlas Global	Turkey	KK
Lufthansa	Germany	LH
Condor	Germany	DE
Germania	Germany	ST
TUI Fly	Germany	X3

Airline name	Country	IATA Code
British Airways	United Kingdom	BA
Easyjet	United Kingdom	U2
Jet2	United Kingdom	LS
Thomas Cook	United Kingdom	MT
Air France	France	AF
KLM	Netherlands	KL
Aegean Airlines	Greece	A3
Swiss Airlines	Switzerland	SR
Emirates	United Arab Emirates	EK
Qatar Airways	Qatar	QA
Air Arabia	United Arab Emirates	G9
Royal Jordanian	Jordan	RJ
Aeroflot	Russia	SU
Ukraine International Airlines	Ukraine	PS
Air Astana	Kazakhstan	KC
Egypt Air	Egypt	MS
Singapore Airlines	Singapore	SG

Abstrakt

CEL: Firmy, które chcą uzyskać korzystną pozycję rynkową i trwałą długoterminową przewagę konkurencyjną na rynku, angażują się w zachowania konkurencyjne. Konkurencyjne zachowanie firmy wykonują w rzeczywistych warunkach rynkowych lub przez reakcje (odwet) na te posunięcia. Ci, którzy inicjują akcję (aktorzy), oraz ci, którzy reagują na akcje (odpowiadający) i działania konkurencyjne stanowią konkurencyjną dynamikę branży. Wyniki działań konkurencyjnych prowadzonych w zakresie dynamiki konkurencji są monitorowane w zakresie funkcjonowania rynku. Celem tego badania jest ujawnienie czynników, które wpływają na wyniki operacyjne i finansowe przedsiębiorstw lotniczych konkurujących na tureckim międzynarodowym rynku lotniczym. METODYKA: W tym kontekście oceniono 26 linii lotniczych konkurujących na tureckim rynku międzynarodowych linii lotniczych w kontekście par rywalizujących w latach 2009-2018. Analiza modeli zaprojektowanych w badaniu została przeprowadzona za pomocą analizy regresji panelowej. WYNIKI: Ustalenia uzyskane w badaniu pokazują, że na względny wzrost udziału w rynku linii lotniczych pozytywny wpływ ma dojrzałość firmy, względna wielkość, zasoby finansowe, całkowita liczba lotów i jednorodność floty, a negatywny wpływ ma ich zdolność do rozmieszczenia zasobów. Według badań na względny przychód w pasażerokilometrach pozytywny wpływ ma względna wielkość linii lotniczych, ten sam model biznesowy i współczynnik obciążenia, ale negatywny wpływ mają możliwości rozmieszczenia zasobów i konkurowanie w tym samym sojuszu. Podczas gdy zdolność alokacji zasobów i efektywność linii lotniczych mają pozytywny wpływ na wynik netto, dojrzałość firmy

i łączna liczba lotów mają negatywny wpływ. Udowodniono, że zdolność linii lotniczych do rozlokowania zasobów i efektywność firmy lotniczej mają pozytywny wpływ na wyniki finansowe, podczas gdy dojrzałość firmy, łączna liczba lotów i niewykorzystane zasoby mają wpływ negatywny. IMPLIKACJE: Oczekuje się, że dzięki wprowadzeniu dodatkowych zmiennych — takich jak jednorodność floty, model biznesowy, sojusze strategiczne i współdzielenie kodów — do zmiennych wykorzystywanych we wcześniejszych badaniach, niniejsze badanie wzbogaci wiedzę na temat dynamiki konkurencji. Linie lotnicze będą kierowane w swoich działaniach na konkurencyjnym rynku, rozumiejąc okoliczności, w których wykażą się lepszymi wynikami operacyjnymi i finansowymi niż ich rywale. ORYGINALNOŚĆ I WARTOŚĆ: Wiedza o tym, w jakich sytuacjach linie lotnicze wykażą się lepszymi wynikami operacyjnymi i finansowymi w porównaniu ze swoimi konkurentami, wpłynie na zachowania przed podjęciem działań na konkurencyjnym rynku.
Słowa kluczowe: dynamika konkurencji, konkurencja, zarządzanie strategiczne, linie lotnicze, analiza danych panelowych, wyniki finansowe, wyniki operacyjne

Biographical notes

Mehmet Yasar currently works at the Department of Civil Aviation Management, Kastamonu University. Mehmet does research in Competitive Dynamics, Air Transport Management, Strategic Management and Managerial Economics.

Ender Gerede currently works as a Professor at Air Transport Management Department, Faculty of Aeronautics and Astronautics, Eskisehir Technical University, Eskisehir, Turkey. Ender does research in Safety Management, Air Transport Management, Strategic Management and Risk Analysis, and Human Factor Psychology.

Authorship contribution statement

Mehmet Yaşar: Conceptualization, Data collecting, Formal analysis, Methodology, Vsualization, Writing. **Ender Gerede:** Writing, Editing, Supervision, Validation.

Conflicts of interest

The authors declare no conflict of interest.

Citation (APA Style)

What makes equity crowdfunding successful in Japan? Testing the signaling and lack of financial literacy hypotheses

Yoshiaki Nose[1] (iD)*, Chie Hosomi[2]*

Abstract

PURPOSE: *The first objective of this study is to identify the factors that contribute to the success of equity crowdfunding (ECF) campaigns in Japan. We examined what makes a campaign successful using data from 217 campaigns conducted on FUNDINNO, Japan's largest ECF platform, between February 2017 and May 2021. The second objective is to assess individual investors' financial literacy based on the ECF campaign's success or failure. This study is unique in that it focuses on funding method differences as well as the contents of the business plans disclosed in the ECF campaigns. In Japan, a common equity campaign and stock acquisition rights campaign are run on the same ECF platform, as if they were the same type of funding. Common stock and stock acquisition rights are treated differently by venture capitalists and other professional investors. By comparing the success or failure of the two Japanese projects, we can assess individual investors' financial literacy after taking into account the project signals.* **METHODOLOGY:** *The "Signaling Hypothesis" and the "Lack of Financial Literacy Hypothesis" were tested. Nine and four variables were set as proxy variables for the Signaling Hypothesis and the Lack of Financial Literacy Hypothesis, respectively. This study first divides the qualitative data into success/failure dichotomies for the proxy variables that comprise the hypotheses and then uses a chi-square test to examine the composition ratio of each. The quantitative data among the hypotheses' proxy variables are then tested for differences in means (t-test) and medians (Wilcoxon signed-rank test). Subsequently, we perform a probit analysis with the explained variable being "success (1)/failure (0)" and the explanatory variable being a proxy variable for the hypothesis. We begin with a probit analysis, and the Logit model is then introduced. Finally, a multiple regression analysis is run with the explained variables "fundraising rate" and "number of investors" and the hypothesized proxy variables as explanatory variables.* **FINDINGS:** *We found that the "number of directors" is an effective management ability indicator of ECF success. In terms of*

1 Yoshiaki Nose, Professor, Graduate School of Business, Doshisha University, Karasuma-higashi-iru, Imadegawa, Kamigyo-ku, 602-8580, Kyoto, Japan, e-mail: ynose@mail.doshisha.ac.jp (ORCID: https://orcid.org/0000-0003-0866-6766), corresponding author.
2 Chie Hosomi, Member, Doshisha Business School Network, Karasuma-higashi-iru, Imadegawa, Kamigyo-ku, 602-8580, Kyoto, Japan, e-mail: hosson419@gmail.com

start-up fundamentals, investors appear to accept the signals "intellectual property", "product releases" and "tax incentives." Awards affected the size of the final funding round. In contrast, B2C companies negatively signaled to private investors. The proxy variable "in final year sales" was supported concerning the lack of a financial literacy hypothesis. Individual investors can be assumed to be financially literate if they perform due diligence. However, since "expected rate of return (Internal Rate of Return, hereafter abbreviated as IRR)" and "common stock dummy" are uncorrelated, we can conclude that they do not demonstrate financial literacy in "valuation," nor whether or not the investment is profitable. Thus, individual investors' financial literacy in the Japanese ECF can be considered to be limited. IMPLICATIONS: We have demonstrated which signals investors in Japan's ECF campaigns respond to. These guidelines will be useful for future start-ups planning ECF campaigns. We were able to identify the lack of financial literacy among ECF individual investors. Therefore, for Japan's equity capital market to grow in the future, individual investors' financial literacy must be improved. ORIGINALITY AND VALUE: With very limited analysis in Asia, home to the world's second- and third-largest stock markets, we have identified the factors behind the success of Japan's ECF. Identifying success factors in a country like Japan, where many individual investors are extremely risk averse, will provide new insights. By comparing the success or failure of the two types of Japanese ECF projects (common equity projects and stock acquisition rights), we could test the financial literacy of individual investors, taking into account the project signals.

Keywords: *equity crowdfunding, financial literacy hypotheses, signaling theory, individual investors, IRR, internal rate of return, management ability, investors, capital market, success factors*

INTRODUCTION

This study is an empirical investigation into the signals that lead to successful fundraising in Japanese equity crowdfunding (hereinafter ECF). The means of raising funds for start-ups are expanding as the information society develops. Crowdfunding is one of such means. Crowdfunding is a method of raising funds from an unspecified number of people via the Internet (Bruton et al., 2015; Drover et al., 2017).

Additionally, ECF is expanding in Japan. However, it remains unclear why ECF among Japanese retail investors has begun to gain traction. Private equity investments have historically been made by professional investors, such as venture capitalists and angel investors, because of their high risk. Numerous experts viewed the development of ECF in Japan with skepticism (Fujii et al., 2021). Why has ECF taken off against the expectations of experts? From the perspective of campaign success factors, this study seeks to validate this question. The success factors of ECF are becoming clear, especially in Europe and

the United States (US). However, empirical studies of ECF success factors in Asia, including Japan, are extremely limited.

This study is a continuation of the study by Fujii et al. (2021) and presents empirical results for their remaining issues. The first objective of this study is to identify the success factors of ECF campaigns in Japan. Using data from 217 campaigns conducted on FUNDINNO, Japan's largest ECF platform, between February 2017 and May 2021, we examined what makes a campaign successful.

The second objective is to check the financial literacy of individual investors based on the success or failure of the ECF campaign. Fujii et al. (2021) mainly focused on the valuations of each project and found a lack of financial literacy among individual investors. We determined their financial literacy even after considering the impact of prevailing success signals identified by previous studies. This study is unique in that it focuses on funding method differences and contents of the business plans disclosed in the ECF campaigns. In Japan, a common equity campaign and a stock acquisition rights campaign are run on the same platform for ECF, as if they were the same type of funding. Of course, it is noted which type the project is. However, on the webpage, the two types are listed without distinction. Common stock and stock acquisition rights are distinctly different for venture capitalists and other professional investors. Stock acquisition rights are very similar to what is known as SAFE (Simple Agreement for Future Equity) or KISS (Keep It Simple Security) overseas. With SAFE and KISS, the stock price at the time of raising is determined later. These frameworks are extremely professional.

We tested the "Signaling Hypothesis" and the "Lack of Financial Literacy Hypothesis". Through statistical analysis, we discovered that several signals were significantly correlated with ECF success. We also found that Japanese retail investors have limited financial literacy.

This paper is structured as follows. Section 2 reviews previous research on ECF. Section 3 describes the verification hypotheses and verification methods. Section 4 details the analysis results. Section 5 summarizes the results of the analysis and describes the future prospects.

Market overview

Crowdfunding is classified into five types: donation, reward, lending, funding, and equity (Hornuf & Neuenkirch, 2016). The returns received by investors differ depending on the type of crowdfunding (Table 1). Since 2013, equity crowdfunding has been used in the United Kingdom (UK) as a new method of raising funds through the sale of stocks and stock acquisition rights. Returns can be stock dividends or capital gains on stocks. The majority of companies that raise funds through ECF are start-ups. Unlike listed stocks, start-up stocks are not

easily traded. They have low liquidity and they cannot be converted into cash without an initial public offering (IPO) or a merger and acquisition (M&A).

Table 1. Crowdfunding types

	Procurer's accounting treatment	Returns
Equity	Capital stock and capital reserve	Dividends on shares, Gain on sale of shares and stock acquisition rights
Debt	Loans payable	Interest
Fund	Deposits received from silent partnerships	Distributions (dividends) based on sales
Rewards	Advance received (accounts receivable)	Products, services, and benefits
Donation	Non-operating income	Certificate of appreciation, etc.

The Financial Instruments and Exchange Law in Japan was partially revised in May 2014. Prior to the revision, unlisted companies had to submit securities registration statements along with audit reports if they wanted to solicit more than 50 investors to purchase shares. The revision removed the limit on the number of applicants on the Web, and companies can now raise funds of less than 100 million yen (700,000 USD). Individual investors may invest no more than 500,000 yen (3,000 USD) per company per year. The platforms must register with the government, screen start-ups that offer shares, and disclose information during campaigns. In response to this legislative change, an equity-based crowdfunding platform was launched in April 2017 (Matsuo, 2018). Because of the risk of fraud and trouble associated with investing in unlisted stocks, soliciting investment by phone or visiting investors is prohibited.

According to the Japan Securities Dealers Association, ECF in Japan has increased since regulations were lifted in 2017, with a target of 2,463 million yen (21 million USD) in 2020. As of October 2021, the amount of assistance had already surpassed that of the previous year (Figure 1). To date, 354 campaigns have been launched, with a success rate of approximately 70% (193 campaigns). In Japan, ECF is divided into common stock and stock acquisition rights, with approximately 75% of common stock and approximately 25% of stock acquisition rights.

Six brokerage firms, including FUNDINNO, are currently registered with the Japan Securities Dealers Association. FUNDINNO was the first approved platform and launched in Japan in November 2016. In December 2021, the platform assisted in raising 7.24 billion yen, ran 221 successful campaigns, and had nearly 88,000 registered investors. FUNDINNO controls approximately 80% of the ECF market in Japan.
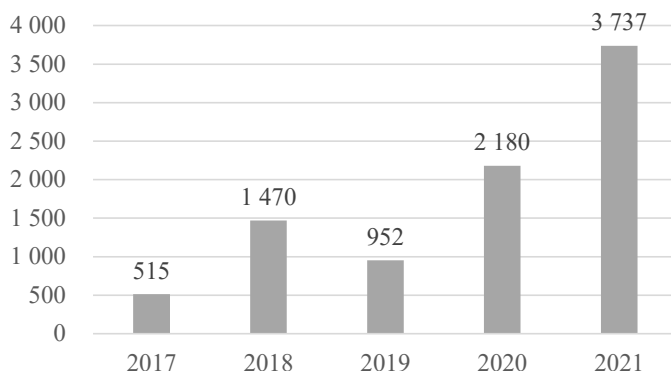
Figure 1. Amount of funds raised through equity crowdfunding in Japan (Millions of yen)

As noted in the previous section, in Japan, a common equity campaign and a stock acquisition rights campaign are run on the same platform for ECF, as if they were the same type of funding. Table 2 compares common stock and stock options in ECF campaigns to stock options in general. The most important feature of stock acquisition rights is that the valuation of the investment can be postponed to a future date. While this can speed up the financing process by postponing the most difficult procedures, investors also take on significant valuation risks. For this reason, SAFEs and KISSs are generally used by professional investors with a high level of financial literacy on the premise of investment diversification.

Table 2. Difference between common stock and stock acquisition rights

	Common stock	Stock acquisition rights	General stock options
Dividends	Yes	None	None
Voting rights	Yes	None	None
Right to claim Distribution of residual assets	Yes	None	None
Invalidation	Not expired	Expires after a certain period (e.g., 7 years)	Expires after a certain period of time
Conversion price	-	Determined after the fact (e.g., 80% of the share price of the next non-equity CF capital increase)	Determined at the time of issuance
Price to be paid	Purchase price of shares	Payment for the purchase of shares is made in advance	Option price only (often free of charge)
How to Exit	Sale	Excise or Sale	None

LITERATURE REVIEW AND HYPOTHESIS

Signaling hypothesis

Although ECF has only been used for about ten years, research is slowly accumulating. The analysis of campaign success factors has been studied primarily in the UK. Table 3 shows the countries and periods that have been analyzed in previous studies. Following the UK, research is being carried out in the US, Australia, and various European countries. We have also found some empirical studies focusing on Asian countries. Moreover, there are several non-empirical studies dealing with ECF campaigns in Middle Eastern countries. According to a comprehensive study conducted by Mochkabadi and Volkmann (2018), so-called "campaign research" that analyzes success factors by constructing multiple regression analysis models with campaign success or failure as the dependent variable and the hypothesis of success signals as the independent variable, has made the most progress in ECF. Therefore, we have also attempted to conduct "campaign research" in our study.

Table 3. Major previous studies

Literature	Country/Platform	Period	sample size
Ahlers et al. (2015)	Australia ASSOB	2006–2011	104
Allison et al. (2017)	USA Kickstarter	2011	383 Entrepreneurs
Cumming et al. (2021)	UK Crowdcube, AIM	2013–2016	Crowdcube167, AIM99
Dehghani et al. (2023)	Iran	2020	408 individual investors
El hajj et al.(2022)	Lebanon	2020	147 start-ups and 10 entrepreneurs
Fajarini et al. (2021)	Indonesia, Malaysia, UAE, South Korea	2018–2019	201
Guenther et al. (2018)	Australia ASSOB	2006–2012	104
Hellmann et al. (2019)	UK Seedrs	2012–2017	767
Horvát et al. (2018)	UK	2012–2016	698
Mamonov and Malaga (2018)	USA 16 platforms	2016–2017	133
Ralcheva and Roosenboom (2016)	UK Crowdcube	2012–2015	541
Ralcheva and Roosenboom (2020)	UK Crowdcube, Seedrs	2012–2014	2171
Shafi (2021)	UK Crowdcube	2015–2016	207
Vismara (2016)	UK Crowdcube, Seedrs	2011–2014	271
Vismara (2018)	UK Crowdcube	2014	111
Vismara (2019)	UK	2014–2015	345
Vulkan et al. (2016)	UK Seedrs	2012–2015	636
Wasiuzzamann and Suhili (2023)	Malaysia 5 platforms	2016–2020	97

What does previous research indicate as a successful campaign factor? Many previous studies have suggested the use of "signals." In other words, the hypothesis is that specific signals provided by fundraising companies increase the likelihood of successful fundraising in ECF campaigns. According to the signaling theory on which this hypothesis is based, reliable signals enable companies to convey positive information that allows investors to identify good investment opportunities (Spence, 1978). Investors believe that receiving high-quality signals eliminates the information asymmetry that has been a major barrier to investing in start-ups.

Following our extensive review, we were able to categorize the candidates for signals that increase a campaign's success factor as "management competence," "company fundamentals," "SNS (Social Networking Service) activity," "past invested performance," and "tax incentives." The following section describes the findings of previous research on each of these topics.

Signals about management competence

Previous research has demonstrated that the greater the number of board members, the greater the likelihood of a successful campaign. For example, Ralcheva and Roosenboom (2020) examined 2,171 campaign data from the two largest ECF platforms in the UK (Crowdcube and Seedrs) and found a positive correlation between the number of managers and the success rate of campaigns. According to their interpretation, the number of managers is a proxy variable for a start-up's human assets. Vismara (2019) also demonstrated that the number of top managers has a significant impact on the success of a campaign.

Similar reports have been made during campaigns in other nations. According to Mamonov and Malaga's (2018) analysis of 133 data points from 16 US platforms and Ahlers et al. (2015) analysis of 104 ECF events on the Australian platform ASSOB, the greater the number of executives, the more successful the campaign. Meanwhile, Mamonov and Malaga (2018) interpreted that start-up success requires a variety of specialized skills, such as product development, marketing, and finance; the presence of multiple individuals with these specialized skills attests to the start-up's quality.

Prior research has consistently found that campaigns are more likely to succeed if the management team has experience in the business associated with the start-up seeking funding. For instance, Shafi (2021) showed that the more experience a campaign's founder has in a related industry, the more funds it raises. Allison et al. (2017) also demonstrated that similar experience in previous management positions increases the probability of successful campaigns. They explain that their experience in related businesses has improved their management skills and that investors have responded favorably to the signal.

As a related experience, some previous studies have examined the relationship between entrepreneurial experience and the success or failure of campaigns. Nonetheless, there is a mixture of positively correlated (Allison et al., 2017; Piva & Rossi-Lamastra, 2018) and negatively correlated (Blaseg et al., 2021; Mamonov et al., 2017; Shafi, 2021) findings.

Some studies have focused on the age of managers. According to Ralcheva and Roosenboom's (2020) logistic analysis, the age of a director is significantly negatively correlated with campaign success, suggesting that younger management is more likely to be successful in fundraising. Meanwhile, Blaseg et al. (2021) demonstrated that ECF is downstream of pecking order theory and is typically utilized by younger managers who lack access to alternative funding sources.

Other research has focused on female founders and managers. For example, Vismara (2016), and Cumming et al. (2021) found that projects with female founders raised statistically significantly less money, which he attributed to a weak female social network. Moreover, Blaseg et al. (2021) noted that female founders are more likely to leverage ECF further down the pecking order because they have less access to alternative funding sources.

In this study, two hypotheses were established based on the previous studies mentioned. The first is Hypothesis 1-1, which considers the number of managers to be a proxy variable for management quality.

H1-1: The number of directors increases the probability of campaign success.

The second is Hypothesis 1-2, which was based on the finding that female founders are less capable of raising funds.
H1-2: Female founders' campaigns have a lower success rate.

Signals about corporate fundamentals

When an outside third party positively evaluates a start-up's resources, it can be a signal that the start-up is of high quality. When retail investors use that signal as a guide, the presence or absence of a third-party evaluation can influence a campaign's success or failure. Patents and Intellectual Property may be the most obvious external assessment for start-ups. Previous studies have found that Intellectual Property has a positive correlation with campaign success (Horvát et al., 2018; Piva & Rossi-Lamastra, 2018; Ralcheva & Roosenboom, 2016; Vismara, 2018; Wang et al., 2019). According to their interpretation, having Intellectual Property signals to investors that the company can innovate and has reliable technology and management (Ralcheva & Roosenboom, 2016; Cumming et al., 2021; Horvát et al., 2018; Mamonov & Malaga, 2018; Ralcheva & Roosenboom, 2020).

Awards and grants are also clear external evaluations. Winning a rigorous professional selection is a sign of the quality of a start-up or its management (Allison et al., 2017; Blaseg et al., 2021; Ralcheva & Roosenboom, 2016, 2020).

So far, we have grouped the term "start-up" into the discussion, but start-ups have different phases. For example, the seed, early, middle, and later stages are well known, and the earlier stages are riskier and require higher expected returns. The stage of a start-up is said to influence its success even in ECF campaigns. Specifically, multiple studies have found that start-ups that already have a product on the market and are selling it (i.e., after the early stages) have a higher probability of campaign success (Mamonov & Malaga, 2018; Ralcheva & Roosenboom, 2016; Vismara, 2018). The nature of the business may also be affected. Specifically, business-to-consumer (B2C) businesses, who are selling products or services directly to consumers, are more accessible to individual investors and therefore easier to finance (Mamonov & Malaga, 2018).

In the present study, four hypotheses were established based on the previous studies mentioned. The first is Hypothesis 1-3, which considers intellectual property as evidence of superior management resources; intellectual property takes time from application to approval. Most of our samples are start-ups whose intellectual properties are in the process of being filed. Given that they are considered protected from filing to final approval, we included firms with pending applications in this study.

H1-3: Filing or possessing Intellectual Property increases the probability of a successful campaign.

Next is Hypothesis 1-4, which considers an award to be a high-quality, positive signal.

H1-4: Award-winning campaigns increase the probability of success.

Hypothesis 1-5 states that the release of a product or service will increase stakeholder awareness.

H1-5: If the product or service has already been released, the campaign's probability of success increases.

Finally, Hypothesis 1-6 considers B2C (business-to-consumer) businesses to be more familiar to individual investors.

H1-6: Campaigns of companies whose businesses include B2C have a higher probability of success.

Track record of investment by investors

In entrepreneur finance, investment history is of utmost importance. For instance, venture capitalists and other professional investors conduct exhaustive due diligence before investing. Venture capitalists value the start-ups in which they invest. If they are a prominent venture capital firm or investor, their investments frequently have a brand effect.

There are scattered studies indicating that the participation of business professionals increases the success rate of ECF campaigns. For instance, the regression model of Ralcheva and Roosenboom (2016) indicates that accelerator participation positively influences campaign success. Additionally, ECF permits repeated fundraising on the same platform. Therefore, if the start-up grows, second and third campaigns will be solicited. Past success in ECF also has a positive signal effect on individual investors, which increases the likelihood of success for the second and third campaigns (Shafi, 2021).

We established two hypotheses based on these considerations. The Hypothesis 1-7 deals with past track records.

H1-7: Past track record of fundraising through ECF increases the probability of campaign success.

Hypothesis 1-8 evaluates the participation of professional investors.

H1-8: Probability of campaign success increases if professional investors invest in the campaign.

Signals about tax incentives

To attract investors to invest in start-ups, governments have created tax incentives. With a tax incentive, individual investors can purchase company shares at a lower price for the reduced tax. Several ECF campaigns allow investors to benefit from tax incentives. Several prior studies have indicated that this tax incentive positively affects the success of ECF (Hellmann et al., 2019; Mochkabadi & Volkmann, 2018; Vulkan, Åstebro & Sierra, 2016), that the tax benefit has no effect (Vismara, 2016, 2018), and that tax incentive evaluations are inconsistent. Therefore, we set Hypothesis 1-9.

H1-9: Campaigns eligible for angel taxation have a higher probability of success.

Signals using SNS

ECF is a type of fundraising activity that takes place over the Internet. As a result, there is a consistent tendency for fundraising campaigns run by start-ups and management with active SNS activity via the Internet to be more successful. Specifically, Facebook activity is positively associated with fundraising success (Allison et al., 2017; Lukkarinen, Teich, Wallenius & Wallenius, 2016; Mollick, 2014; Aprilia & Wibowo, 2017). More LinkedIn connections of founders boost campaign success (Piva & Rossi-Lamastra, 2018; Vismara, 2016, 2018). In this case, the number of connections is likely to indicate the strength of an entrepreneur's business network to retail investors. These papers point out that high-profile executives and investors in the entrepreneur's LinkedIn are checked, which signals their viability as a start-up. This hypothesis is outside the scope of this paper's testing due to data limitations.

Table 4 lists the proxy variables associated with ECF success factors and their significance.

Table 4. Summary of the analysis of equity crowdfunding success factors

Category	Variable	Vismara (2016)	Hellmann et al. (2019)	Rakiteva and Roosenboom (2020)	Rakiteva and Roosenboom (2016)	Vulkan et al. (2016)	Horvat et al. (2018)	Cumming et al. (2021)	Vismara (2015)	Vismara (2018)	Vismara (2019)	Shafi (2021)	Allison et al. (2017)	Mamonov and Malaga (2018)	Ahlers et al. (2015)	Guenther et al. (2018)	Blaseg et al. (2021)	Piva and Rossi-Lamastra (2018)	Lukkarinen et al. (2016)
Signals about management	Number of Directors + TMT Size	+	+	+		+		−	+	+	+	+		+	+		+		
	TMT Size	+				+			+	+	+								
	Business Education of Directors												+	+		+	+		+
	Women	−						−										+	
	Entrepreneurial Experience												−	+	−			−	+
	Young Entrepreneur				+													+	
	Entrepreneur's dream/motivation/commitment													+	−				
	Entrepreneur's ownership of company stock	+		+															
Signals about corporate fundamentals	Intellectual Property				+		+		+					−				+	
	Awards				+														
	Grants				+										−	−	+		
	Product Releases				+				+					+					
	B-to-C Business																		+
	Social contact on social networking sites	+							+	+								+	+
	High-tech companies																−		
	Seed companies										+								
	Sustainability oriented										+								
	Low-cost				+														
	Group Identity													−					
Track record of investment by investors	Past equity-based CF performance				+								+						
	Professional investment results				+									+					−
	Number of early investors during campaign period				+		+	+											
	Early fundraising rate				+				+										
tax benefit	tax benefit	−	+		+			−		+							+		
Others	EXIT by IPO														+	−			
	Financial Information													−					+
	Major Cities	−	+	+			−	−									+		
	Target Amount to be Raised								−							+		−	
	Dividend							+											

Note: +: significantly positive, −: significantly negative. TMT means top management team. Colored variables are those analyzed in this study.

Lack of financial literacy hypothesis

Indeed, many people questioned the popularity of ECF when it first began (Matsuo, 2017). This is because unlisted stock transactions have always been conducted by professional investors who perform professional due diligence to determine the value of the issuing company. In ECF, however, individual investors must perform due diligence. Do individual investors really have such financial literacy?

Most previous research on the financial literacy of investors investing in ECFs has focused on issuer fraud. For example, Ivanov and Knyazeva (2017), Wilson and Testoni (2014), and Mochkabadi and Volkmann (2018) discussed how to prevent damage caused by fraud and how far regulation should cover it. Moreover, Signori and Vismara (2016) presented the case of Rebus, a company that raised £816,790 and went bankrupt in less than a year. Prior research indicating fraudulent activities by issuers and platforms inevitably calls for tighter regulation (Goethner et al., 2021; Goethner et al., 2021).

However, investors are not always the victims of fraud either; Fujii et al. (2021) is the only previous study focusing on the offering format in Japanese ECF. Our research included 109 transactions from 2017 to 2020. They disaggregated campaign success/failure by common stock/stock acquisition rights and discovered no statistically significant difference in success rates between the two. Moreover, they stated that "a stock acquisition rights project, in which even professional investors are unable to calculate internal rate of returns (IRRs), is completed at the same rate as a common stock project; this suggests that individual investors lack financial literacy." Furthermore, due diligence on the business plans revealed that many samples did not meet the listing criteria, even if the start-ups were to achieve their goals in the future. In other words, even if the issuer or platform discloses information properly, individual investors may not use it or may invest in ECF using completely different information unnecessary for their investment decisions. Individual investors who are not financially literate may free ride on individual investors who are also not financially literate in ECF (Agrawal et al., 2014; Hornuf & Schmitt, 2016; Mochkabadi & Volkmann, 2018; Wilson & Testoni, 2014).

Investors who lack financial literacy are more likely to fail and, according to Gaudecker (2015) and Meoli and Vismara (2021), those with little mathematical knowledge fail to diversify and lose investment returns. Mintjes (2016) conducted an independent study and confirmed Gaudecker's (2015) hypothesis. Individual investors with low financial literacy who invest in ECF temporarily stimulate start-up finance. However, if their investments turn out to be a slew of failures after a few years, the recently emerged promising FINTECH ECFs will become worthless (Collins & Pierrakis, 2012).

The Lack of Financial Literacy Hypothesis assumes that individual investors are either unable or unwilling to comprehend the information and signals provided by start-ups and platforms and therefore invest "without understanding" and "somehow." Financial literacy in this context does not refer to a superficial understanding of the information disclosed in ECF, but rather determines whether or not they can perform "due diligence" and "valuation" (Fujii et al., 2021), which professional investors, such as venture capitalists, take for granted.

This study will examine the four proxy variables for financial literacy. The first variable is investing in stock acquisition rights. If Japanese investors had adequate financial literacy, they would be more hesitant to invest in stock acquisition rights. At the very least, the probability of success should be lower than for campaigns involving common stock. In this study, we use the success rate of common stock campaigns as a proxy for individual investors' financial literacy.

H2-1: Campaigns with a common stock offering type are more likely to succeed (campaigns with stock acquisition rights have a lower success rate)

The second variable is an exit through an IPO. The capital strategy road map influences the decisions of investors (Guenther et al., 2018).

According to Ahlers et al. (2015), the success rate of campaigns targeting an IPO with an exit strategy is higher than campaigns targeting an M&A or a leveraged buyout (LBO). Prior to that, an IPO is almost the only means of exit for individual investors because the stock trading market for unlisted stocks in Japan is not well developed. In addition, if the business plan does not include an IPO date, IRR cannot be estimated. Therefore, projects that do not aim for an IPO must be avoided by individual investors. However, projects with ambiguous exit timing and methods have succeeded in raising funds in Japan's ECF. Japanese individual investors may invest without thinking about exit. Based on these considerations, we set up hypothesis H2-2:

H2-2: Campaigns of companies seeking to exit by IPO have a higher probability of success.

The third variable is sales in the final year of the business plan. Each company's business plan is presented in FUNDINNO's ECF in the form of three detailed financial tables. If individual investors had the literacy to read and comprehend this detailed table of numbers, they would adjust their investment decisions accordingly. Suppose, for instance, that there are two types of companies: company A, which is anticipated to experience significant revenue growth in the future, and company B, which is not anticipated to experience

significant growth in the future. Individual investors would favor firm A over firm B. Therefore, we formulate Hypothesis H2-3.

H2-3: The likelihood of a successful campaign increases in proportion to the final year's sales (natural logarithm) stated in the business plan.

Lastly, the fourth variable is IRR. Indeed, as Fujii et al. (2021) demonstrate, based on the information disclosed by the platform, Japanese common stock ECF projects can estimate IRR on an investment if the investee goes through an IPO. Such valuation skills are essential in start-up finance and will be used by financially literate individual investors. Therefore, we set up hypothesis H2-4.

H2-4: The higher the IRR, the more likely the campaign will be successful.

Issues in prior research

Prior research on factors influencing the success of ECF campaigns has analyzed which signals have the greatest impact on campaign success. The number of directors is a common factor influencing success, which studies in the UK, US, Australia, and Germany indicate as a positive correlation (Table 4). Additionally, "directors have received business education" and "being young entrepreneurs" are positively significant, according to previous research. The success of ECF campaigns is affected not only by the number of people but also by the characteristics of those whose directors are young, promising, and have business educations. Intellectual property correlated significantly positively in the UK, Australian, and Italian studies, but negatively in the US study. Previous studies have also reported significant correlations between receiving "grants" and having received "awards." This may be a sign to look for good firms among unlisted firms with a significant information asymmetry.

Typically, venture capitalists and business angels invest in geographically nearby businesses. However, the literature on ECF is divided into two groups: those that argue that distance is associated with campaign success and those that do not. Several studies also indicated that social networking contact is a success factor. In ECF, information asymmetry is resolved primarily through IT networks; thus, geographical proximity may be irrelevant in ECF. As mentioned previously, prior research has demonstrated several significant proxy variables that rely on signaling theory.

However, previous studies are skewed heavily toward cases in the UK and the US. The analysis of success factors for ECF fundraising in Asia, which has the second- and third-largest stock markets in the world, is very limited. Are the success factors of ECF in the East and West identical? Do different markets

have distinct ECF success factors? A multifaceted study is now required. This study aims to identify the universal factors that contribute to the success of ECF financing by analyzing data from Japan, which is commonly regarded as having distinctive characteristics from the West.

In fact, Japan's financial assets have characteristics not found in other countries. Table 5 shows the composition of financial assets held by households in Japan, the US, and Europe. Japanese households hold ¥2005 trillion in assets, of which 54.3% is in cash and deposits and only 14.7% is in stocks and mutual funds. This is only one-third of that in the US, where 52.4% of assets are invested in stocks and mutual funds, and only half of that in Europe, where 29.9% of assets are invested in stocks and mutual funds. In other words, Japanese individual investors are extremely risk averse compared to those in other countries.

Table 5. Households'financial asset composition

Country/Area and Household Financial Assets	Cash & Deposits	Stocks and Mutual Funds	Insurance, Pension, Others
Japan (14.85 trillion dollars)	54.3%	14.7%	31.0%
US (115.5 trillion dollars)	13.7%	52.4%	33.9%
Euro-Area (32 trillion dollars)	34.5%	29.9%	35.6%

Note: As of March 31, 2022. Compiled by the author from Bank of Japan statistical data.

On the contrary, ECF is one of the riskiest investments. Although previous studies have focused on relatively risk-taking countries, we believe that identifying success factors in a country like Japan, where many individual investors are extremely risk averse, will provide new insights. The Japanese government has been encouraging individuals to invest their idle cash and deposits, and the current study provides a glimpse into this goal. Our study also provides material for considering approaches to risk-averse individual investors in the US and Europe. Given these factors, the present study does not simply provide additional data from a single Asian country.

In addition, improving the financial literacy of individual investors who invest in ECF is essential for the future development of ECF. However, none of the previous campaign studies emphasized financial literacy. Prior studies have contributed to the analysis of what individual investors focus on in their equity crowdfunding, which is unquestionably important. However, individual investors may not actually focus on anything.

In Japan's ECF, two distinct "products," namely common stock and stock acquisition rights, are sold concurrently as if they were the same. Stock acquisition rights are such a complex product that even venture capitalists have difficulty valuing them. This type of ECF market is unique in Japan when compared to the

rest of the world. We have previously indicated that Japanese individual investors may not distinguish between common stock and stock acquisition rights and we emphasized the lack of financial literacy among individual investors (Fujii et al., 2021). However, a comprehensive empirical analysis that accounts for more variables remains an issue, which is addressed in this study.

DATA AND ANALYSIS METHODOLOGY

This study employs qualitative and quantitative data from campaigns on FUNDINNO, Japan's largest platform, which handles approximately 80% of ECF campaigns in the country. This study uses 217 campaigns from FUNDIINNO's first project from February 2017 to May 2021. An empirical analysis is conducted using the statistical model with the campaign data.

IRR estimation method used in this study is the same as that used by Fujii et al. (2021). Specifically, IRR is defined as the return "if the business performance progresses as planned and the company goes public" based on the business plan presented by each start-up. The IRR formula (1) is as follows: The estimated market capitalization at IPO is calculated by multiplying the expected net income by the actual price-to-earnings ratio (PER) of companies listed in that industry. The estimated market capitalization at the time of the IPO is determined by multiplying the expected net income by the industry's actual PER. The IRR is defined as the compound annual rate of return on the amount invested.

$$\textit{Estimated market capitalization at IPO } \times \textit{ shareholding ratio } = \textit{amount invested } x \, (1 + IRR)n \tag{1}$$

where n is the number of years between the investment and the IPO.

The investment amount is calculated as "the share price offered in each offering campaign × the number of shares". For convenience, this study assumes that one investor purchases all of the shares issued in the campaign. The shareholding ratio was calculated as "number of newly issued shares / (number of shares outstanding at the time of offering + number of newly issued shares + stock options)". The shareholding ratio was calculated by dividing the number of newly issued shares by (the number of shares issued at the time of the offering + the number of newly issued shares + stock options). Note that many start-ups raise equity financing following their subsequent growth stages, which dilutes their traditional shareholdings.

Table 6 summarizes the hypotheses tested in this study and their proxy variables.

Table 6. Proxy variables for hypotheses

Hypothesis	Attribute	Proxy variables	Explanation	Positive or negative
Explained variable Percentage raised Number of investors		Campaign Success or Failure	Whether the campaign was successful or not (success = 1, failure = 0)	
		Amount raised divided by the target amount		
		Number of investors who applied for the campaign		
Signaling hypothesis	Signals about Management	Number of directors	Number of board members	Positive
		Female founders dummy	Whether the founder is a woman (including if there are women in the founding group) (women = 1, men = 0)	Negative
	Signals about company fundamentals	Intellectual Property Dummy	Whether the company has any intellectual property (including pending applications) (Yes = 1, No = 0)	Positive
		Awards Dummy	Whether the campaign page mentions any awards (Yes = 1, No = 0)	Positive
		Product Releases Dummy	Whether the product or service has been released (Yes = 1, No = 0)	Positive
		B-to-C Business Dummy	Whether the business includes B-to-C (included = 1, not included = 0)	Positive
		Past equity CF Success Dummy	Whether the business has had equity CF in FUNDINNO in the past (Yes = 1, No = 0)	Positive
		Professional Investment Dummy	Whether the business has been funded by angel investors, VC, CVC, or business companies (Yes = 1, No = 0)	Positive
		Tax Incentives Dummy	Whether the campaign is eligible for angel taxation (eligible = 1, not eligible = 0)	Positive
Lack of Financial Literacy Hypothesis Exit by IPO dummy In Final Year Sales IRR		Common Stock Dummy	Stock acquisition rights = 0, common stock = 1	No correlation or negative
		Whether the company is aiming to exit through an IPO (aiming = 1, not aiming = 0)	No correlation or negative	
		Natural logarithm of sales in the last year of the business plan	No correlation or negative	
		Expected rate of return on investment in that campaign (Internal Rate of Return)	No correlation or negative	
Control variable Large city dummy Shareholder perks Dummy		Number of years since establishment	Number of years since establishment	
		Whether the company is located in Tokyo (Tokyo = 1, outside Tokyo = 0)		
		Whether the company has shareholder perks (Yes = 1, No = 0)		

Control variables

The variables of the number of years since establishment, location, and shareholder perks are control variables that are not directly related to the hypotheses but can affect the campaign's success or failure. Agency theory states that investors should invest in more local firms because it is easier to obtain information about firms and exercise voting rights in them. Meanwhile, ECF is said to alleviate some distance-related constraints, including monitoring business conditions, providing information, and gathering information (Agrawal et al., 2014).

Wilson and Testoni (2014) point out that, in addition to the geographical problem of monitoring, ECF is a one-time event for many investors, which increases the possibility of fraud. In theory, investors in start-ups should be in the neighborhood (Agrawal et al., 2011). This is because gathering information and monitoring progress are particularly important for investors, and the cost of these activities is determined by distance. However, the previous financing's reliance on geographic distance is not seen in ECF (Agrawal et al., 2011). However, Guenther et al. (2018) claimed that investors, including venture capitalists and business angels, are aware of geographic distance in ECF.

The system of shareholder perks allows shareholders to receive goods and services from the investing company. This is a unique Japanese system that has been shown to benefit individual investors in listed stocks (Nose et al., 2021) and may influence investment behavior in ECF.

Analysis method

This study first divides the qualitative data into success/failure dichotomies for the proxy variables that comprise the hypotheses, and then use a chi-square test to examine the composition ratio of each.

The quantitative data among the hypotheses' proxy variables are then tested for differences in means (t-test) and medians (Wilcoxon signed-rank test). Equation (2) is used to compute the difference.

Difference = mean/median in successful campaign – mean/median in unsuccessful campaign (2)

Subsequently, we perform a probit analysis with the explained variable being "success (1)/failure (0)" and the explanatory variable being a proxy variable for the hypothesis. We begin with a probit analysis, as described by Vulkan et al. (2016), Vismara (2019), Vismara, Benaroio and Carne (2017), Shafi

(2021), Blaseg et al. (2021), Piva and Rossi-Lamastra (2018), and others. The fundamental model (3) is as follows:

$$prob(y_i = 1) = \Phi(\gamma_0 + \sum_{j=1}^{k} \gamma_j x_{ij}) \qquad (3)$$

where Φ() is the cumulative distribution function of the standard normal distribution, and x_{ij} denotes the j_{th} variable supporting the success factor for campaign i.

We then also introduce the Logit model used by Horvát et al. (2018), Allison et al. (2017), Mamonov and Malaga (2018), and Guenther et al. (2018). The basic model equation is as follows.

$$P_i = P(y = 1|y_i) = \frac{1}{1+\exp(-y_i)} \qquad (4)$$

where yi takes the values 0 and 1, y = 1 is success, P is the probability of a successful campaign, i.e., y = 1 taking the values 0 and 1, and Pi is the probability of success for campaign i. The formula for yi is as follows.

$$y_i = \ln\frac{P_i}{1-P_i} = \beta_{i0} + \sum_{n=1}^{m} \beta_{in} \times x_{in} + \varepsilon \qquad (5)$$

In this case, x represents the hypothetical proxy or control variable, and denotes the error term.

Finally, to assess the robustness of the analysis results, multiple regression analysis was conducted. Based on previous studies, the explained variables are "funding rate" and "number of investors" (Vismara, 2016; Lukkarinen et al., 2016), whereas the explanatory variables are the proxy variables for hypotheses. The multiple regression analysis is performed as follows:

$$yi = \alpha_{i0} + \sum_{n=1}^{m} \beta_{in} \times \chi_{in} + \varepsilon \qquad (6)$$

where y is the "rate of fundraising" or "number of investors", i is the sample, α is the constant term, β is the coefficient of the hypothesis's explanatory variable, χ is the hypothesis's proxy variable, n is the n-th variable, and ε is the error term.

Table 7 summarizes the descriptive statistics for the qualitative data's proxy variables. Common stock and stock acquisition rights are the two types of ECF,

and the number of successes and failures for each is described. The presence/absence of each dummy variable indicates success/failure.

Table 7. Descriptive statistics (qualitative data)

	Common stock		Stock acquisition rights	
	Success	**Failure**	**Success**	**Failure**
Common Stock or Stock Acquisition Rights	129	41	35	12

	Yes		No	
	Success	**Failure**	**Success**	**Failure**
Female Founders	17	4	147	49
Intellectual Property	60	10	104	43
Awards	25	7	139	45
Product Releases	110	22	54	31
B2C Business	68	36	96	17
Past Equity CF Success	27	8	137	45
Professional Investment	83	24	81	29
Tax Incentives	63	13	100	40
Exit by IPO	150	45	14	8
Shareholder Perks	18	8	146	45
Large city	114	35	50	18

Table 8 shows the descriptive statistics of the quantitative data. The mean, standard deviation, maximum and minimum values of each variable by success/failure are described.

Table 8. Descriptive statistics (quantitative data)

Variables	Success					Failure				
	n	Mean	SD	Min	Max	n	Mean	SD	Min	Max
Percentage raised	164	225.4	97.2	94.5	445.5	53	57.0	27.2	8.0	111.2
Number of investors	164	218.2	111.0	46.0	591.0	53	58.2	46.2	13.0	286.0
Number of directors	164	2.5	1.4	1.0	7.0	53	1.8	0.9	1.0	4.0
ln final year sales	163	21.3	0.7	18.6	24.3	52	20.8	1.1	14.6	22.4
IRR	128	89.0	46.1	2.3	274.4	41	88.7	48.4	19.7	323.3
Number of years since establishment	164	6.5	6.1	0.8	43.7	53	6.9	6.9	0.5	37.2

The correlation coefficient table for each variable is shown in Table 9. Simply looking at the correlation between the campaign's success or failure and the variables, "ln Final Year Sales," "Product Releases," and "Number of Directors" had positive correlations of 0.25, 0.23, and 0.21, respectively, whereas "B2C Business" had a negative correlation of −0.23.

Table 9. Correlation matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Success or Failure	1.00																		
2. Percentage Raised	0.65***	1.00																	
3. Number of Investors	0.57***	0.74***	1.00																
4. Number of Directors	0.21***	0.13*	0.17**	1.00															
5. Female Founders	0.04	-0.02	-0.02	0.07	1.00														
6. Intellectual Property	0.16**	0.26***	0.27***	-0.02	0.04	1.00													
7. Awards	0.02	0.24***	0.21***	-0.02	-0.13*	0.32***	1.00												
8. Product Releases	0.23***	0.14*	0.01	-0.10	-0.02	0.13*	0.01	1.00											
9. B-to-C Business	-0.23***	-0.25***	-0.30***	-0.11	0.00	-0.23***	-0.09	0.00	1.00										
10. Past Equity CF Success	0.02	0.18**	0.11	0.21***	-0.06	0.07	0.13*	0.12	-0.09	1.00									
11. Professional Investment	0.05	0.13	0.13*	0.20***	0.08	0.11	0.03	0.04	-0.08	0.14*	1.00								
12. Tax Incentives	0.13	0.15*	0.00	0.16**	0.05	0.05	0.00	0.04	-0.03	0.25***	0.15*	1.00							
13. Common Stock	0.01	-0.02	0.00	0.15*	-0.09	-0.07	-0.03	-0.01	-0.06	0.20***	-0.31***	0.39***	1.00						
14. Exit by IPO	0.09	0.02	0.08	0.19**	-0.04	0.10	-0.12	0.07	-0.04	0.06	0.03	0.09	0.05	1.00					
15. ln final year sales	0.25***	0.18**	0.25***	0.02	0.00	-0.01	0.02	-0.02	-0.04	-0.02	0.01	-0.09	-0.03	0.17***	1.00				
16. IRR	0.00	-0.06	-0.06	-0.14*	0.09	0.05	-0.10	0.08	-0.04	-0.06	0.01	0.01	0.00	0.14*	0.14*	1.00			
17. Years Since Establishment	-0.03	-0.02	0.06	0.02	-0.03	0.09	0.12*	0.03	-0.16***	0.02	-0.01	-0.28***	0.10	0.04	0.04	-0.02	1.00		
18. Large Cities	0.03	-0.07	-0.02	0.06	-0.01	-0.13*	-0.17**	0.01	0.11	-0.08	0.05	-0.01	0.01	-0.03	0.13*	0.19**	-0.28***	1.00	
19. Shareholder Perks	-0.05	-0.05	-0.11	0.06	-0.12	-0.13*	0.01	0.01	0.21***	0.15*	-0.02	0.10	0.16**	-0.06	-0.04	-0.14*	-0.07	-0.06	1.00

Note: ***, **, * Significant at the 1%, 5%, and 10% level, respectively.

RESULTS

What makes an equity crowdfunding successful?

Table 10 displays the results of the chi-square test, which was used to determine whether the difference in proportions between the two groups was statistically significant in campaign success and failure. There was no significant difference in the success rate for equity and stock acquisition rights, which were 76% and 74%, respectively, for the proxy variable "type of offering." This finding implies that individual investors may make investment decisions without distinguishing between the riskiness of stocks and stock acquisition rights. The findings support the Lack of Financial Literacy Hypothesis.

A dummy variable difference test confirmed that the variables "Intellectual Property," "Product Releases," and "Tax Incentives" were significantly positively correlated with campaign success. These are proxies for signals about the offering firm's fundamentals. The fundraising may be successful because individual investors reacted positively to these signals. Conversely, "B2C Business" is significantly negatively correlated with campaign success at the 1% level. The management proxy variable "female founders" and the financial literacy proxy variable "Exit through IPO" were not significantly correlated.

We also conducted an analysis in which the sample was split into two for common stock and stock acquisition rights and each dummy variable was compared to the percentage of campaign successes or failures. However, given that no significant differences were found, the description was omitted.

Table 10. Chi-square test (qualitative data)

	Common stock		Stock acquisition rights		Pearson's Chi-square test		
	Success	Failure	Success	Failure	Chi-square	p-value	
Common Stock or Stock Acquisition Rights	76%	24%	74%	26%	0.04	0.84	
	Yes		No		Pearson's Chi-square test		
	Success	Failure	Success	Failure	Chi-square	p-value	
Female Founders	81%	19%	75%	25%	0.36	0.55	
Intellectual Property	86%	14%	71%	29%	5.75	0.02	**
Awards	78%	22%	76%	24%	0.10	0.75	
Product Releases	83%	17%	64%	36%	10.99	0.00	***
B-to-C Business	65%	35%	85%	15%	11.24	0.00	***
Past equity CF Success	77%	23%	75%	25%	0.06	0.81	
Professional Investment	78%	22%	74%	26%	0.46	0.50	
Tax Incentives	83%	17%	71%	29%	3.50	0.06	*
Exit by IPO	77%	23%	64%	36%	1.89	0.17	
Shareholder perks	69%	31%	76%	24%	0.64	0.42	
Large City	77%	23%	74%	26%	0.23	0.64	

Note: ***, **, * Significant at the 1%, 5%, and 10% level, respectively.

Table 11 shows the results of statistical tests of mean and median differences for quantitative variables, categorizing campaigns as successful or unsuccessful. At the 1% level, the number of directors is significantly higher in successful campaigns than in unsuccessful campaigns, indicating good management. Individual investors may prefer start-ups with a collective management structure over sole proprietors.

Table 11. Tests of difference (quantitative data)

	Success			Failure			Mean difference	t-value		Median difference	z-value	
	n	mean	median	n	mean	median						
Percentage raised	164	225.4	199.8	53	57.0	56.4	168.4	12.44	***	143.4	10.81	***
Number of investors	164	218.2	189.0	53	58.2	47.0	160.1	14.90	***	142.0	9.88	***
Number of directors	164	2.5	2.0	53	1.8	2.0	0.6	3.80	***	0.0	2.79	***
ln final year sales	163	21.4	21.3	52	20.8	20.9	0.5	3.84	***	0.4	3.41	***
IRR	128	89.0	84.2	41	88.7	80.0	0.2	0.03		4.3	0.19	
Years since establishment	164	6.5	5.3	53	6.9	4.9	−0.4	−0.45		0.4	−0.12	

Note: *** Significant at the 1% level.

For successful projects, final year sales, a proxy variable for the financial literacy hypothesis, are also significantly higher at the 1% level. This finding implies that individual investors are using financial literacy to decipher the detailed business-plan number tables disclosed in ECF. The expected rate of return, however, is not significantly different. We interpret their financial literacy as limited. We further conducted an analysis in which the sample was divided into common stock and stock acquisition rights, however, no significant differences were found.

Cross-section analysis

The results of the probit analysis with the success dummy as the explained variable and the proxy variables associated with the Signaling Hypothesis and Lack of Financial Literacy Hypothesis are presented in Table 12. Model (1)(2) is the foundation model. Campaign success is significantly correlated with the variables "Number of Directors," "Product Releases," "Tax Incentives," "Intellectual Property," and "ln Final year Sales." Individual investors may actively evaluate and invest in projects that have a collective management structure, a product that has already been released, Intellectual Property, and are deemed worthy of angel taxation by the government. Individual investors may also be reading the business plan and conducting due diligence on how large the start-up will grow. Meanwhile, B2C businesses are significantly negatively correlated with campaign success. Individual investors may avoid companies that are simple to understand.

Models (3) and (4) check for a proxy variable for the Lack of Financial Literacy Hypothesis and the Common Stock Dummy. In Japanese ECF, common stock projects and stock acquisition rights projects are mixed. Stock acquisition rights are a financial technique for professional investors with diversified investments. We have determined that stock acquisition rights are not suitable for individual investors.

Therefore, we assume that financially literate investors will avoid stock acquisition rights projects, and that their success rate will be lower than that of common stock projects (the success rate of common stock projects is significantly higher). In other words, if the "common stock dummy" is positively correlated with campaign success, Models (3) and (4) are consistent with the hypothesis. The coefficients, however, are not significantly related to campaign success. This implies that individual investors who participate in ECF may be investing "without regard" of whether the campaign is an offering of common stock or stock acquisition rights. The findings support the Hypothesis of Financial Illiteracy.

Model (5) shows the results of an additional test of the Lack of Financial Literacy Hypothesis by including the investment's "IRR" as an explanatory variable. Projects with a higher expected rate of return would have a higher success rate if individual investors used "valuation" literacy. Because the expected rate of return for stock acquisition rights projects cannot be estimated, this model is only estimated for common stock projects. As a result, we discovered that the "IRR" had no bearing on the project's success or failure. In addition, the variables "Exit by IPO," was not significant across all models in Table 12. Individual investors may assess the income statement of the business plan but not the exit plan. These findings support the Lack of Financial Literacy Hypothesis.

Table 12. Probit analysis with success dummy as explained variable

Dependent variable: Success dummy

Variables	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4	(5) Model 5
Number of directors	0.314***	0.319***	0.320***	0.322***	0.428***
	(0.110)	(0.106)	(0.111)	(0.106)	(0.137)
Female founders	0.324	0.250	0.314	0.242	−0.452
	(0.423)	(0.405)	(0.427)	(0.407)	(0.481)
Intellectual Property	0.303	0.438*	0.306	0.439*	
	(0.264)	(0.257)	(0.264)	(0.257)	
Awards	0.012	0.004	0.010	0.001	−0.158
	(0.333)	(0.334)	(0.335)	(0.335)	(0.366)
Product Releases	0.793***	0.774***	0.768***	0.761***	0.863***

Variables	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4	(5) Model 5
	(0.221)	(0.217)	(0.225)	(0.221)	(0.257)
B-to-C Business	−0.619***		−0.632***		−0.444*
	(0.232)		(0.233)		(0.259)
Past Equity CF Success	−0.397	−0.331	−0.374	−0.317	−0.436
	(0.328)	(0.320)	(0.331)	(0.323)	(0.347)
Professional Investment	−0.248	−0.241	−0.322	−0.279	−0.293
	(0.235)	(0.229)	(0.270)	(0.261)	(0.306)
Tax Incentives	0.456*	0.472*	0.532*	0.513*	0.533*
	(0.258)	(0.253)	(0.292)	(0.286)	(0.303)
Equity Dummy			−0.196	−0.102	-
			(0.350)	(0.336)	
Exit by IPO	−0.218	−0.278	−0.218	−0.279	−0.0659
	(0.360)	(0.359)	(0.362)	(0.359)	(0.428)
ln Final Year Sales	0.604***	0.573***	0.606***	0.573***	0.718***
	(0.171)	(0.165)	(0.172)	(0.166)	(0.217)
IRR					−0.002
					−0.003
Years since Establishment	−0.012	−0.005	−0.008	−0.003	−0.010
	(0.019)	(0.018)	(0.020)	(0.019)	(0.023)
Large Cities	0.028	0.002	0.061	0.018	−0.096
	(0.251)	(0.243)	(0.257)	(0.248)	(0.300)
Shareholder perks	−0.111	−0.281	−0.080	−0.268	−0.323
	(0.341)	(0.335)	(0.345)	(0.338)	(0.365)
Constant	−12.68***	−12.34***	−12.59***	−12.29***	−15.19***
	(3.572)	(3.460)	(3.589)	(3.469)	(4.441)
Observations	213	213	213	213	167
LR chi2 =	55.460	48.110	55.770	48.200	46.370
Prob > chi2 =	0.000	0.000	0.000	0.000	0.000
Log likelihood =	−89.514	−93.188	−89.355	−93.142	−68.751
Pseudo R2 =	0.237	0.205	0.238	0.206	0.252

Note: Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Robustness check

We conducted robustness tests to validate the dependability of our results. Table 13 displays the results of the logistic regression with the success dummy as the explained variable, and the proxy variables associated with the Signaling Hypothesis and the Lack of Financial Literacy Hypothesis as the explanatory variables. As shown in Table 12, Models (1) and (2) are the foundational models;

similar to the probit analysis outcomes, the variables "Number of Directors," "Product Releases," "Tax Incentives," "Intellectual Property," and "ln final year sales" are significantly positively correlated with campaign success. These indicators appear to affect the effectiveness of ECF campaigns. In this analysis, the coefficient for B2C transactions is also significantly negative at the 1% level in this analysis as well.

Models (3) and (4) are models established to check the "common stock dummy," which is a proxy variable for the Lack of Financial Literacy Hypothesis. Model (5) shows the results of an additional test of the Lack of Financial Literacy Hypothesis by adding the "IRR" of the investment as an explanatory variable.

These results indicate that specific variables consistently support the "Signaling Hypothesis" As firm fundamentals, the specific variables are "number of directors," "product releases," "tax incentives," and "Intellectual Property." On the other hand, proxy variables other than "ln Final year sales" were not significant, as shown in Table 12, and the "Lack of Financial Literacy Hypothesis" was supported throughout the research.

Table 13. Logistic analysis with success dummy as explained variable

Dependent variable: Success dummy

Variables	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4	(5) Model 5
Number of directors	0.554***	0.560***	0.566***	0.568***	0.751***
	(0.195)	(0.186)	(0.197)	(0.188)	(0.243)
Female founders	0.518	0.419	0.488	0.384	−0.901
	(0.767)	(0.748)	(0.767)	(0.750)	(0.825)
Intellectual Property	0.647	0.861*	0.648	0.866*	
	(0.482)	(0.475)	(0.483)	(0.476)	
Awards	−0.0246	−0.0679	−0.0293	−0.0793	−0.284
	(0.577)	(0.581)	(0.580)	(0.583)	(0.632)
Product Releases	1.371***	1.329***	1.330***	1.302***	1.481***
	(0.390)	(0.384)	(0.398)	(0.390)	(0.454)
B-to-C Business	−1.064***		−1.078***		−0.821*
	(0.409)		(0.411)		(0.457)
Past Equity CF Success	−0.697	−0.612	−0.653	−0.580	−0.770
	(0.573)	(0.549)	(0.578)	(0.554)	(0.598)
Professional Investment	−0.379	−0.381	−0.512	−0.471	−0.470
	(0.410)	(0.401)	(0.482)	(0.469)	(0.558)
Tax Incentives	0.812*	0.830*	0.942*	0.921*	0.974*
	(0.458)	(0.450)	(0.518)	(0.511)	(0.541)
Equity Dummy			−0.328	−0.226	-
			(0.616)	(0.598)	

Variables	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4	(5) Model 5
Exit by IPO	−0.396	−0.488	−0.403	−0.498	−0.189
	(0.612)	(0.608)	(0.616)	(0.611)	(0.731)
ln Final Year Sales	1.017***	0.990***	1.029***	0.999***	1.206***
	(0.298)	(0.290)	(0.301)	(0.293)	(0.380)
IRR					−0.00306
					(0.00499)
Years since Establishment	−0.0207	−0.00863	−0.0146	−0.00418	−0.0126
	(0.0321)	(0.0323)	(0.0341)	(0.0344)	(0.0421)
Large Cities	0.0308	−0.0324	0.0797	−0.00101	−0.141
	(0.447)	(0.431)	(0.455)	(0.438)	(0.521)
Shareholder perks	−0.241	−0.530	−0.194	−0.500	−0.583
	(0.572)	(0.549)	(0.578)	(0.555)	(0.613)
Constant	−21.37***	−21.35***	−21.41***	−21.41***	−25.49***
	(6.207)	(6.050)	(6.242)	(6.082)	(7.764)
Observations	**213**	**213**	**213**	**213**	**167**
LR chi2 =	55.650	48.530	55.940	48.670	46.100
Prob > chi2 =					
Log likelihood =	−89.414	−92.970	−89.271	−92.904	−68.935
Pseudo R2 =	0.237	0.207	0.239	0.208	0.250

Note: Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The results of a multiple regression analysis with the procurement rate (amount raised/solicited) as the explained variable and the proxy variables for the hypotheses as explanatory variables are shown in Table 14. The results show a positive correlation at the 1% level for "ln Final Year Sales," at the 5% level for "Intellectual Property," "Product Releases," and "Awards Received," and at the 10% level for "Number of Directors" and "Tax Incentives." "B2C Business" is negative and significant at the 1% level. The results are largely consistent with Tables 12 and 13. The only difference is that in Table 14 Model 1, the coefficient of awards received is significantly positive at the 5% level. Although any start-up seeking funding should aim for a successful campaign, it appears that "winning awards" is important in order to obtain more funding.

Model 2 depicts the results of including "IRR" as an explanatory variable in order to test the Lack of Financial Literacy Hypothesis further. As the IRR cannot be estimated for stock acquisition rights projects, the sample in model (2) is limited to common stock projects. The analysis results show that the "IRR" and "Exit by IPO" are not significant. Individual investors lack the financial literacy of "valuation." Other results were generally consistent with Tables 12, 13, and

Table 14 Model 1. A study on reward-based crowdfunding conducted by Pinkow (2022) showed that factors affecting project success/failure differ from those affecting fundraising rate (overfunding). In Japanese ECF, project success/failure and fundraising rate are expected to be affected by almost the same factors.

Table 14. Multiple regression analysis with funding rate (amount raised/amount offered) as the explained variable

Dependent variable: Percentage raised (amount raised/amount offered)

Variables	Model 1				Model 2			
	Estimated value	Standard error	t-value		Estimated value	Standard error	t-value	
Number of directors	10.77	5.84	1.84	*	12.32	6.19	1.99	**
Female founders	−12.47	25.03	−0.5		−48.25	29.07	−1.66	*
Intellectual Property	34.38	16.7	2.06	**	31.18	17.49	1.78	*
Awards	49.43	21.67	2.28	**				
Product Releases	31.37	14.83	2.12	**	38.77	16.04	2.42	**
B-to-C Business	−40.16	15.05	−2.67	***	−28.93	16.61	−1.74	*
Professional Investment	9.03	16.29	0.55		−2.48	18.17	−0.14	
Tax Incentives	31.36	18.5	1.69	*	41.96	18.66	2.25	**
Equity Dummy	−10.61	22.05	−0.48					
Exit by IPO	−25.43	24.79	−1.03		−7.21	28.91	−0.25	
In Final Year Sales	26.91	8.35	3.22	***	31.77	11.92	2.66	***
IRR					−0.21	0.18	−1.19	
Years since Establishment	−1.18	1.3	−0.91		−0.27	1.41	−0.19	
Large Cities	−16.59	16.53	−1					
Shareholder perks	−6.2	23.63	−0.26		−8.68	24.18	−0.36	
Intercept	−392.52	175.8	−2.23	**	−523.74	245.57	−2.13	**
N	213				167			
adjusted R-squared	0.170				0.138			

Note: ***, **, * Significant at the 1%, 5%, and 10% level, respectively.

Table 15 Model 3 displays the findings of a multiple regression analysis using the same explanatory variables as in Table 14, with the number of investors who invested in ECF as the explained variable. The "Number of Directors" and "Intellectual Property" are positively correlated at the 5% level, whereas "Awards Received" is positively correlated at the 10% level. "B2C Business" shows a negative and significant correlation at the 1% level. We obtain results that are generally consistent with the results of our previous analyses when we change the combination of explanatory variables.

Table 15. Results of multiple regression analysis with number of investors as explained variable

Dependent variable: number of investors

Variables	Model 3				Model 4			
	Estimated value	Standard error	t-value		Estimated value	Standard error	t-value	
Number of directors	13.24	6.34	2.09	**	14.40	6.79	2.12	**
Female founders	−11.26	26.92	−0.42		−50.19	31.11	−1.61	
Intellectual Property	45.05	17.95	2.51	**	32.11	18.74	1.71	*
Awards	41.91	23.46	1.79	*				
Product Releases	−1.67	16.14	−0.1					
B-to-C Business	−49.74	16.21	−3.07	***	−33.41	17.83	−1.87	*
Past Equity CF Success	10.02	22.6	0.44		13.89	22.28	0.62	
Professional Investment	20.71	17.71	1.17		13.71	19.67	0.70	
Tax Incentives	−14.49	20.02	−0.72		−6.94	20.24	−0.34	
Equity Dummy	9.42	23.98	0.39					
Exit by IPO	0.42	26.65	0.02		−5.37	30.91	−0.17	
ln Final Year Sales	32.43	8.98	3.61	***	45.85	12.73	3.60	***
IRR					−0.23	0.19	−1.22	
Years since Establishment	−0.66	1.39	−0.47		−0.76	1.55	−0.49	
Large Cities	−3.74	17.82	−0.21		−1.32	19.73	−0.07	
Shareholder perks	−17.2	25.62	−0.67		−28.68	26.10	−1.10	
Intercept	−539.44	189.01	−2.85	***	−787.36	261.64	−3.01	**
N	213				167			
adjusted R-squared	0.231				0.140			

Note: ***, **, * Significant at the 1%, 5%, and 10% level, respectively.

Model 4 depicts the results of including "IRR" as an explanatory variable to test the Lack of Financial Literacy Hypothesis further. The analysis results show that the "IRR" and "Exit by IPO" are not significant. On the contrary, "In final year sales" is significant at the 1% level in both Models (3) and (4). These results suggest that individual investors are literate enough to check the business plans disclosed by start-ups to some extent (due diligence). However, they can be considered to lack the financial literacy to estimate the return on their investments (valuation) at the time of exit.

The results of the above analysis revealed the following. To begin, the "Signaling Hypothesis" is consistently supported in certain variables, including the number of directors (positive), Intellectual Property (positive), product releases (positive), awards received (weakly positive), and B2C Business

(negative). Individual investors are expected to view these signals positively (negatively).

The findings supported the hypothesis of a lack of financial literacy. Individual investors in Japanese ECF, according to the study, do not consider whether a project is common stock or stock acquisition rights, which is a critical factor in investment decisions. In addition, unlike professional investors, individual investors do not appear to calculate the IRR (valuation). Sales in the final year of the business plan disclosed in ECF projects, on the other hand, consistently demonstrated significant positive correlations with each of the variables: project success or failure, funding rate, and number of investors. This suggests that, to a lesser extent, individual investors check business plans. That is to say, we interpret that their financial literacy is limited.

Finally, to summarize our analysis, we present Table 16, which adds our empirical results to the right-hand side of Table 6.

Table 16. Research hypotheses and results of this study

Hypothesis	Attribute	Proxy Variables	Explanation	Positive or Negative	Result
Signaling hypothesis	Signals about Management	Number of directors	Number of board members	Positive	Supported
		Female founders dummy	Whether the founder is a woman (including if there are women in the founding group) (women = 1, men = 0)	Negative	Not supported
	Signals about company fundamentals	Intellectual Property Dummy	Whether the company has any intellectual property (including pending applications) (Yes = 1, No = 0)	Positive	Supported
		Awards Dummy	Whether the campaign page mentions any awards (Yes = 1, No = 0)	Positive	Weak Supported
		Product Releases Dummy	Whether the product or service has been released (Yes = 1, No = 0)	Positive	Supported
		B-to-C Business Dummy	Whether the business includes B-to-C (included = 1, not included = 0)	Positive	Negatively Supported
		Past equity CF Success Dummy	Whether the business has had equity CF in FUNDINNO in the past (Yes = 1, No = 0)	Positive	Not Supported
		Professional Investment Dummy	Whether the business has been funded by angel investors, VC, CVC, or business companies (Yes = 1, No = 0)	Positive	Not Supported
		Tax Incentives Dummy	Whether the campaign is eligible for angel taxation (eligible = 1, not eligible = 0)	Positive	Supported

Hypothesis	Attribute	Proxy Variables	Explanation	Positive or Negative	Result
Lack of Financial Literacy Hypothesis Exit by IPO dummy ln Final Year Sales IRR		Common Stock Dummy	Stock acquisition rights = 0, common stock = 1	No correlation or negative	Supported
		Whether the company is aiming to exit through an IPO (aiming = 1, not aiming = 0)	No correlation or negative	Supported	
		Natural logarithm of sales in the last year of the business plan	No correlation or negative	Not Supported	
		Expected rate of return on investment in that campaign (Internal Rate of Return)	No correlation or negative	Supported	

CONCLUSIONS

This study analyzed the factors that lead to successful ECF fundraising for companies that raised funds between 2017 and 2021 on the Japanese ECF platform FUNDINNO. The "Signaling Hypothesis" and the "Lack of Financial Literacy Hypothesis" were tested. After various analyses, we found that the "Number of Directors" is an effective indicator of management. In terms of start-up fundamentals, investors appear to accept the signals "Intellectual Property," "Product Releases," and "Tax Incentives" Awards had an effect on the size of the final funding round. In contrast, B2C companies signaled negatively to private investors; entrepreneurs running ECF campaigns with B2C companies must signal to compensate for the disadvantages.

The results of this study are generally consistent with those of previous studies in Europe and the US. Japanese individual investors differ from their Western counterparts, as they are more risk-averse. However, when investing in ECF campaigns, they focused on the same points and received signals from companies to invest.

The proxy variable "ln final year sales" was not supported concerning the Lack of Financial Literacy Hypothesis. We can infer that individual investors are financially literate to the extent that they perform due diligence. However, since "IRR," "common stock dummy," and "Exit by IPO" are uncorrelated, Japanese individual investors make investment decisions without checking an IPO schedule in business plans and estimating the IRR of their investments. Given their disinterest in investment valuations, stock acquisition rights projects have been just as successful as common stock projects.

We can therefore conclude that Japanese individual investors do not demonstrate financial literacy in "valuation" that is, whether the investment is profitable or not. Thus, the financial literacy utilized by individual investors in the Japanese ECF can be considered limited.

Through this paper's analysis, we have demonstrated which signals investors in Japan's ECF campaigns respond to. These guidelines will be helpful for start-ups planning ECF campaigns in the future.

We were able to point out the lack of financial literacy of individual investors participating in ECF. As Fujii et al. (2021) pointed out; ECF is a win-win FINTECH for both individual investors and start-ups if it is properly utilized in the future. However, if investment decisions are made without evidence by those who lack financial literacy, the current boom will eventually subside, and the financing environment for Japanese start-ups will rapidly deteriorate back to its previous state. Therefore, the financial literacy of individual investors in Japan must be improved for the future growth of the equity capital market. This paper is intended to be a contribution to the discussion. In addition, the lack of financial literacy may not be limited to the Japanese. ECF research worldwide has so far focused on the search for success signals. Their findings call for entrepreneurs to send out higher quality signals. Conversely, our findings indicate that no matter how high quality the signals are, investors may not understand them. The focus on financial literacy has just begun, and we hope that our research framework will be widely used in the future.

This study leaves several issues unresolved. In particular, the history of ECF in Japan is still young, and we have not been able to collect enough campaign data to verify the results. Future campaign-data collection must be expanded to enhance the accuracy of the empirical analysis. This study has only revealed a few of the factors that contribute to successful fundraising in Japanese ECF. Therefore, continued and extensive verification will be required in the future.

Acknowledgments

References

Agrawal, A., Catalini, C., & Goldfarb, A. (2011). *The geography of crowdfunding.* NBER Working Paper, No. 16820, National Bureau of Economic Research, Cambridge, MA. https://doi.org/10.3386/w16820

Agrawal, A., Catalini, C., & Goldfarb, A. (2014). Some simple economics of crowdfunding. *Innovation Policy and the Economy, 14*(1), 63-97. https://doi.org/10.1086/674021

Ahlers, G. K., Cumming, D., Günther, C., & Schweizer, D. (2015). Signaling in equity crowdfunding. *Entrepreneurship Theory and Practice, 39*(4), 955-980. https://doi.org/10.1111/etap.12157

Allison, T. H., Davis, B. C., Webb, J. W., & Short, J. C. (2017). Persuasion in crowdfunding: An elaboration likelihood model of crowdfunding performance. *Journal of Business Venturing, 32*(6), 707-725. https://doi.org/10.1016/j.jbusvent.2017.09.002

Aprilia, L., & Wibowo, S. S. (2017). The impact of social capital on crowdfunding performance. *The South East Asian Journal of Management*, *11*(1), 3. https://doi.org/10.21002/seam.v11i1.7737

Blaseg, D., Cumming, D., & Koetter, M. (2021). Equity crowdfunding: High-quality or low-quality entrepreneurs? *Entrepreneurship Theory and Practice, 45*(3), 505-530. https://doi.org/10.1177/1042258719899427

Bruton, G., Khavul, S., Siegel, D., & Wright, M. (2015). New financial alternatives in seeding entrepreneurship: Microfinance, crowdfunding, and peer-to-peer innovations. *Entrepreneurship Theory and Practice, 39*(1), 9-26. https://doi.org/10.1111/etap.12143

Collins, L., & Pierrakis, Y. (2012). *The venture crowd: Crowdfunding equity investments into business*. London, United Kingdom: Nesta.

Cumming, D., Meoli, M., & Vismara, S. (2021). Does equity crowdfunding democratize entrepreneurial finance? *Small Business Economics*, 56, 533-552. https://doi.org/10.1007/s11187-019-00188-z

Cumming, D. J., Vanacker, T., & Zahra, S. A. (2021). Equity crowdfunding and governance: Toward an integrative model and research agenda. *Academy of Management Perspectives, 35*(1), 69-95. https://doi.org/10.5465/amp.2017.0208

Dehghani, M., Piwowar-Sulej, K., Salari, E., Leone, D., & Habibollah, F. (2023). The role of trust and e-WOM in the crowdfunding participation: The case of equity crowdfunding platforms in financial services in Iran. *International Journal of Emerging Markets*(ahead-of-print). https://doi.org/10.1108/IJOEM-09-2021-1358

Drover, W., Busenitz, L., Matusik, S., Townsend, D., Anglin, A., & Dushnitsky, G. (2017). A review and road map of entrepreneurial equity financing research: Venture capital, corporate venture capital, angel investment, crowdfunding, and accelerators. *Journal of Management, 43*(6), 1820-1853. https://doi.org/10.1177/0149206317690584

El Hajj, M. C., Chidiac, M., & Awdeh, A. (2022). Entrepreneurs signaling: Promoting equity crowdfunding in Lebanon. *Journal of Economic and Administrative Sciences* (ahead-of-print). https://doi.org/10.1108/JEAS-12-2021-0249

Fajarini, C., Dalimunthe, Z., & Haikal, S. (2021). What information needed to present in a fundraising campaign through equity crowdfunding. *Indonesian Capital Market Review, 13*(2), 94-103. http://dx.doi.org/10.2139/ssrn.3923526

Fujii, M., Hosomi, C., & Nose, Y. (2021). Equity crowdfunding and financial literacy of individual investors in Japan. *Journal of Capital Markets Studies*, *5*(1), 5-27. https://doi.org/10.1108/JCMS-03-2021-0007

Gaudecker, H.-M. V. (2015). How does household portfolio diversification vary with financial literacy and financial advice? *The Journal of Finance, 70*(2), 489-507. https://doi.org/10.1111/jofi.12231

Goethner, M., Hornuf, L., & Regner, T. (2021). Protecting investors in equity crowdfunding: An empirical analysis of the small investor protection act. *Technological Forecasting and Social Change, 162*, 120352. https://doi.org/10.1016/j.techfore.2020.120352

Goethner, M., Luettig, S., & Regner, T. (2021). Crowdinvesting in entrepreneurial projects: Disentangling patterns of investor behavior. *Small Business Economics*, *57*, 905-926. https://doi.org/10.1007/s11187-020-00332-0

Guenther, C., Johan, S., & Schweizer, D. (2018). Is the crowd sensitive to distance?—How investment decisions differ by investor type. *Small Business Economics, 50*(2), 289-305. https://doi.org/10.1007/s11187-016-9834-6

Hellmann, T., Mostipan, I., & Vulkan, N. (2019). Be careful what you ask for: Fundraising strategies in equity crowdfunding. Retrieved from *SSRN Electronic Journal*. http://dx.doi.org/10.2139/ssrn.3448596

Hornuf, L., & Neuenkirch, M. (2016). Pricing shares in equity crowdfunding. *Small Business Economics, 48*(4), 795-811. https://doi.org/10.1007/s11187-016-9807-9

Hornuf, L., & Schmitt, M. (2016). Success and failure in equity crowdfunding. *CESifo DICE Report, 14*(2), 16-22. Retrieved from https://www.ifo.de/DocDL/dice-report-2016-2-hornuf-schmitt-june.pdf

Horvát, E.-Á., Wachs, J., Wang, R., & Hannák, A. (2018). The role of novelty in securing investors for equity crowdfunding campaigns. *Proceedings of the AAAI Conference on Human Computation and Crowdsourcing, 6*(1), 50-59. https://doi.org/10.1609/hcomp.v6i1.13336

Ivanov, V., & Knyazeva, A. (2017). US securities-based crowdfunding under Title III of the JOBS Act. *SEC White paper*. Retieved from https://www.sec.gov/files/regcf_whitepaper.pdf

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

Mamonov, S., & Malaga, R. (2018). Success factors in Title III equity crowdfunding in the United States. *Electronic Commerce Research and Applications, 27*, 65-73. https://doi.org/10.1016/j.elerap.2017.12.001

Mamonov, S., Malaga, R., & Rosenblum, J. (2017). An exploratory analysis of Title II equity crowdfunding success. *Venture Capital, 19*(3), 239-256. https://doi.org/10.1080/13691066.2017.1302062

Matsuo, J. (2017). New developments in equity crowdfunding. *Shoken Report,* (1704), 1-20. (In Japanese).

Matsuo, J. (2018). Expanding Japanese equity crowdfunding. *Shoken Report,* (1707), 11-36. (In Japanese).

Meoli, M., & Vismara, S. (2021). Information manipulation in equity crowdfunding markets. *Journal of Corporate Finance, 67,* 101866. https://doi.org/10.1016/j.jcorpfin.2020.101866

Mintjes, D. (2016). *The role of financial literacy on portfolio diversification in peer-to-peer lending*. Working Paper. Retrieved from https://thesis.eur.nl/pub/36801/Mintjes-D.-431825-.pdf

Mochkabadi, K., & Volkmann, C. K. (2018). Equity crowdfunding: A systematic review of the literature. *Small Business Economics, 54*(1), 75-118. https://doi.org/10.1007/s11187-018-0081-x

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

Nose, Y., Miyagawa, H., & Ito, A. (2021). How do firms attract the attention of individual investors? Shareholder perks and financial visibility. *Journal of Behavioral and Experimental Finance, 31*, 100520. https://doi.org/10.1016/j.jbef.2021.100520

Pinkow, F. (2022). The impact of common success factors on overfunding in reward-based crowdfunding: An explorative study and avenues for future research. *Journal of Entrepreneurship, Management and Innovation*, *18*(1), 131-167. https://doi.org/10.7341/20221815

Piva, E., & Rossi-Lamastra, C. (2018). Human capital signals and entrepreneurs' success in equity crowdfunding. *Small Business Economics, 51*(3), 667-686. https://doi.org/10.1007/s11187-017-9950-y

Ralcheva, A., & Roosenboom, P. (2016). On the road to success in equity crowdfunding. Retrieved from *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2727742

Ralcheva, A., & Roosenboom, P. (2020). Forecasting success in equity crowdfunding. *Small Business Economics, 55*, 39-56. https://doi.org/10.1007/s11187-019-00144-x

Shafi, K. (2021). Investors' evaluation criteria in equity crowdfunding. *Small Business Economics, 56*(1), 3-37. https://doi.org/10.1007/s11187-019-00227-9

Signori, A., & Vismara, S. (2016). Returns on investments in equity crowdfunding. Retrieved from *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2765488

Spence, M. (1978). Job market signaling. In *Uncertainty in Economics* (pp. 281-306). Amsterdam, Netherlands: Academic Press.

Surowiecki, J. (2005). *The wisdom of crowds.* New York, NY: Anchor.

Vismara, S. (2016). Equity retention and social network theory in equity crowdfunding. *Small Business Economics, 46*(4), 579-590. https://doi.org/10.1007/s11187-016-9710-4

Vismara, S. (2018). Information cascades among investors in equity crowdfunding. *Entrepreneurship Theory and Practice, 42*(3), 467-497. https://doi.org/10.1111/etap.12261

Vismara, S. (2019). Sustainability in equity crowdfunding. *Technological Forecasting and Social Change, 141*, 98-106. https://doi.org/10.1016/j.techfore.2018.07.014

Vismara, S., Benaroio, D., & Carne, F. (2017). Gender in entrepreneurial finance: Matching investors and entrepreneurs in equity crowdfunding. In *Gender and Entrepreneurial Activity.* Cheltenham, United Kingdom: Edward Elgar Publishing. https://doi.org/10.4337/9781785364747.00015

Vulkan, N., Åstebro, T., & Sierra, M. F. (2016). Equity crowdfunding: A new phenomena. *Journal of Business Venturing Insights, 5*, 37-49. https://doi.org/10.1016/j.jbvi.2016.02.001

Wang, W., Mahmood, A., Sismeiro, C., & Vulkan, N. (2019). The evolution of equity crowdfunding: Insights from co-investments of angels and the crowd. *Research Policy, 48*(8), 103727. https://doi.org/10.1016/j.respol.2019.01.003

Wasiuzzaman, S., & Suhili, N. F. (2023). Examination of the success drivers of equity crowdfunding campaigns in Malaysia. *Journal of Entrepreneurship in Emerging Economies*, *15*(2), 425-446. https://doi.org/10.1108/JEEE-04-2021-0134

Wilson, K. E., & Testoni, M. (2014). Improving the role of equity crowdfunding in Europe's capital markets. Retrieved from *SSRN Electronic Journal.* http://dx.doi.org/10.2139/ssrn.2502280

Abstrakt

CEL: *Pierwszym celem tego badania jest identyfikacja czynników, które przyczyniają się do sukcesu kampanii finansowania społecznościowego (ECF) w Japonii. Zbadaliśmy, co decyduje o sukcesie kampanii, korzystając z danych z 217 kampanii przeprowadzonych na FUNDINNO, największej japońskiej platformie ECF, w okresie od lutego 2017 r. do maja 2021 r. Drugim celem jest ocena wiedzy finansowej indywidualnych inwestorów na podstawie sukcesu lub porażki kampanii ECF. To badanie jest wyjątkowe, ponieważ koncentruje się na różnicach w metodach finansowania, a także na treści biznesplanów ujawnianych w kampaniach ECF. W Japonii kampania dotycząca akcji zwykłych i praw do nabycia akcji jest prowadzona na tej samej platformie ECF, tak jakby dotyczyły tego samego rodzaju finansowania. Akcje zwykłe i prawa do nabycia akcji są różnie traktowane przez inwestorów venture capital i innych profesjonalnych inwestorów. Porównując sukces lub porażkę dwóch japońskich projektów, możemy ocenić wiedzę finansową poszczególnych inwestorów po uwzględnieniu sygnałów projektu. **METODYKA:** Zbadano „hipotezę sygnalizacji" i „hipotezę braku wiedzy finansowej". Dziewięć i cztery zmienne zostały ustawione jako zmienne zastępcze odpowiednio dla hipotezy sygnalizacyjnej i hipotezy braku umiejętności finansowych. To badanie najpierw dzieli dane jakościowe na dychotomie sukces/porażka dla zmiennych zastępczych składających się na hipotezy, a następnie wykorzystuje test chi-kwadrat do zbadania stosunku składu każdej z nich. Dane ilościowe wśród zmiennych zastępczych hipotez są następnie testowane pod kątem różnic w średnich (test t) i medianach (test rang ze znakiem Wilcoxona). Następnie przeprowadzamy analizę probitową, gdzie zmienną objaśnianą jest „sukces (1)/porażka (0)", a zmienną objaśniającą jest zmienną zastępczą dla hipotezy. Rozpoczynamy od ana-*

lizy probitowej, a następnie wprowadzamy model Logit. Na koniec przeprowadzana jest analiza regresji wielokrotnej ze zmiennymi objaśnianymi „stopa pozyskiwania funduszy" i „liczba inwestorów" oraz hipotetycznymi zmiennymi zastępczymi jako zmiennymi objaśniającymi. **WYNIKI:** *Stwierdziliśmy, że „liczba dyrektorów" jest skutecznym wskaźnikiem zdolności zarządczych sukcesu ECF. Jeśli chodzi o fundamenty start-upów, inwestorzy wydają się akceptować sygnały „własność intelektualna", „wydanie produktu" i „zachęty podatkowe". Nagrody wpłynęły na wielkość ostatniej rundy finansowania. Z kolei firmy B2C negatywnie sygnalizowały inwestorom prywatnym. Zmienna zastępcza „w sprzedaży w ostatnim roku" została poparta w związku z brakiem hipotezy dotyczącej znajomości finansów. Można założyć, że inwestorzy indywidualni posiadają wiedzę finansową, jeśli przeprowadzą due diligence. Ponieważ jednak „oczekiwana stopa zwrotu (wewnętrzna stopa zwrotu, dalej w skrócie IRR)" i „akcje zwykłe" nie są ze sobą skorelowane, możemy stwierdzić, że nie wykazują one wiedzy finansowej w zakresie „wyceny", ani tego, czy inwestycja jest opłacalna. Tym samym wiedzę finansową inwestorów indywidualnych w zakresie japońskich ECF można uznać za ograniczoną.* **IMPLIKACJE:** *Wykazaliśmy, na jakie sygnały reagują inwestorzy w japońskich kampaniach ECF. Te wskazówki będą przydatne dla przyszłych start-upów planujących kampanie ECF. Udało nam się zidentyfikować brak wiedzy finansowej wśród inwestorów indywidualnych ECF. Dlatego, aby japoński rynek kapitału akcyjnego rozwijał się w przyszłości, należy poprawić wiedzę finansową inwestorów indywidualnych.* **ORYGINALNOŚĆ I WARTOŚĆ:** *Dzięki bardzo ograniczonej analizie w Azji, gdzie znajdują się drugie i trzecie co do wielkości giełdy na świecie, zidentyfikowaliśmy czynniki stojące za sukcesem japońskich ECF. Zidentyfikowanie czynników sukcesu w kraju takim jak Japonia, gdzie wielu inwestorów indywidualnych wykazuje skrajną awersję do ryzyka, dostarczy nowych informacji. Porównując powodzenie lub porażkę dwóch typów japońskich projektów ECF (projektów typu common equity i praw do nabycia akcji), mogliśmy sprawdzić wiedzę finansową indywidualnych inwestorów, biorąc pod uwagę sygnały projektu.*

Słowa kluczowe*: crowdfunding udziałowy, wiedza finansowa, teoria sygnalizacji, inwestorzy indywidualni, IRR, umiejętność zarządzania, inwestorzy, rynek kapitałowy, czynniki sukcesu, ryzyko*

Biographical notes

Yoshiaki Nose is a professor of finance at the Graduate school of business, Doshisha University (Doshisha Business School), Japan. His area of expertise is empirical analysis of corporate finance. In recent years, he has focused on payouts, mergers and acquisitions, and entrepreneurial finance.

Chie Hosomi is a member of Doshisha Business School Network, the alumni organization of Doshisha Business School. She is also a manager of FUJIFILM Business Expert Corporation.

Authorship contribution statement

Yoshiaki Nose: Conceptualization, Funding Acquisition, Methodology, Project Administration, Validation, Writing – Original Draft, Writing – Review & Editing. **Chie Hosomi:** Data Curation, Formal Analysis, Software, Visualization, Writing – Original Draft.

Conflicts of interest

The authors declare no conflict of interest.

Citation (APA Style)

Nose, Y., & Hosomi , C. (2023). What makes equity crowdfunding successful in Japan? Testing the signaling and lack of financial literacy hypotheses. *Journal of Entrepreneurship, Management, and Innovation*, *19*(4), 146-183. https://doi.org/10.7341/20231945

ESG performance and dividend stability of the world's largest enterprises

Agnieszka Matuszewska-Pierzynka[1] iD
Urszula Mrzygłód[2] iD *, Aleksandra Pieloch-Babiarz[3]* iD

Abstract

PURPOSE: *Theoretical and empirical research on corporate sustainability focuses on the relationship between environmental, social, and governance (ESG) performance and profitability or market value; little attention is given to describing their effect on dividend policy. Therefore, the main purpose of this paper is to address the research gap by identifying the relationship between corporate sustainability performance and the stability of dividend payouts. To achieve this goal, we formulated a general research hypothesis that there is a positive link between an enterprise's ESG performance and its propensity to pay stable dividends. This research hypothesis is operationalized by the following five specific hypotheses: (1) the link between the overall ESG score and the propensity to pay stable dividends is positive; (2) the link between the environmental pillar score and the propensity to pay stable dividends is positive; (3) the link between the social pillar score and the propensity to pay stable dividends is positive; (4) the link between the governance pillar score and the propensity to pay stable dividends is positive; (5) the link between the ESG controversies score and the propensity to pay stable dividends is positive.* **METHODOLOGY:** *The hypothesis was empirically verified using a logistic regression model among the world's largest non-financial enterprises listed in the Global 500 of 2021 for the years 2012–2021. The specifications of the general model include sustainability variables such as environmental, social, and governance pillar scores, as well as the ESG controversies score, which measures an enterprise's exposure to environmental, social, and governance controversies and negative events reflected in global media. The financial ratios, such as a return on assets, current ratio, and*

1   Agnieszka Matuszewska-Pierzynka, Assistant Professor, Department of International Business and Trade, Faculty of Economics and Sociology, University of Lodz, P.O.W. St. 3/5, Lodz, 90-255, Poland, e-mail: agnieszka.matuszewska@uni.lodz.pl (ORCID: https://orcid.org/0000-0003-4130-1494), corresponding author.
2   Urszula Mrzygłód, Assistant Professor, Department of Sustainable Market Processes, Faculty of Economics, University of Gdansk, Jana Bażyńskiego St. 8, Gdańsk, 80-309, Poland, e-mail: urszula.mrzyglod@ug.edu.pl (ORCID: https://orcid.org/0000-0003-4130-1494).
3   Aleksandra Pieloch-Babiarz, Assistant Professor, Department of International Finance and Investment, Faculty of Economics and Sociology, University of Lodz, P.O.W. St. 3/5, Lodz, 90-255, Poland, e-mail: aleksandra.pieloch@uni.lodz.pl (ORCID: https://orcid.org/0000-0001-7885-1284).

*debt-to-equity ratio, are considered control variables in the model specifications. The research was extended by implementing descriptive statistics and Pearson correlation coefficients. All required financial and sustainability data were retrieved from the London Stock Exchange Group (LSEG) Eikon database. **FINDINGS:** The results of the estimation revealed that: (1) the effect of integrated ESG activities on payout stability is statistically significant and negative only in model specifications without the ESG controversies; (2) the effect of the environmental dimension is statistically significant and negative only when other particular ESG pillars are not considered; (3) the effect of the social dimension is statistically significant and negative, only when the governance dimension and the ESG controversies are not considered together in the same model specification; (4) the effect of the governance dimension is statistically significant and positive only if other particular pillars are considered together in one model specification, both with and without the ESG controversies; (5) the effect of the ESG controversies is statistically significant and positive in each model specification. Therefore, the general research hypothesis cannot be confirmed because only the fifth specific research hypothesis can be positively verified in all model specifications. **IMPLICATIONS**: Further research should be conducted on the relationship between corporate sustainability performance and dividend policy. It should consider not only commonly applied ESG scores but also the ESG controversies score, which was statistically significant in this research. Governments and international organizations should cooperate with companies that provide ESG data to make ESG scores, including the ESG controversies score, publicly available to all stakeholder groups, which would help to reduce the information gap. Managers should pay more attention to increasing the visibility of ESG initiatives from the perspective of risk, which they allow to avoid controversies in particular corporate sustainability dimensions. **ORIGINALITY AND VALUE:** The value added of this paper is that it investigates the relationship between ESG performance and payout policy, which was not thoroughly explored in previous studies, especially in the context of an enterprise's controversial ESG activities. To fill the research gap in the literature, the authors incorporated the ESG controversies score as an independent variable in the model specifications, which is a novelty in research on dividend policy.*
Keywords: dividend policy, dividend stability, ESG scores, ESG controversies score, global enterprises, ESG performance

INTRODUCTION

Corporate sustainability means creating long-term value for an enterprise's direct and indirect stakeholders by meeting their current and future expectations (Dyllick & Hockerts, 2002; Giovannoni & Fabietti, 2013; Sanders & Wood, 2015; World Commission on Environment and Development [WCED], 1987). Theoretical research on corporate sustainability focuses on building a holistic business model to explain the general mechanisms of transforming an enterprise's environmental, social, and governance (ESG) efforts into the satisfaction of various stakeholder groups (e.g., shareholders, employees, customers, suppliers, local communities)

and corporate financial performance (Perrini et al., 2011; Kantabutra & Ketprapakorn, 2020). Perrini et al. (2011) presented a multilevel framework for the relationship between corporate sustainability performance and corporate financial performance. In it, integrated socially responsible activities in certain management areas, like internal organization, customers, supply chains, society, the natural environment, and corporate governance, can influence revenues and costs by affecting stakeholder performance drivers. These drivers include employee satisfaction, customer trust, reputation, innovativeness, and reliability. Kantabutra and Ketprapakorn (2020) explained that when members of an enterprise who are deeply involved in achieving its mission implement corporate sustainability rules, it improves corporate sustainability performance in economic, environmental, social, and governance dimensions. This increases the satisfaction of stakeholders and enhances firm reputation and brand equity. Both these guides to the link of corporate sustainability with an enterprise's financial performance are based on the Triple Bottom Line model created by Elkington (1997) and modified by others (Jonker & Witte, 2006; Oželienė, 2017), where the crucial issue is to maintain a balance between economic prosperity, social equality and environmental quality under the rules of good governance, being recognized as the fourth dimension of corporate sustainability (United Nations [UN], 2012).

By contrast, empirical research aims to identify a statistically significant relationship between corporate sustainability performance and corporate financial performance, i.e. profitability or market value (Ziegleret al., 2007; Wagner, 2010; Soana, 2011; Barnett & Salomon, 2012; Nolletet al., 2016; Tuppuraet al., 2016; Xiao et al., 2018; Nizam et al., 2019; Jha & Rangarajan, 2020; Behl et al., 2022; Douissa & Azrak, 2022). The previous empirical research on the relationship between corporate sustainability performance and corporate financial performance referred rather indirectly to an enterprise's individual stakeholder groups, which are beneficiaries of corporate sustainability. Additionally, the consideration of shareholders is not comprehensive as researchers mainly focus on the effect of ESG scores on the share value and less on the dividend payout. As a result, this field of research is still not sufficiently explored.

To the best of our knowledge, few empirical papers describe the results of research on the impact of ESG scores on the level of dividend (Mihancea et al., 2021) or its stability (Benlemlih, 2019; Matos, et al., 2020; Dahiya, et al., 2023). The link between corporate sustainability performance and dividend policy can be explained against the background of fundamental theories of enterprises, such as signaling theory, agency theory, and stakeholder theory. On the one hand, as Matos et al. (2020) suggest, enterprises with high ESG scores have a greater propensity to pay greater dividends to avoid overinvesting in sustainable initiatives and to deal with agency problems (Jensen & Meckling, 1976). On the other hand,

a high dividend level, which is related to higher ESG scores, sends a positive signal to the market (Bhattacharya, 1979) and shows that financing ESG activities for particular stakeholder groups does not harm an enterprise's profitability (Stubbs & Rogers, 2013). Enterprises aim to smooth out dividends and still pay them out when profitability decreases, which signals their good financial standing and high future performance (Lin & Lee, 2021; Huang et al., 2022).

Therefore, this paper addresses the research gap by identifying the relationship between corporate sustainability performance and dividend payout stability. Following the findings of Matos et al. (2020) and Benlemlih (2019) regarding the impact of ESG scores on dividend policy and the fundamental theories of enterprises, a research hypothesis was formulated that posits a positive link between an enterprise's ESG performance and its propensity to pay stable dividends. The general research hypothesis is operationalized by the following five specific hypotheses: (1) the link between the overall ESG score and the propensity to pay stable dividends is positive; (2) the link between the environmental pillar score and the propensity to pay stable dividends is positive; (3) the link between the social pillar score and the propensity to pay stable dividends is positive; (4) the link between the governance pillar score and the propensity to pay stable dividends is positive; (5) the link between the ESG controversies score and the propensity to pay stable dividends is positive. These hypotheses were empirically verified using a logistic regression model among the world's largest non-financial enterprises listed in the Global 500 of 2021 for the years 2012–2021.

The originality of the research relates to the inclusion of the ESG controversies score, which measures an enterprise's exposure to ESG controversies and negative events reflected in global media, and has not been widely used (Casey et al., 2020). In other words, the ESG controversies score can be crucial for shareholders as an important risk measure of ESG dimensions of corporate sustainability within a specific enterprise, they may consider investing in. Considering the ESG controversies score in empirical research is a novelty, which is the authors' contribution to the literature, as it extends the previous studies on dividend payouts in relation to ESG performance with a new analytical perspective. The descriptive statistics and the Pearson correlation coefficients have also been analyzed. All required financial and sustainability data were retrieved from the London Stock Exchange Group (*LSEG*) *Eikon* (formerly *Refinitiv*) database.

The paper is structured as follows. Section 1 describes the current literature concerning the relationship between corporate sustainability performance and dividend policy. Section 2 explains the research methodology, providing descriptions of the variables and model specifications. The next section presents and discusses the main results of the empirical research. The last section contains the most salient findings and final conclusions.

LITERATURE REVIEW

Payout policy is one of the most important elements of the long-term financing of enterprises. Enterprises embrace diverse dividend payment strategies, each exhibiting a distinct level of variability. This paper focuses on a dividend policy strategy in which an entity maintains a stable dividends-to-earnings ratio over time, which is referred to as a stable payout ratio. Maintaining this ratio at a constant level implies that a company adheres to a stable profit-sharing principle with shareholders and safeguards its growth potential (Matos et al., 2020).

A company's sustainability efforts are another key area where value distribution occurs. As such, corporate sustainability involves generating long-term value for an enterprise's various stakeholder groups (Dyllick & Hockerts, 2002; Sanders & Wood, 2015). Indeed, the significance of corporate policies in restoring sustainability in the world economy has led to increased interest from market regulators and the public. As a result, there has been a growing focus on studies within corporate finance that investigate corporate social responsibility (CSR) and environmental, social and governance (ESG) practices on various factors, such as market value, cost of capital, and risk measures (Gillan, Koch, & Starks, 2021). Still, the relationship between dividend policy and CSR/ESG has not been thoroughly investigated.

This relationship can be explained using basic theories of enterprises, such as agency, signaling, and stakeholder theories. Agency theory proposes that separating company ownership and management results in information asymmetry between agents (managers) and shareholders (Jensen & Meckling 1976). The arising conflicting interests are more pronounced in companies with substantial free cash flow, which enables managers to overinvest, potentially reducing shareholder value (Jensen, 1986).

Overinvestment is also possible in responsible and sustainable corporate initiatives. As Barnea and Rubin (2010) found, corporate insiders, including managers, may pursue CSR expenditures beyond the point of maximizing firm value because they gain personal benefits, such as enhanced reputation, and a selfish pleasure – the "warm-glow" feeling (Andreoni 1990). Barnea and Rubin (2010) discovered that managers' incentive to overinvest in social practices is mitigated by insiders' ownership and leverage. While the former underscores the significance of costs held by insiders associated with such practices, the latter captures the external monitoring mechanism. Additionally, Brown, Helland and Smith (2006) confirmed that agency costs help explain corporate charitable practices.

Following Jensen and Meckling (1976), Easterbrook (1984), and Jensen (1986), agency costs can be effectively addressed by dividend payments that constrain the availability of free cash flow, which might otherwise be exploited

by self-interested managers. Hence, payout policy can significantly influence decisions and function as a monitoring mechanism (Easterbrook, 1984). Consequently, cash-abundant companies should increase dividend payments to prevent overinvestment in ESG initiatives. However, following Rozeff (1982), increasing dividends forces companies to seek external financing, which increases the transaction costs of external financing. In other words, increasing dividends relative to earnings (payout ratio) generates more external financing. While companies want to obtain this financing on favorable terms, they need to reveal additional information on their financial condition (Lloyd, Jahera, & Page, 1985).

In the second theoretical approach, informational asymmetries also play a significant role in explaining corporate payouts. Dividends thus serve as a positive signal from a company, helping investors assess a company's profitability, value (Bhattacharya 1979) and prospects. Conversely, information on ESG initiatives may also be relevant for outsiders, as it reveals the quality of the company's operations (Huang 2022), offers an additional monitoring tool (Hendijani Zadeh 2021) and enhances the company's reputation (Benlemlih 2019). In this respect, the predictions of signaling theory are not clear-cut. On the one hand, signals from ESG practices and dividends may act as substitutes, as highlighted by Ellili's (2022) research review. This suggests that deeper engagement in ESG actions is inversely related to dividends. On the other hand, Benlemlih (2019) mentioned the importance of balancing the interests of shareholders and non-financial stakeholders. Consequently, socially responsible companies that uphold a favorable dividend policy signal to markets that they also consider shareholder interests (Benlemlih 2019; Matos et al. 2020).

This perspective aligns closely with stakeholder theory (Freeman et al., 2004; Freeman et al., 2010), which asserts that managers' obligations surpass the goal of maximizing shareholder value. The criticism of stakeholder theory is centered on its perceived deficiency in providing clear guidelines for navigating trade-offs among competing stakeholder interests, which may result in higher agency costs (Jensen, 2002). The proponents of this theory contend that managers should be more aware of how value is actually created and manage the interests of all stakeholders, including shareholders (Freeman et al., 2010). Furthermore, managers should fairly distribute wealth among those who contribute to its creation (Gallo, 2004; Samet & Jarbouri, 2017). Applying that statement to payout policies, fair distribution may imply a decrease in dividends for shareholders (Matos et al., 2020). An opposing viewpoint states that as companies are expected to act responsibly and sustainably, not only in the eyes of society but also for creditors, investors, and policymakers, adopting a more responsible approach may result in preferential treatment. For instance, it could reduce financing costs and free up the company's available cash flow for dividend payments (Matos et al., 2020). However, prior research provides mixed evidence

on how the debt market values corporate responsible actions (Menz, 2010; Attig et al., 2013; Oikonomou et al., 2014).

More significantly, stakeholder theory embraces a long-term perspective that diverges from framing the issue of wealth distribution as a zero-sum game among stakeholders. As Freeman et al. (2010) mentioned, stakeholders form a network that optimizes value over the long term. Consequently, dividend policies should center on the long-term horizon. Furthermore, while the concept of dividend policy stability can be interpreted in various ways, as seen in Matos et al. (2020) and Benlemlih (2019), in our study, stability signifies that a consistent dividend payout is maintained. From the standpoint of stakeholder theory, upholding such a ratio, while potentially challenging in the short run, provides an anchor for harmonizing the interests of diverse stakeholder groups. Thus, companies intensely engaged in ESG and CSR endeavors may be better positioned to maintain a steady payout ratio.

This paper empirically examines the relationship between ESG scores and dividend payouts in a sample of the world's largest enterprises. Compared to corporate governance, ESG indicators consider environmental and social factors in addition to governance itself. From this perspective, using ESG rankings in research provides a much more comprehensive characterization of responsible enterprises' activities. Compared to the extensive literature on dividends, few studies examine the relationship between CSR/ESG and payout policy.

Overall, irrespective of geographical context, most previous studies confirm that enterprises that engage more strongly in social responsibility activities tend to have more generous payout policies. Specifically, the finding that higher CSR/ESG ratings correspond to higher dividend payouts has been supported by cross-country studies encompassing entities covered by global indices (Hendijani Zadeh, 2021), European enterprises (Samet & Jarbouri, 2017; Bilyay-Erdogan et al., 2023; Zahid et al., 2023), as well as single-country studies on enterprises originating in the US (Cheung, Hu, & Schwiebert, 2018; Benlemlih, 2019), France (Salah & Amar, 2022), India (Dahiya et al., 2023), Korea (Kim & Kim, 2022), and Malaysia (Badru & Qasem, 2021). Thus, these studies confirm a positive relationship between ESG measures and dividend payments, even in emerging markets. It can be inferred that enhancing the quality of companies' environmental, social and governance initiatives is also beneficial to their shareholders.

The results of prior research are not free from heterogeneity, however. Saeed and Zamir (2021) confirmed that higher CSR reporting and disclosures are associated with lower dividend growth and payout ratios. Their study was conducted on enterprises from seven countries, encompassing both emerging and developed economies. Additionally, Lakhal et al. (2023) suggested a negative link between ESG dimensions and dividend growth, but a positive link between ESG dimensions and dividend payout. A study by Sheikh et al. (2020) compared

family and non-family-controlled enterprises and found that a greater number of CSR activities increases the propensity to pay dividends but reduces the dividend payout in dividend-paying firms. Conversely, in family firms, a greater number of CSR activities decreases the propensity to pay dividends but increases the dividend payout in dividend-paying firms. Niccolò, Battisti, Papa, and Miglietta (2020) found that the overall ESG score and its governance and environmental components are linked to lower payouts in Chinese companies. These diverse findings highlight the need for further research and show the significance of empirical approaches to the outcomes.

In addition to studies based on general ESG ratings, the literature also includes research analyzing specific dimensions of ESG. Ellili (2022) suggested that when environmental, social, and governance scores are considered together in one regression, they do not have a significant impact on the dividend payout ratio. However, when individual scores are analyzed separately in three different models, the impact of social disclosure is positive. Benlemlih (2019) identified that five components of CSR, namely community, diversity, employee relations, environment, and corporate governance, are associated with high dividend payouts. Similarly, Cheung et al. (2018) revealed that CSR scores related to community relations, corporate governance, and diversity positively correlate with dividends. However, the environmental dimension and product safety show a contrasting relationship. Additionally, Hendijani Zadeh (2021) found that transparency, in terms of both environmental and social factors, is associated with higher payouts, including higher cash payouts and higher stock repurchase payouts. Meanwhile, Salah and Amar (2022) found that only the environmental dimension has no effect on the dividend policy. This result is explained by the high costs of environmental investment that enterprises aspiring for higher environmental ratings must cover. Furthermore, Lakhal et al.'s (2023) recent cross-country study showed that nine dimensions of environmental, social, and governance pillars are linked to dividend payout. Taken together, these findings highlight the significance of specific ESG measures in understanding the relationship between ESG and dividend payments.

Few studies have specifically examined the relationship between an enterprise's responsible practices and dividend stability. Benlemlih (2019) argued that socially responsible firms have more stable dividend payouts than socially irresponsible firms. Responsible firms adjust dividends at a slower pace, indicating a higher level of stability in their dividend policy. The same finding was confirmed by Hendijani Zadeh (2021) for the environmental and social transparency of enterprises. By contrast, Zahid et al. (2023) confirmed that higher ESG scores are associated with lower dividend growth. This finding can also be interpreted as maintaining a stable dividend policy.

Dahiya et al. (2023) revealed that socially responsible enterprises adjust their dividends quicker, suggesting that they can revert to their target dividends more quickly than their counterparts. Furthermore, Matos et al. (2020) showed that higher ESG scores coincide with a more stable dividend payout. Their study employed three measures of dividend stability, and the payout range of 2% was statistically significant for the overall ESG score and its environmental and governance dimensions. Overall, these findings suggest that enterprises with strong, responsible practices and higher ESG scores tend to exhibit greater dividend stability, indicating a long-term commitment to shareholders and sustainable business practices.

Finally, only a few studies have paid more attention to the ESG controversies component, which is disregarded in most dividend studies. Although Casey et al. (2020) presumed that more controversial enterprises are more prone to conduct less stable dividends, the controversy score does not seem strongly related to dividends within the IT industry (Casey et al., 2020). By contrast, Benlemih (2019) and Bilyay-Erdogan et al. (2023) demonstrated that being involved more in controversial practices is associated with lower dividend payments. Indeed, Benlemih (2019) confirms the significance of controversial military and alcohol practices, whereas Bilyay-Erdogan et al. (2023) validate the overall ESG controversies score for the level of enterprise dividends.

In conclusion, the authors of this paper were motivated to conduct their own research in the field due to the limited number of empirical studies on the relationship between sustainability performance (CSP) and enterprises' dividend policies. The existing studies, such as those by Bruna & Lahouel (2022) and Lu & Taylor (2016), yield ambiguous results, partly for methodological reasons. In the empirical research described here, the researchers focus on the corporate sustainability performance only in environmental, social and governance dimensions (ESG scores), ignoring mostly the ESG controversies. The identification of this research gap became the basis for including the ESG controversies score as an explanatory variable in the proposed model specifications, along with other commonly employed ESG scores. This holistic approach may be useful for various stakeholders in reducing the information gap. In our paper, we want to verify if changes in all ESG scores are linked to stable dividend payments, defined as stable dividend payouts. In consequence, our general hypothesis is formulated as follows:

H: The link between ESG performance and propensity to pay stable dividends is positive.

The general research hypothesis is operationalized by the following five specific hypotheses:

HS1: The link between the overall ESG score and the propensity to pay stable dividends is positive.

HS2: The link between the environmental pillar score and the propensity to pay stable dividends is positive.

HS3: The link between the social pillar score and the propensity to pay stable dividends is positive.

HS4: The link between the governance pillar score and the propensity to pay stable dividends is positive.

HS5: The link between the ESG controversies score and the propensity to pay stable dividends is positive.

The literature on the determinants of dividend payments is extensive and examines various fundamental factors that describe a company's financial condition (Dewasiri et al., 2019; Benlemlih, 2019; Siladjaja & Anwar, 2020; Lin & Lee, 2021; Huang et al., 2022), especially in terms of liquidity (Bilyay-Erdogan et al., 2023), financing structure (Aivazian et al. 2003; Michael, 2013; Chang, Kang, & Li, 2016; Adjaoud & Hermassi, 2017; Benlemlih, 2019), size (Denis & Osobov, 2008; Matos et al., 2020), and age (Benlemlih, 2019). Another stream of the literature is built upon the assumption that the institutional environment in which an enterprise operates can influence internal decisions regarding the payout policy (Aivazian et al., 2003; La Porta et al., 2000). Thus, this stream of research emphasizes the importance of the legal system, the extent of shareholder protection, and corporate governance rules (Aivazian et al., 2003; La Porta et al., 2000; Bilyay-Erdogan et al., 2023; Saeed & Zamir, 2021), which can also affect the link between sustainability performance and dividend policy (Yilmaz et al., 2022). Empirical evidence supports the view that stronger corporate governance is positively linked to dividends (Mitton, 2004; Sawicki, 2009), whereas poor governance practices are not only met with sharp criticism, but also considered an essential premise that leads to economic crises (Sawicki, 2009).

RESEARCH METHODS

The research hypotheses were verified using data from 2012–2021 of the world's largest non-financial enterprises listed in the Global 500 of 2021. The world's largest enterprises were chosen for the research sample because they are continuously assessed by the financial market and analysts in every dimension of corporate sustainability, so their ESG ratings have been estimated for many years and are not accidental. Additionally, these enterprises must transform their financial and innovative potential into ESG initiatives to balance environmental deterioration and social inequality, for which they are responsible

(Gray, 2010). Therefore, these enterprises should be regarded as global leaders, not followers, both in terms of competitive market position and the level of corporate sustainability.

Initially, 265 enterprises were qualified for the research sample, but 29 were not found in the *LSEG Eikon* database, which was the source of all required financial and sustainability data (accessed July 9, 2022). The research sample consists of entities listed in the Global 500 of 2021, which means that some enterprises ranked in this list over the research period could stop to be listed in the Global 500 of 2021 so they are not included in this research. Twenty-eight enterprises were excluded from the sample:

- eight did not reveal data on their corporate sustainability performance;
- three did not have data for the whole ten-year period;
- thirty-seven had incomplete data for each year of the research period.

Finally, the research hypothesis was verified on a sample of 188 of the largest enterprises in the world. The sample was dominated by US enterprises (28%, which is 30% of the total observations) and enterprises from the energy sector (20%, which is 17% of the total observations) (see Tables 1 and 2).To investigate the relationship between the sustainability performance of the world's largest enterprises, in particular, their controversial ESG activities and the propensity to pay stable dividends, data for the 188 enterprises were collected for a ten-year period. This yielded 1,511 firm-year observations, of which only 3% indicated a lack of dividend payments.

Table 1. Characteristics of the research sample by country

Country	Enterprises		Observations	
	Number	Share [%]	Number	Share [%]
Australia	2	1.064	18	1.191
Belgium	1	0.532	7	0.463
Brazil	3	1.596	13	0.860
Britain	14	7.447	104	6.883
Canada	2	1.064	17	1.125
China	9	4.787	59	3.905
Denmark	1	0.532	6	0.397
Finland	1	0.532	2	0.132
France	14	7.447	114	7.545
Germany	13	6.915	99	6.552
India	4	2.128	35	2.316

Country	Enterprises		Observations	
	Number	Share [%]	Number	Share [%]
Ireland	2	1.064	18	1.191
Italy	2	1.064	16	1.059
Japan	36	19.149	301	19.921
Luxembourg	1	0.532	2	0.132
Malaysia	1	0.532	8	0.529
Mexico	1	0.532	9	0.596
Netherlands	3	1.596	26	1.721
Norway	1	0.532	6	0.397
Russia	2	1.064	16	1.059
Singapore	1	0.532	10	0.662
South Korea	6	3.191	51	3.375
Spain	3	1.596	15	0.993
Sweden	2	1.064	17	1.125
Switzerland	5	2.660	35	2.316
Taiwan	3	1.596	29	1.919
Thailand	1	0.532	9	0.596
Turkey	1	0.532	10	0.662
U.S.	53	28.191	459	30.377
Total	188	100.000	1,511	100.000

Source: Own elaboration based on information from the *LSEG Eikon* database.

Table 2. Characteristics of the research sample by sector

Sector	Enterprises		Observations	
	Number	Share [%]	Number	Share [%]
Aerospace & Defense	7	3.723	61	4.037
Apparel	2	1.064	12	0.794
Business Services	1	0.532	10	0.662
Chemicals	4	2.128	37	2.449
Energy	37	19.681	253	16.744
Engineering & Construction	6	3.191	47	3.111
Food & Drug Stores	7	3.723	60	3.971
Food, Beverages & Tobacco	11	5.851	95	6.287
Health Care	17	9.043	145	9.596
Household Products	3	1.596	30	1.985
Industries	8	4.255	72	4.765

Sector	Enterprises		Observations	
	Number	Share [%]	Number	Share [%]
Materials	10	5.319	56	3.706
Media	2	1.064	19	1.257
Motor Vehicles & Parts	24	12.766	204	13.501
Retailing	6	3.191	55	3.640
Technology	20	10.638	164	10.854
Telecommunications	12	6.383	100	6.618
Transportation	3	1.596	25	1.655
Wholesalers	8	4.255	66	4.368

Source: Own elaboration based on information from the *LSEG Eikon* database.

The panel approach was not applied primarily due to the highly unbalanced nature of the panel data, which reduces the validity of individual effects – both fixed and random. The general logistic regression model is as follows:

$$logit\ P = ln\frac{P\big(Stability_{i,t} = 1\big)}{1 - P\big(Stability_{i,t} = 1\big)}$$

$$logit\ P = \alpha_0 + \alpha_1 Return_{i,t-1} + \alpha_2 Liquidity_{i,t-1} + \alpha_3 Debt_{i,t-1} + \alpha_4 Growth_{i,t-1} + \alpha_5 Size_{i,t-1} + \alpha_6 Country_{i,t} + \beta \boldsymbol{X}_{i,t-1} \tag{1}$$

where:

Stability$_{i,t}$ is a binary variable equal to 1 if the enterprise has a stable dividend policy, defined as a change of the dividend payout ratio (ΔDPR) of the *i*-th enterprise between year *t* and year *t*-1, which is in the range of -2 to 2 percentage points, and 0 otherwise. This interpretation of dividend stability is consistent with the literature (Matos et al., 2020). DPR in year *t* is determined as the relationship between the dividend paid in year *t+1* and net earnings in year *t*;

P(*Stability*$_{i,t}$ = 1) is a conditional probability of obtaining the value of 1 by the dependent variable for the given values of the explanatory variables;

Return$_{i,t-1}$ is a return on assets of the *i*-th enterprise in year *t*-1 – the return on assets is calculated as the relation of net profit to total assets;

Liquidity$_{i,t-1}$ means the current ratio of the *i*-th enterprise in year *t*-1 – the current ratio is calculated as the relation of current assets to current liabilities;

Debt$_{i,t-1}$ stands for the leverage ratio of the *i*-th enterprise in year *t*-1 – the leverage ratio is calculated as the relation of total debt to total equity;

Growth$_{i,t-1}$ means the growth opportunities measured by the market-to-book value ratio of the *i*-th enterprise in year *t*-1 (Samet & Jarbouri, 2017; Cheung et al., 2018; Matos et al., 2020; Sheikh et al., 2020; Saeed & Zamir, 2021; Kim & Kim, 2022);

$Size_{i,t-1}$ stands for the size of the enterprise calculated as the natural logarithm of total assets of the i-th enterprise in year *t*-1;

$Country_{i,t}$ is a binary variable equal to 1 if the country of origin of the *i*-th enterprise is a developed country in year *t*, and 0 otherwise. The distinction between developed and developing countries follows the WEO Database of the International Monetary Fund;

X is a vector of sustainability performance, which covers one-year lagged sustainability scores of the enterprises (*ESG_Score, E_Score, S_Score, G_Score and CONT_Score*);

$ESG\_Score_{i,t-1}$ is the overall sustainability score of the *i*-th enterprise in year *t*-1. It is calculated based on information about environmental, social, and governance dimensions of sustainability;

$E\_Score_{i,t-1}$ is the environmental pillar score of the *i*-th enterprise in year *t*-1;

$S\_Score_{i,t-1}$ is the social pillar score of the *i*-th enterprise in year *t*-1;

$G\_Score_{i,t-1}$ is the governance pillar score of the *i*-th enterprise in year *t*-1;

$CONT\_Score_{i,t-1}$ is the ESG controversies score of the i-th enterprise in year *t*-1.

Table 3 describes the sustainability variables in detail. The sustainability scores (i.e., both the overall sustainability score and the individual sustainability pillar scores) take values from 0 to 100. They should be interpreted according to the following scale: <0;25) – poor score, <25;50) – satisfactory score, <50;75) – good score, <75;100) – excellent score. The ESG controversies score also ranges from 0 to 100; enterprises with no controversies receive a score of 100.

Table 3. Characteristics of the sustainability variables used in the logistic regression models

Variable	Measure	Description
ESG_ Score	Environmental, social, and governance score	The overall sustainability score, which is the sum of weighted scores in environmental, social, and governance pillars – the weights depend on the sector in which the enterprise operates.
E_Score	Environmental pillar score	The indicator, which measures an enterprise's effectiveness in avoiding environmental risk and taking advantage of environmental opportunities – it measures the enterprise's impact on natural systems (i.e., the air, land and water) and complete ecosystems (resource use, emissions, innovations).
S_Score	Social pillar score	The indicator, which measures an enterprise's reputation and its ability to inspire the trust and loyalty of employees, customers, and society. – it measures the status of an enterprise's license to operate (workforce, human rights, product responsibility).
G_Score	Governance pillar score	The indicator, which measures an enterprise's capacity to manage and control its corporate rights and obligations – it measures the internal systems and processes that make the board members and executives act in the best interests of its long-term stakeholders (management, shareholders, and CSR responsibility).

Variable	Measure	Description
CONT_ Score	Environmental, social and governance controversies score	The indicator, which measures an enterprise's exposure to environmental, social, and governance controversies and negative events reflected in global media.

Source: Own elaboration based on information from the *LSEG Eikon* database.

Taking into consideration the general logit model, eleven model specifications are proposed and estimated (see Table 4). They differ from one another by the vector **X**, which consists of various sustainability scores. Model specifications 1–5 include basic ESG scores (both the overall sustainability score and the environmental, social and governance pillar scores), while specifications 6–11 also incorporate the ESG controversies score. The general logit model covers financial variables that are commonly used in research on dividend payouts (Emeka, 2020).

The study is supplemented by an analysis of descriptive statistics and correlations using the Pearson correlation coefficient. All necessary calculations were made with the *Gretl* statistical package.

Table 4. The general logit model specifications

No.	Model specifications
(1)	$logit\ P = \alpha_0 + \alpha_1 Return_{i,t-1} + \alpha_2 Liquidity_{i,t-1} + \alpha_3 Debt_{i,t-1} + \alpha_4 Growth_{i,t-1} + \alpha_5 Size_{i,t-1} + \alpha_6 Country_{i,t} + \beta_1 ESG\_Score_{i,t-1}$
(2)	$logit\ P = \alpha_0 + \alpha_1 Return_{i,t-1} + \alpha_2 Liquidity_{i,t-1} + \alpha_3 Debt_{i,t-1} + \alpha_4 Growth_{i,t-1} + \alpha_5 Size_{i,t-1} + \alpha_6 Country_{i,t} + \beta_1 E\_Score_{i,t-1}$
(3)	$logit\ P = \alpha_0 + \alpha_1 Return_{i,t-1} + \alpha_2 Liquidity_{i,t-1} + \alpha_3 Debt_{i,t-1} + \alpha_4 Growth_{i,t-1} + \alpha_5 Size_{i,t-1} + \alpha_6 Country_{i,t} + \beta_1 S\_Score_{i,t-1}$
(4)	$logit\ P = \alpha_0 + \alpha_1 Return_{i,t-1} + \alpha_2 Liquidity_{i,t-1} + \alpha_3 Debt_{i,t-1} + \alpha_4 Growth_{i,t-1} + \alpha_5 Size_{i,t-1} + \alpha_6 Country_{i,t} + \beta_1 G\_Score_{i,t-1}$
(5)	$logit\ P = \alpha_0 + \alpha_1 Return_{i,t-1} + \alpha_2 Liquidity_{i,t-1} + \alpha_3 Debt_{i,t-1} + \alpha_4 Growth_{i,t-1} + \alpha_5 Size_{i,t-1} + \alpha_6 Country_{i,t} + \beta_1 E\_Score_{i,t-1} + \beta_2 S\_Score_{i,t-1} + \beta_3 G\_Score_{i,t-1}$
(6)	$logit\ P = \alpha_0 + \alpha_1 Return_{i,t-1} + \alpha_2 Liquidity_{i,t-1} + \alpha_3 Debt_{i,t-1} + \alpha_4 Growth_{i,t-1} + \alpha_5 Size_{i,t-1} + \alpha_6 Country_{i,t} + \beta_1 E\_Score_{i,t-1} + \beta_2 S\_Score_{i,t-1} + \beta_3 G\_Score_{i,t-1} + \beta_4 CONT\_Score_{i,t-1}$
(7)	$logit\ P = \alpha_0 + \alpha_1 Return_{i,t-1} + \alpha_2 Liquidity_{i,t-1} + \alpha_3 Debt_{i,t-1} + \alpha_4 Growth_{i,t-1} + \alpha_5 Size_{i,t-1} + \alpha_6 Country_{i,t} + \beta_1 ESG\_Score_{i,t-1} + \beta_2 CONT\_Score_{i,t-1}$
(8)	$logit\ P = \alpha_0 + \alpha_1 Return_{i,t-1} + \alpha_2 Liquidity_{i,t-1} + \alpha_3 Debt_{i,t-1} + \alpha_4 Growth_{i,t-1} + \alpha_5 Size_{i,t-1} + \alpha_6 Country_{i,t} + \beta_1 CONT\_Score_{i,t-1}$
(9)	$logit\ P = \alpha_0 + \alpha_1 Return_{i,t-1} + \alpha_2 Liquidity_{i,t-1} + \alpha_3 Debt_{i,t-1} + \alpha_4 Growth_{i,t-1} + \alpha_5 Size_{i,t-1} + \alpha_6 Country_{i,t} + \beta_1 E\_Score_{i,t-1} + \beta_2 CONT\_Score_{i,t-1}$
(10)	$logit\ P = \alpha_0 + \alpha_1 Return_{i,t-1} + \alpha_2 Liquidity_{i,t-1} + \alpha_3 Debt_{i,t-1} + \alpha_4 Growth_{i,t-1} + \alpha_5 Size_{i,t-1} + \alpha_6 Country_{i,t} + \beta_1 S\_Score_{i,t-1} + \beta_2 CONT\_Score_{i,t-1}$
(11)	$logit\ P = \alpha_0 + \alpha_1 Return_{i,t-1} + \alpha_2 Liquidity_{i,t-1} + \alpha_3 Debt_{i,t-1} + \alpha_4 Growth_{i,t-1} + \alpha_5 Size_{i,t-1} + \alpha_6 Country_{i,t} + \beta_1 G\_Score_{i,t-1} + \beta_2 CONT\_Score_{i,t-1}$

Source: Own study.

RESULTS AND DISCUSSION

Table 5 presents the descriptive statistics of the variables for the 1,511 firm-year observations. The mean dividend payout ratio, the a change of which allows us to determine whether an enterprise has a stable dividend policy, is equal to 61.747%. It means that the world's largest enterprises pay out on average 61.747% of their net earnings. The average return to assets is 6.497%, and it is above the median (5.400%). The enterprises are rather highly profitable because *Return* is higher than 3.256% (Q1) for 75% of the total observations. The mean current ratio is 1.332 while the median is 1.250. The financial liquidity of the enterprises can be regarded as optimal because half of the total observations fall within the range of 1.011 (Q1) − 1.520 (Q3). The leverage ratio is, on average, 123.711%, and it is above the median (74.278%). *Debt* is lower than 141.777% (Q3) for 75% of the total observations; therefore, the enterprises can be recognized as little indebted, despite exhibiting significant disparities. The average market-to-book value ratio, which represents an enterprise's growth opportunities, is equal to 3.632 (the median is 1.822). It indicates that the market value is, on average, more than three times larger than their book value. The mean *Size*, expressed as a natural logarithm of total assets, is 26.366. *Country,* which is a binary variable, takes a value of 0 when the country of origin is a developing country (such as Brazil, China, India, Malaysia, Mexico, Russia, Thailand, or Turkey) or 1 when it is a developed country (according to the World Economic Outlook Database [WEO] of the International Monetary Fund).

Table 5. Descriptive statistics of the dividend payout ratio (DPR) and explanatory variables (N = 1,511)

Variables	Mean	St. Dev.	Q1	Median	Q3
DPR, %	61.747	102.438	26.531	41.210	67.751
Return. %	6.497	4.307	3.256	5.400	8.719
Liquidity	1.332	0.524	1.011	1.250	1.520
Debt. %	123.711	447.654	42.476	74.278	141.777
Growth	3.632	16.765	1.119	1.822	3.429
Size	26.366	2.288	24.546	25.541	28.516
ESG_Score	68.836	16.451	59.352	71.659	81.822
E_Score	70.394	20.191	59.092	76.035	85.006
S_Score	69.697	20.377	57.897	74.536	85.600
G_Score	65.237	20.721	50.597	69.908	81.304
CONT_Score	65.859	35.300	30.556	79.412	100.000

Source: Own calculations.

Referring to corporate sustainability scores, the world's largest enterprises are at a good sustainability level because the average overall sustainability score ranges from 50 to 75 points, and more than 75% of all total observations are at least at a satisfactory level (Q1=59.352). The mean scores for the environmental and social pillars are higher than the average *ESG_Score,* while the mean governance pillar score is lower. The ESG controversies score is excellent for at least half of the total observations (Q2=79.412).

Table 6 shows the coefficients of the pairwise correlation between the independent variables. The strongest significant correlation among control variables is between *Return* and *Size*. The coefficient is significant at 1% and demonstrates that the negative dependence is weak (r_{yx}=-0.305). The correlations of *ESG_Score* with the control variables are significant for all variables except *Debt*, but their coefficients imply a very weak relationship – the dependence is positive for *Return* and *Growth* while negative for *Liquidity* and *Size*. All correlations of the overall ESG score with its individual pillar scores are positive and significant at 1% – the coefficient for *G_Score* (r_{yx}=0.665) is the lowest but suggests a strong dependence. The strongest significant correlation among individual sustainability pillar scores is between *E_Score* and *S_Score* – the coefficient is significant at 1% and indicates that the positive dependence is strong (r_{yx}=0.633). The correlations of the ESG controversies score with the control variables are significant for all variables except *Growth* – all coefficients point to a very weak relationship. The relationship between *CONT_Score* and the overall sustainability score, which is significant at 1%, is negative and weak (r_{yx}=-0.354) – *CONT_Score's* strongest correlation with an individual sustainability pillar is with *S_Score* (r_{yx}=-0.337).

To summarize, the independent variables considered in particular specifications of the general logit model are not strongly correlated with each other – the coefficients take values between -0.8 and 0.8 (Fooladi, 2012, pp. 691–692). The variables with correlation coefficients higher than ±0.8 are not considered in the same model specification. The collinearity between independent variables was also evaluated with Variance Inflation Factors (VIF), which were lower than 1.971 in each model specification.

Table 6. Pearson correlation matrix (N = 1,511)

Variables	Return	Liquidity	Debt	Growth	Size	ESG_Score	E_Score	S_Score	G_Score	CONT_Score
Return	1.000									
Liquidity	0.300***	1.000								
Debt	-0.011	-0.073***	1.000							
Growth	0.161***	-0.019	0.096***	1.000						
Size	-0.305***	0.038	-0.046*	-0.100***	1.000					
ESG_Score	0.146***	-0.047*	-0.003	0.062**	-0.081***	1.000				
E_Score	0.083***	-0.044*	-0.005	0.039	0.069***	0.813***	1.000			
S_Score	0.193***	-0.021	0.010	0.066**	-0.171***	0.883***	0.633***	1.000		
G_Score	0.084***	-0.015	-0.007	0.050*	-0.067***	0.665***	0.330***	0.370***	1.000	
CONT_Score	-0.090***	0.048*	-0.045*	-0.034	0.067***	-0.354***	-0.268***	-0.337***	-0.220***	1.000

Note: *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively.
Source: Own calculations.

Table 7 presents the estimation results of the eleven specifications of the general logit model. Starting with the control variables, in the ten-year research period, the propensity to pay stable dividends increased as profitability increased, as measured by the return on assets. In all model specifications, the coefficient at *Return* is positive and significant at different significance levels (i.e., from 1% to 5%). This means that if the enterprise generates higher net earnings at an unchanged level of total assets, the probability of holding the dividend payout at the same level as in previous years increases. Rather than considering the stability of dividend payouts, other authors analyze the level of the dividend. Those studies found that rationally operating enterprises increase dividends only when the increase in net earnings is stable (Denis & Osobov, 2008; Dewasiri et al., 2019). Otherwise, if subsequent net earnings return to the level of previous years, the enterprise is likely to reduce the dividend amount, which the capital market may perceive as a negative signal. As a result, an enterprise's market value may decrease (Siladjaja & Anwar, 2020). This finding is in line with signaling theory (Bhattacharya, 1979) and demonstrates that enterprises attempt to maintain dividends at the levels from previous years, even when their profitability increases. In other words, enterprises smooth out dividends to send a positive signal to the market about their financial performance (Lin & Lee, 2021; Huang et al., 2022).

Table 7. Estimation results (N = 1,511)

Variables	Model specifications										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Intercept	0.771 (0.628)	0.430 (0.353)	1.061 (0.849)	0.094 (0.074)	0.502 (0.380)	-0.268 (-0.193)	0.114 (0.090)	-0.144 (-0.115)	-0.081 (-0.065)	0.455 (0.349)	-0.797 (-0.610)
Return	0.055** (2.552)	0.056** (2.555)	0.060*** (2.773)	0.048** (2.203)	0.061*** (2.808)	0.065*** (2.952)	0.058*** (2.664)	0.055** (2.548)	0.060*** (2.703)	0.062*** (2.869)	0.055** (2.482)
Liquidity	-0.507*** (-2.590)	-0.506*** (-2.600)	-0.534*** (-2.631)	-0.478** (-2.427)	-0.561*** (-2.649)	-0.593*** (-2.704)	-0.535*** (-2.629)	-0.520** (-2.571)	-0.539*** (-2.658)	-0.558*** (-2.676)	-0.528** (-2.542)
Debt	-0.002* (-1.957)	-0.002* (-1.951)	-0.002* (-1.922)	-0.002** (-2.058)	-0.002** (-1.988)	-0.002* (-1.951)	-0.002* (-1.906)	-0.002* (-1.934)	-0.002* (-1.894)	-0.002* (-1.876)	-0.002** (-1.986)
Growth	-0.006 (-0.468)	-0.007 (-0.456)	-0.005 (-0.410)	-0.007 (-0.446)	-0.004 (-0.316)	-0.007 (-0.374)	-0.009 (-0.539)	-0.010 (-0.564)	-0.009 (-0.524)	-0.007 (-0.471)	-0.011 (-0.539)
Size	-0.042 (-0.978)	-0.030 (-0.687)	-0.048 (-1.139)	-0.047 (-1.076)	-0.040 (-0.861)	-0.038 (-0.816)	-0.042 (-1.003)	-0.044 (-1.054)	-0.033 (-0.754)	-0.046 (-1.104)	-0.042 (-0.995)
Country	-1.150*** (-4.786)	-1.099*** (-4.626)	-1.136*** (-4.852)	-1.341*** (-5.581)	-1.137*** (-4.622)	-1.111*** (-4.521)	-1.127*** (-4.717)	-1.191*** (-5.099)	-1.070*** (-4.504)	-1.102*** (-4.715)	-1.262*** (-5.268)
ESG_Score	-0.009* (-1.648)						-0.005 (-0.895)				
E_Score		-0.009* (-1.942)			-0.004 (-0.556)	-0.003 (-0.482)			-0.006 (-1.395)		
S_Score			-0.011** (-2.477)		-0.013* (-1.743)	-0.011 (-1.465)				-0.008* (-1.818)	
G_Score				0.007 (1.484)	0.012** (2.544)	0.014*** (2.745)					0.009** (2.004)
CONT_Score						0.006** (2.073)	0.006** (2.023)	0.007** (2.356)	0.006** (2.027)	0.005* (1.816)	0.008*** (2.648)
McFadden R²	0.045	0.046	0.048	0.044	0.055	0.061	0.049	0.049	0.051	0.052	0.053
Accuracy. %	91.300	91.300	91.300	91.300	91.300	91.300	91.300	91.300	91.300	91.300	91.300
$\chi^{2(K)}$ (p-value)	39.691 (0.000)	40.760 (0.000)	42.871 (0.000)	39.444 (0.000)	49.391 (0.000)	53.943 (0.000)	43.958 (0.000)	43.255 (0.000)	45.015 (0.000)	46.270 (0.000)	47.202 (0.000)
Hosmer-Lemeshow test (p-value)	11.073 (0.198)	11.749 (0.163)	3.535 (0.896)	3.535 (0.896)	3.432 (0.904)	6.721 (0.567)	6.721 (0.567)	8.031 (0.405)	14.152 (0.078)	9.036 (0.339)	8.033 (0.430)

Note: *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively. The *z*-statistic is given in brackets.

As for the second control variable, the results given in Table 7 show that the propensity to pay stable dividends decreases as liquidity increases. The estimation results show that the coefficient at *Liquidity* is always negative and significant at 1% or 5%, depending on the model specification. This means that if an enterprise's current ratio increases, the probability of maintaining a stable dividend payout also increases. This result is consistent with agency theory (Jensen & Meckling, 1976), whereby both owners and managers strive to achieve their goals. However, because their goals differ, conflicts of interest escalate. As a result, an enterprise's free cash flows may be used inefficiently. To prevent this, enterprises pay out dividends (Michael, 2013; Chang et al., 2016; Adjaoud & Hermassi, 2017), including ones that are higher than in previous years.

The results show that an increase in an enterprise's debt decreases the propensity to pay stable dividends. The coefficient at *Debt* is negative in all model specifications and significant at 5% or 10%, depending on the model

specifications. It can be argued that a stable dividend policy is pursued when debt does not increase. Higher debt must be serviced, which makes it difficult to pay out dividends at the previous level. This finding is consistent with Ghose et al. (2022), who showed that the propensity to pay out higher dividends decreases in heavily indebted enterprises.

As for the next two explanatory variables, i.e., *Growth* and *Size*, the coefficient is negative. However, these variables are not significant at the adopted levels of statistical significance in any of the eleven model specifications.

Finally, the coefficient at *Country* is negative and significant at 1% in each model specification. This means that the probability of a stable payout ratio is higher in developing countries, where the signaling effect seems stronger. Therefore, a less stable dividend policy in these countries would result in greater volatility of the enterprise's market value.

Referring to the sustainability performance scores, which are of main interest of this paper, in specification 1, the coefficient of the *ESG_Score* is weakly significant (at the 10% level) and negative. Moreover, it stops being statistically significant in specification 7, when the controversies score is additionally considered in the model. The estimation results of specification 1 suggest that *ESG_Score* is negatively linked with our dependent variable, meaning that companies with higher overall ESG score are less likely to maintain a stable dividend policy in terms of the payout ratio. Thus, the sign of the relationship between ESG and dividend stability is the opposite of that expected in the first specific hypothesis, so it should be rejected.

Moreover, this result contradicts the findings of Matos et al. (2020) and Benlemlih (2019), which showed that enterprises with higher ESG or CSR ratings exhibit greater stability in their dividend payouts. By contrast, our result is in line with Dahiya et al. (2023), which demonstrates that companies engaging in extensive CSR activities tend to exhibit less stable dividend policies. Nevertheless, the disparity with our findings can be attributed to differences in the employed methodology (Benlemlih, 2019) and the uniqueness of the underlying samples (Benlemlih, 2019; Matos et al., 2020). Both Benlemlih (2019) and Dahiya et al. (2023) examined the speed of dividend adjustment in US and Indian companies, respectively. While Lintner's approach (1956) is not directly utilized in our study, the divergent results obtained by Benlemlih (2019) and Dahiya et al. (2023) suggest that companies listed on less developed capital market are less likely to maintain a stable dividend policy. The significance of the *Country* variable additionally confirms this finding.

As the methodology of our study is similar to that of Matos et al. (2020) – based on the logistic regression with a binary dependent variable and the same source of ESG data – it again becomes important to consider the distinct characteristics of the underlying sample of their study, as it focused on European companies

within the Stoxx Euro 600 index. The constituents of this index represent highly developed European capital markets, which lends a greater degree of homogeneity to the sample. This homogeneity extends to the similarity of the economic and institutional environment in which those companies operate. Conversely, although our sample encompasses transnational companies, some entities operate on less developed stock markets. Compared to EU countries, which have more harmonized regulatory policies toward financial markets and sustainable development, the institutional environment of companies included in our study is more heterogenous. Finally, EU countries have implemented policies that encompass both regulatory measures and financial incentives to encourage and support companies in their sustainability endeavors. As a result, companies and other market participants in Europe should be more aware of the importance of taking measures towards sustainability. This may have a positive impact on the overall sustainability of dividend policies in companies with high ESG scores. Zahid et al. (2023) raised the importance of a specific institutional context regarding ESG and dividend policy and the need to explore regions other than the EU. In the next step, the specific dimensions of ESG are explored. This analysis is related to verifying the next four specific hypotheses.

Starting with the environmental sustainability dimension, in specification 2, the coefficient of *E_Score* has a negative sign and is weakly significant at the 10% level. *E_Score* also appears in specifications 5, 6 and 9, however, it no longer maintains statistical significance. The results show that the second specific hypothesis should be rejected. This observation is in line with the concern raised by Ellili (2022), who suggested that including all dimensions simultaneously diminishes their individual impact on dividend policy. Nevertheless, our findings contradict the results of Benlemlih (2019), Hendijani Zadeh (2021) and Matos et al. (2020). However, their results were not as strong in terms of statistical significance. More specifically, the negative association between *E_Score* and the propensity to maintain a stable payout ratio can be attributed to the need to cover the high costs associated with environmental investments. The large enterprises examined in this study generally have a greater financial capacity than smaller ones to implement environmental policies and manage environmental risks. They are also more aware of how these risks may impact their business operations in the present and near future, which encourages them to pursue environmental investments. However, allocating funds for pro-environmental activities reduces the cash available and may influence decisions about earnings allocation.

On the one hand, because of the high value of environmental investments, enterprises that pursue them may face challenges in maintaining a stable dividend policy, which may lead to dividend cuts or omissions. On the other hand, large, publicly-traded enterprises are subject to greater market discipline and must consider the expectations of shareholders. From this perspective, increased

environmental investments – described by a higher *E_Score* – intensify the agency conflict between shareholders and management, leading the latter to increase dividend payouts. In other words, significant expenditure on environmental initiatives may necessitate adjustments to dividend policies. This is driven by the need to balance environmental responsibility with meeting shareholder expectations, considering the financial implications of such investments.

Turning to an enterprise's social sustainability dimension, the *S_Score* variable appears in specifications 3, 5, 6, and 10. Like *E_Score*, the coefficient at the *S_Score* is negative and significant at 5% (specification 3) or 10% (specifications 5 and 10), except for specification 6. Therefore, the third specific hypothesis, like the second one, should also be rejected. The negative sign of the coefficient suggests that an increase in the social pillar score coincides with a more unstable dividend payout ratio. In other words, more intense activities in the social dimension of ESG reduce the propensity to maintain a stable dividend policy. Our finding is stronger than the results of the Matos et al. (2020) study, in which the social dimension was not linked with stable dividend payouts in terms of the 2% payout ratio range.

On the other hand, Benlemlih (2019) revealed that individual social factors can act differently on dividend adjustments. One of the reasons why we observe a negative link between the social dimension of ESG and dividend stability may stem from the necessity to cover the costs of product development in line with a sustainable strategy. Product responsibility, together with other factors included in *S_Score,* may be related to higher expenditures on social and employee programs, which lower the amount of available cash resources. This line of reasoning justifies dividend decreases and omissions. However, companies that are building their market position on values of reliability, equality, and responsibility may still be subject to shareholder pressure to increase dividends, sacrificing stable dividend payouts. Moreover, as Attig et al. (2013), Oikonomou et al. (2014), and Menz (2014) suggested, sustainable practices are received by market participants differently. In such a case, companies may be more willing to adjust their dividend policy more often to send an additional signal to the market participants.

The results given in Table 7 also suggest that not all ESG dimensions are related to dividend stability in the same direction. Indeed, in contrast to *E_Score* and *S_Score*, the governance sustainability dimension is positively linked with dividend stability. The coefficient at *G_Score* is positive and significant at 1% for specification 6, and at 5% for specifications 5 and 11. Both specifications 5 and 6 encompass at least three ESG dimensions. Nevertheless, the *G_Score* coefficient is statistically insignificant when it appears in the specification as the only explanatory variable (specification 4). It means that the fourth specific hypothesis should also be rejected. Overall, this result is in line with

Matos et al. (2020). The positive association between dividend stability and the corporate governance score of ESG activities suggests that efficient and transparent corporate governance rules help alleviate agency conflicts between managers and shareholders. Through efficient governance practices and enhanced monitoring of managers, the likelihood of opportunistic behavior that undermines a company's long-term growth potential is reduced.

Finally, the controversial dimension of ESG activities is examined in specifications 6 to 11. The positive sign of the coefficient *CONT_Score* remains statistically significant across all specifications at 1%, 5% and 10%. This implies that enterprises with lower exposure to environmental, social and governance controversies are more likely to pay stable dividends, confirming the fifth specific hypothesis. Notably, a higher *CONT_Score* is indicative of decreased controversy. This result corresponds to the previous findings of Benlemlih (2019) and Bilyay-Erdogan et al. (2023), which indicate the relevance of controversial practices for an enterprise's dividend policy. Specifically, both studies indicate that involvement in controversial practices is related to lower dividend payments.

Our findings also confirm Casey et al.'s (2020) suggestion that more controversies lead to lower dividend yield stability. One argument to support this conclusion relates to the way the controversial score is generated. Since it is based on media reports regarding various factors considered in individual ESG dimensions, the controversial score goes beyond a company's declarative statements, subjecting them to heightened scrutiny by a wide range of stakeholders. Indeed, one aspect considered in this indicator is the infringement of shareholders' rights. From this perspective, companies rated highly by the media may pay particular attention to appropriate investor relations, which are a part of the governance sustainability dimension and strive to maintain a stable dividend policy. In other words, controversial information regarding a company's operations conveys an unfavorable signal to market participants, which may result in impromptu decisions concerning dividend policy to counterbalance this adverse message. Conversely, companies with a lack of controversy have no pressure to send an additional signal to investors and can maintain an unaltered dividend policy.

CONCLUSIONS

A logistic regression model was used to test the research hypothesis that there is a link between an enterprise's ESG performance and its propensity to pay stable dividends in terms of the dividend payout ratio. The results revealed that:

- the effect of integrated ESG activities on the payout stability is statistically significant and negative only in model specifications without the ESG controversies – the first specific hypothesis is rejected;
- the effect of the environmental dimension is statistically significant and negative, but only when other particular ESG pillars are not considered – the second specific hypothesis is rejected;
- the effect of the social dimension is statistically significant and negative, but only when the governance dimension and the ESG controversies are not considered together in the same model specification – the third specific hypothesis is rejected;
- the effect of the governance dimension is statistically significant and positive only if other particular pillars are considered together in one model specification both without and with the ESG controversies – the fourth specific hypothesis is rejected;
- the effect of the ESG controversies is statistically significant and positive in each model specification – the fifth specific hypothesis is confirmed;
- the results for the control variables are consistent with the previous results.

Therefore, the general research hypothesis cannot be confirmed because only the fifth specific research hypothesis, which states that *the link between the ESG controversies score and the propensity to pay stable dividends is positive,* can be positively verified in all model specifications.

As the ESG controversies score was statistically significant regardless of the model specification, it is recommended that research be conducted on the relationship between corporate sustainability performance and dividend policy, taking into account not only commonly applied ESG scores but also the ESG controversies score. Governments and international organizations should cooperate with companies that provide ESG data to make ESG scores, including the ESG controversies score, publicly available to all stakeholder groups, which would help to reduce the information gap. Managers should pay more attention to increasing the visibility of ESG initiatives they undertake from the perspective of risk, which they allow, to avoid controversies in particular corporate sustainability dimensions. What is more, our research shows that although particular ESG scores are significant, they are not related to dividend stability in the same way because the expectations for environmental, social, and governance dimensions will be slightly different. Therefore, they should be considered by managers separately.

The added value of the paper is that it concerns the relationship between ESG performance and dividend stability, not the dividend amount, which has been the subject of research conducted by other authors. Additionally, our study is based on sustainability data provided by the *LSEG Eikon* database, which – like

other leading databases such as Bloomberg, MCSI, and KLD – are characterized by objectivity and reliability, given the methodology used to produce them (Clément et al., 2023). The study was limited to large and highly traded enterprises, which are primarily of great interest to institutional investors, which is why they must maintain a relatively high level of corporate sustainability. However, the world's largest enterprises are subject to different corporate sustainability policies and do not have the same incentives to have a stable dividend policy in terms of dividend payout ratio. Enterprises listed in global indices can be more focused on meeting the expectations of international investors by dynamically adjusting their dividends to current financial performance than by conducting a smooth dividend policy.

Finally, this study has some limitations. First, although the preliminary sample of companies was high, missing data reduced the number of observations that could be considered, which limited the possible estimation methods. In future research, with an enlarged sample, the smoothing approach and panel data estimation could be employed. Second, this study was conducted on large international corporations that operate in various countries. Therefore, the findings should be viewed with caution, as not much can be said about smaller companies that operate domestically. Third, although the variables used are in line with the dividend payment literature, an investigation of other proxies of size and dividend stability could enhance the results and provide interesting information on the relationship between ESG and dividend policy. Finally, future research could consider a cross-regional analysis to understand the interplay between ESG activities, dividend policies, and market characteristics.

Acknowledgment

References

Adjaoud, F., & Hermassi, N. (2017). The impact of corporate governance mechanisms on the dividend policy of Canadian firms: empirical study. *Journal of Business, Accounting and Finance, 11*(1), 90-105.

Aivazian, V., Booth, L., & Cleary, S. (2003). Do emerging market firms follow different dividend policies from US firms?. *Journal of Financial Research, 26*(3), 371-387. https://doi.org/10.1111/1475-6803.00064

Andreoni, J. (1990). Impure altruism and donations to public goods: A theory of warm-glow giving. *The Economic Journal*, *100*(401), 464-477. https://doi.org/10.2307/2234133

Attig, N., El Ghoul, S., Guedhami, O., & Suh, J. (2013). Corporate social responsibility and credit ratings. *Journal of Business Ethics*, *117*, 679-694. http://dx.doi.org/10.1007/s10551-013-1714-2

Badru, B. O., & Qasem, A. (2021). Corporate social responsibility and dividend payments in the Malaysian capital market: The interacting effect of family-controlled companies. *Journal of Sustainable Finance & Investment*, 1-24. https://doi.org/10.1080/20430795.2021.1979926

Barnea, A., & Rubin, A. (2010). Corporate social responsibility as a conflict between shareholders. *Journal of Business Ethics*, *97*, 71-86. https://doi.org/10.1007/s10551-010-0496-z

Barnett, M. L., & Salomon, R. M. (2012). Does it pay to be really good? Addressing the shape of the relationship between social and financial performance. *Strategic Management Journal, 33*, 1304-1320. https://doi.org/10.1002/smj.1980

Behl, A., Kumari, P. S. R., Makhija, H., & Sharma, D. (2022). Exploring the relationship of ESG score and firm value using cross-lagged panel analysis: Case of the Indian Energy sector. *Annals of Operations Research, 313*, 231-256. https://doi.org/10.1007/s10479-021-04189-8

Ben Salah, O., & Ben Amar, A. (2022). Does corporate social responsibility affect dividend policy? Empirical evidence in the French context. *Journal of Global Responsibility, 13*(3), 268-289. https://doi.org/10.1108/JGR-10-2021-0082

Benlemlih, M. (2019). Corporate social responsibility and dividend policy. *Research in International Business and Finance*, *47*, 114-138. https://doi.org/10.1016/j.ribaf.2018.07.005

Bhattacharya, S. (1979). Imperfect information, dividend policy, and "the bird in the hand" fallacy. *Bell Journal of Economics, 10*(1), 259-270. https://doi.org/10.2307/3003330

Bilyay-Erdogan, S., Danisman, G. O., & Demir, E. (2023). ESG performance and dividend payout: A channel analysis. *Finance Research Letters, 55*(Part A), 103827. https://doi.org/10.1016/j.frl.2023.103827

Brown, W. O., Helland, E., & Smith, J. K. (2006). Corporate philanthropic practices. *Journal of Corporate Finance*, *12*(5), 855-877. https://doi.org/10.1016/j.jcorpfin.2006.02.001

Bruna, M. G., & Lahouel, B. B. (2022). CSR & financial performance: Facing methodological and modeling issues commentary paper to the eponymous FRL article collection. *Finance Research Letters, 44*(2), 1-8. https://doi.org/10.1016/j.frl.2021.102036

Casey Jr., K. M., Casey, K. M., & Griffin, K. (2020). Does good stewardship reduce agency costs in the IT sector? Evidence from dividend policy and ESG ratings. *Global Journal of Accounting and Finance Volume, 4*(1), 6-16.

Chang, K., Kang, E., & Li, Y. (2016). Effect of institutional ownership on dividends: An agency-theory-based analysis. *Journal of Business Research, 69*(7), 2551-2559. https://doi.org/10.1016/j.jbusres.2015.10.088

Cheung, A. (W.), Hu, M., & Schwiebert, J. (2018). Corporate social responsibility and dividend policy. *Accounting and Finance, 58*, 787-816. https://doi.org/10.1111/acfi.12238

Clément, A., Robinot, É., & Trespeuch, L. (2023). The use of ESG scores in academic literature: A systematic literature review. *Journal of Enterprising Communities: People and Places in the Global Economy*. https://doi.org/10.1108/JEC-10-2022-0147

Dahiya, M., Singh, S., & Chaudhry, N. (2023). Corporate social responsibility and dividend policy in India. *Management Decision*. https://doi.org/10.1108/MD-08-2022-1152

Denis, D. J., & Osobov, I. (2008). Why do firms pay dividends? International evidence on the determinants of dividend policy. *Journal of Financial Economics, 89*(1), 62-82. https://doi.org/10.1016/j.jfineco.2007.06.006

Dewasiri, N. J., Yatiwelle Koralalage, W. B., Abdul Azeez, A., Jayarathne, P. G. S. A., Kuruppuarachchi, D., & Weerasinghe, V. A. (2019). Determinants of dividend policy: Evidence from an emerging and developing market. *Managerial Finance, 45*(3), 413-429. https://doi.org/10.1108/MF-09-2017-0331

Douissa I. B., & Azrak T. (2022). Long-run dynamics between CFP and CSP in the GCC banking sector: Estimation non-statutory heterogeneous panels allowing for cross-sectional dependence. *Social Responsibility Journal, 18*(3), 518-533. https://doi.org/10.1108/SRJ-09-2020-0365

Dyllick, T., & Hockerts, K. (2002). Beyond the case for corporate sustainability. *Business Strategy and the Environment, 11*(2), 130-141. https://doi.org/10.1002/bse.323

Easterbrook, F. H. (1984). Two agency-cost explanations of dividends. *The American Economic Review, 74*(4), 650-659.

Elkington, J. (1997). *Cannibals with Forks. The Triple Bottom Line of 21st Century Business.* Oxford: Capstone Publishing Ltd.

Ellili, N. O. D. (2022). Impact of environmental, social and governance disclosure on dividend policy: What is the role of corporate governance? Evidence from an emerging market. *Corporate Social Responsibility and Environmental Management, 29*(5), 1-18. https://doi.org/10.1002/csr.2277

Emeka, A. H. (2020). Determinants of dividend policy: Empirical evidence from Nigerian listed firms. *International Journal of Business Insights & Transformation*, *13*(2), 38-67.

Fooladi, M. (2012). Board characteristics and firm performance. *Journal of Modern Accounting and Auditing, 8*(5), 688-694.

Freeman, R. E., Harrison, J. S., Wicks, A. C., Parmar, B. L., & De Colle, S. (2010). *Stakeholder theory: The state of the art*. Cambridge: Cambridge University Press.

Freeman, R. E., Wicks, A. C., & Parmar, B. (2004). Stakeholder theory and "the corporate objective revisited". *Organization Science, 15*(3), 364-369. https://doi.org/10.1287/orsc.1040.0066

Gallo, M. A. (2004). The family business and its social responsibilities. *Family Business Review, 17*(2), 135-148. https://doi.org/10.1111/j.1741-6248.2004.0000

Ghose, B., Baruah, D., & Gope, K. (2022). Propensity to propose and pay dividend: does firm characteristics matter?. *Global Business Review*, 1-27. https://doi.org/10.1177/09721509221110314

Gillan, S. L., Koch, A., & Starks, L.T. (2021). Firms and social responsibility: A review of ESG and CSR research in corporate finance. *Journal of Corporate Finance, 66*, 1-34. https://doi.org/10.1016/j.jcorpfin.2021.101889

Giovannoni, E., & Fabietti, G. (2013). What is sustainability? A review of the concept and its applications. In C. Busco, M. L. Frigo, P. Quattrone, & A. Riccaboni (Eds.). *Integrated Reporting. Concepts and Cases That Redefine Corporate Accountability* (pp. 21-40). Berlin: Springer. https://doi.org/10.1007/978-3-319-02168-3_2

Gray, R. (2010). Is accounting for sustainability actually accounting for sustainability...and how would we know? An exploration of narratives of organisations and the planet. *Accounting Organizations and Society, 35*(1), 47-62. https://doi.org/10.1080/0969160X.2011.556420

Hendijani Zadeh, M. (2021). The effect of corporate social responsibility transparency on corporate payout policies. *International Journal of Managerial Finance, 17*(5), 708-732. https://doi.org/10.1108/IJMF-07-2020-0386

Huang, D. Z. X. (2022). Environmental, social and governance factors and assessing firm value: Valuation, signalling and stakeholder perspectives. *Accounting & Finance*, *62*(S1), 1983-2010. https://doi.org/10.1111/acfi.12849

Huang, L., Li, L., Wang, H., & Wu, L. (2022). Stock dividend and analyst optimistic bias in earnings forecast. *International Review of Economics and Finance, 78*, 643–659. https://doi.org/10.1016/j.iref.2022.01.007

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics, 3*(4), 305-360. https://doi.org/10.1016/0304-405X(76)90026-X

Jensen, M. C. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *The American Economic Review*, *76*(2), 323-329.

Jensen, M. C. (2002). Value maximization, stakeholder theory, and the corporate objective function. *Business Ethics Quarterly*, *12*(2), 235-256. https://doi.org/10.2307/3857812

Jha, M. K., & Rangarajan, K. (2020). Analysis of corporate sustainability performance and corporate financial performance causal linkage in the Indian context. *Asian Journal of Sustainability and Social Responsibility, 5*(1), 1-30. https://doi.org/10.1186/s41180-020-00038-z

Jonker, J., & Witte, M. (2006). *Management Models for Corporate Social Responsibility*. New York: Springer Berlin Heidelberg.

Kantabutra, S., & Ketprapakorn, N. (2020). Toward a theory of corporate sustainability: A theoretical integration and exploration. *Journal of Cleaner Production*, *270*, 1-22. https://doi.org/10.1016/j.jclepro.2020.122292

Kim, S. I., & Kim, I. (2022). Decomposition of the dividend model: From the perspective of ESG and firm characteristics. *Journal of the Korean Data Analysis Society, 24*(4), 1213-1223. https://doi.org/10.37727/jkdas.2022.24.4.1213

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. (2000). Investor protection and corporate governance. *Journal of Financial Economics, 58*(1-2), 3-27. https://doi.org/10.1016/S0304-405X(00)00065-9

Lakhal, F., Kuzey, C., Uyar, A., & Karaman, A. S. (2023). The relationship between dividend payout and corporate social responsibility: The moderating effect of shareholder friendliness and board monitoring. *Journal of Cleaner Production, 394*, 136297. https://doi.org/10.1016/j.jclepro.2023.136297

Lin, J. J., & Lee, C. F. (2021). Does managerial reluctance of dividend cuts signal future earnings?. *Review of Quantitative Finance and Accounting, 56*, 453-478. https://doi.org/10.1007/s11156-020-00899-5

Lintner, J. (1956). Distribution of incomes of corporations among dividends, retained earnings, and taxes. *The American Economic Review, 46*(2), 97-113.

Lloyd, W. P., Jahera, J. S., & Page, D. E. (1985). Agency costs and dividend payout ratios. *Quarterly Journal of Business and Economics*, 19-29.

Lu, L., & Taylor, M. (2016). Which factors moderate the relationship between sustainability performance and financial performance? A meta-analysis study. *Journal of International Accounting Research, 15*(1), 1-15. https://doi.org/10.2308/jiar-51103

Matos, P. V., Barros, V., & Sarmento, J. M. (2020). Does ESG affect the stability of dividend policies in Europe?. *Sustainability, 12*(21), 1-15. https://doi.org/10.3390/su12218804

Menz, K. M. (2010). Corporate social responsibility: Is it rewarded by the corporate bond market? A critical note. *Journal of Business Ethics*, *96*(1), 117-134. http://dx.doi.org/10.1007/s10551-010-0452-y

Michael, N. B. (2013). Agency conflict and corporate dividend policy decisions in Nigeria. *Asian Economic and Financial Review, 3*(8), 1110-1121.

Mihancea, E. A., Pirtea, M. G., & Boțoc, F. C. (2021). Bibliometric analysis on the recent trends in dividend policy research. *"Ovidius" University Annals, Economic Sciences Series, 21*(2), 1051-1059

Mitton, T. (2004). Corporate governance and dividend policy in emerging markets. *Emerging Markets Review, 5*(4), 409-426. https://doi.org/10.1016/j.ememar.2004.05.003

Niccolò, N., Battisti, E., Papa, A., & Miglietta, N. (2020). Shareholder value and dividend policy: The role of ESG strategies. *Proceedings of the 2020 IEEE International Conference on Technology Management, Operations*

and Decisions (ICTMOD). Marrakech, Morocco: IEEE, 29-33. https://doi.org/10.1109/ICTMOD49425.2020.9380585

Nizam, E., Ng, A., Dewandaru, G., Nagayev, R., & Nikoba, M. A. (2019). The impact of social and environmental sustainability on financial performance: A global analysis of the banking sector. *Journal of Multinational Financial Management, 49*, 35-53. https://doi.org/ 10.1016/j.mulfin.2019.01.002

Nollet, J., Filis, G., & Mitrokostas, E. (2016). Corporate social responsibility and financial performance: A non-linear and disaggregated approach. *Economic Modelling, 52*, 400-407. https://doi.org/10.1016/j.econmod.2015.09.019

Oikonomou, I., Brooks, C., & Pavelin, S. (2014). The effects of corporate social performance on the cost of corporate debt and credit ratings. *Financial Review*, *49*(1), 49-75. https://doi.org/10.1111/fire.12025

Oželienė, D. (2017). A review of enterprise sustainable development models: Critical appraisal. *International Scientific Journal "Science. Business. Society", 2*(2), 97-103.

Perrini, F., Russo, A., Tencati, A., & Vurro, C. (2011). Deconstructing the relationship between corporate social and financial performance. *Journal of Business Ethics, 102*(1), 59-76. https://doi.org/10.1007/s10551-011-1194-1

Rozeff, M. S. (1982). Growth, beta and agency costs as determinants of dividend payout ratios. *Journal of Financial Research*, *5*(3), 249-259

Saeed, A., & Zamir, F. (2021). How does CSR disclosure affect dividend payments in emerging markets?. *Emerging Markets Review, 46*, 100747. https://doi.org/10.1016/j.ememar.2020.100747

Samet, M., & Jarboui, A. (2017). Corporate social responsibility and payout decisions. *Managerial Finance, 43*(9), 982-998. https://doi.org/10.1108/MF-01-2017-0020

Sanders, N.R., Wood, J.D. (2015). *Foundations of Sustainable Business*. New Jersey, NJ: Wiley.

Sawicki, J. (2009). Corporate governance and dividend policy in Southeast Asia pre-and post-crisis. *The European Journal of Finance, 15*(2), 211-230. https://doi.org/10.1080/13518470802604440

Sheikh, M. F., Bhutta, A. I., Rehman, B., Bazil, M., & Hassan, A. (2020). Corporate social responsibility and dividend policy: A strategic choice in family firms. *Journal of Family Business Management, 12*(2), 296-315. https://doi.org/10.1108/JFBM-10-2020-0096

Siladjaja, M., & Anwar, Y., (2020). The impact of innate accruals quality on the future market value moderated by dividend policy. *Asian Journal of Accounting Research, 5*(2), 269-283. https://doi.org/10.1108/AJAR-04-2020-0026

Soana, M. G. (2011). The relationship between corporate social performance and corporate financial performance in the bank sector. *Journal of Business Ethics, 104*(1), 133-148. https://doi.org/10.1007/s10551-011-0894-x

Stubbs, W., & Rogers, P. (2013). Lifting the veil on environment-social-governance rating methods. *Social Responsibility Journal, 9*(4), 622–640. https://doi.org/10.1108/SRJ-03-2012-0035

Tuppura, A., Arminen H., Pätäri, S., & Jantunen, A. (2016). Corporate social and financial performance in different industry contexts: The chicken or the egg? *Social Responsibility Journal, 12*(4), 672-686. https://doi.org/10.1108/SRJ-12-2015-0181

United Nations (2012). *Future we want*. Rio de Janeiro: UN.

Wagner, M. (2010). The role of corporate sustainability performance for economic performance: A firm-level analysis of moderation effects. *Ecological Economics, 69*(7), 1553-1560. https://doi.org/10.1016/j.ecolecon.2010.02.017

World Commission on Environment and Development (1987). *Our common future*. Oxford: Oxford University Press.

World Economic Outlook Database, Publications of the International Monetary Fund. Retrieved from https://www.imf.org/en/Publications/SPROLLs/world-economic-outlook-databases#sort=%40imfdate%20descending

Yilmaz, M. K., Aksoy, M., & Khan, A. (2022). Moderating role of corporate governance and ownership structure on the relationship of corporate sustainability performance and dividend policy. *Journal of Sustainable Finance & Investment*, 1-31. https://doi.org/10.1080/20430795.2022.2100311

Xiao, C., Wang, Q., van der Vaart, T., & van Donk, D. P. (2018). When does corporate sustainability performance pay off? The impact of Country-level sustainability performance. *Ecological Economics, 146*, 325-333. https://doi.org/10.1016/j.ecolecon.2017.11.025

Zahid, R. A., Taran, A., Khan, M. K., & Chersan, I. C. (2023). ESG, dividend payout policy and the moderating role of audit quality: empirical evidence from Western Europe. *Borsa Istanbul Review, 23*(2), 350-367. https://doi.org/10.1016/j.bir.2022.10.012

Ziegler, A., Schröder, M., & Rennings, K. (2007). The effects of environmental and social performance on the stock performance of European corporations. *Environmental and Resource Economics, 37*(4), 661-680. https://doi.org/10.1007/s10640-007-9082-y

Abstrakt

CEL: *Teoretyczne i empiryczne badania nad zrównoważonym rozwojem przedsiębiorstw koncentrują się na związku między wynikami ESG a rentownością lub wartością rynkową, a w niewystarczającym stopniu opisują ich wpływ na politykę dywidendową. Dlatego głównym celem tego artykułu jest wypełnienie zidentyfikowanej luki badawczej poprzez określenie związku między wynikami przedsiębiorstwa w zakresie zrównoważonego rozwoju a stabilnością wypłat dywidendy. Aby osiągnąć ten cel, sformułowano główną hipotezę badawczą, zgodnie z którą związek między wynikami ESG przedsiębiorstwa a skłonnością do wypłaty stabilnej dywidendy jest pozytywny. Dla weryfikacji głównej hipotezy badawczej sformułowano pięć hipotez szczegółowych: (1) związek między zintegrowanym wynikiem ESG a skłonnością do wypłaty stabilnej dywidendy jest dodatni; (2) związek między wynikiem wymiaru środowiskowego a skłonnością do wypłaty stabilnej dywidendy jest pozytywny; (3) związek między wynikiem wymiaru społecznego a skłonnością do*

wypłaty stabilnej dywidendy jest pozytywny; (4) związek między wynikiem wymiaru ładu korporacyjnego a skłonnością do wypłaty stabilnej dywidendy jest pozytywny; (5) związek między wynikiem dotyczącym kontrowersji w zakresie ESG a skłonnością do wypłaty stabilnej dywidendy jest pozytywny. **METODYKA**: Empiryczna weryfikacja hipotezy została przeprowadzona z wykorzystaniem modelu regresji logistycznej wśród największych światowych przedsiębiorstw niefinansowych notowanych na liście Global 500 z roku 2021 w okresie badawczym 2012-2021. Specyfikacje modelu ogólnego obejmują zmienne dotyczące zrównoważonego rozwoju, takie jak wyniki wymiarów środowiskowego, społecznego i ładu korporacyjnego, a także wynik dotyczący kontrowersji w zakresie ESG, który mierzy narażenie przedsiębiorstwa na kontrowersje środowiskowe, społeczne i w systemie ładu korporacyjnego oraz negatywne zdarzenia ujawniane w światowych mediach. Ponadto wskaźniki finansowe, takie jak ROA, CR i D/E są uwzględniane w specyfikacjach modeli jako zmienne kontrolne. Badania rozszerzono o zastosowanie statystyki opisowej oraz współczynników korelacji Pearsona. Wszystkie niezbędne dane finansowe i te odnoszące się do zrównoważonego rozwoju zostały pobrane z bazy danych LSEG Eikon. **WYNIKI:** Wyniki estymacji wykazały, że: (1) wpływ zintegrowanych działań ESG na stabilność wypłat dywidendy jest istotny statystycznie i ujemny tylko w specyfikacjach modeli bez kontrowersji w zakresie ESG; (2) efekt wymiaru środowiskowego jest istotny statystycznie i ujemny tylko wtedy, gdy nie uwzględnia się innych filarów ESG; (3) efekt wymiaru społecznego jest istotny statystycznie i ujemny tylko wtedy, gdy wymiar ładu korporacyjnego i kontrowersje w zakresie ESG nie są rozpatrywane łącznie w tej samej specyfikacji modelu; (4) efekt wymiaru ładu korporacyjnego jest statystycznie istotny i pozytywny tylko wtedy, gdy inne filary są rozpatrywane razem w jednej specyfikacji modelu, zarówno bez, jak i z kontrowersjami w zakresie ESG; (5) efekt kontrowersji w zakresie ESG jest statystycznie istotny i pozytywny w każdej specyfikacji modelu. Zatem główna hipoteza badawcza nie może zostać potwierdzona, ponieważ tylko piąta szczegółowa hipoteza może zostać pozytywnie zweryfikowana we wszystkich specyfikacjach modelu. **IMPLIKACJE**: Zaleca się prowadzenie badań nad związkiem między wynikami przedsiębiorstwa w zakresie zrównoważonego rozwoju a polityką dywidendową z uwzględnieniem nie tylko powszechnie stosowanych wyników ESG, ale także wyniku dotyczącego kontrowersji w zakresie ESG. Rządy i organizacje międzynarodowe powinny współpracować z firmami dostarczającymi danych na temat wyników ESG, w tym kontrowersji w zakresie ESG, aby były one powszechnie dostępne dla wszystkich grup interesariuszy, co pomogłoby zmniejszyć lukę informacyjną. Menedżerowie przedsiębiorstw powinni zwrócić większą uwagę na prezentowanie podejmowanych inicjatyw ESG z perspektywy ryzyka, którego pozwalają one uniknąć w związku z kontrowersjami w poszczególnych wymiarach zrównoważonego rozwoju przedsiębiorstwa. **ORYGINALNOŚĆ I WARTOŚĆ**: Wartością dodaną tego artykułu jest zbadanie związku między wynikami ESG a polityką wypłat, co nie zostało wystarczająco przeanalizowane w poprzednich badaniach, zwłaszcza w kontekście kontrowersji dotyczących działań przedsiębiorstwa w wymiarze środowiskowym, społecznym i ładu korporacyjnego. Aby zredukować zidentyfikowaną w literaturze lukę badawczą, autorzy zdecydowali się na włączenie do specyfikacji modelu wyniku dotyczącego kontrowersji w zakresie ESG jako jednej ze zmiennych niezależnych, co stanowi swoistą nowość w badaniach nad polityką dywidendową.

Biographical notes

Agnieszka Matuszewska-Pierzynka, Ph.D., is an assistant professor at the Department of International Business and Trade at the Faculty of Economics and Sociology, University of Lodz (Poland). She has researched ownership transformations of state-owned enterprises, with a particular focus on employee-owned companies. However, her new research interest focuses on corporate sustainability and sustainable business strategies. She has authored many academic papers in highly-ranked international and national journals. Additionally, she has actively participated in various economics and finance conferences. What is more, she was a principal investigator of several research projects funded by the Ministry of Science and Higher Education and the University of Lodz.

Urszula Mrzygłód, Ph.D., is an assistant professor at the Department of Sustainable Market Processes at the Faculty of Economics, University of Gdansk (Poland). She specializes in financial market integration and corporate dividend policy, including dividend smoothing, financial market reactions, and alternative finance, especially drivers of crowdfunding success. She is a member of the editorial board at the Journal of Alternative Finance, has a wealth of experience in research projects financed by the National Science Centre (Poland) and the National Bank of Poland, and her works have been published in various journals, including Electronic Markets, Emerging Markets Finance and Trade, Economics & Sociology, and Bank i Kredyt.

Aleksandra Pieloch-Babiarz, Ph.D., is an assistant professor at the Department of International Finance and Investments at the Faculty of Economics and Sociology, University of Lodz (Poland). She specializes in corporate finance, dividend policy, capital markets and corporate sustainability. She has published several dozen articles in high-quality international and Polish scientific journals. She has authored several books on corporate finance and co-edited a book on entrepreneurship. Moreover, she is a reviewer in many academic journals and a member of the reviewers council of several international academic conferences. She has also been a speaker at many prestigious economic conferences. She was the head of a research project funded by the National Science Centre (Poland) and has participated as principal investigator and co-investigator in numerous research projects financed by the Ministry of Science and Higher Education and the University of Lodz.

Authorship contribution statement

Agnieszka Matuszewska-Pierzynka, Urszula Mrzygłód, and Aleksandra Pieloch-Babiarz equally contributed to this paper by writing the introduction, preparing the literature review, selecting the methodology, performing calculations, describing the results, and composing the conclusions.

Conflicts of interest

The authors declare no conflict of interest.

Citation (APA Style)

Funding liquidity on bank lending growth: The case of India

Erum Shaikh[1] (iD)*, Muhammad Nawaz Tunio[2]* (iD)
Vishal Dagar[3] (iD)

Abstract

PURPOSE: *By bridging the funding gap between funding surplus units and deficit units, financial institutions like banks play a crucial role in fostering economic development in a nation. Banks provide the crucial task of organizing individual and institutional resources and directing them to those prepared to engage in business ventures or other productive uses. The aim of this paper is to evaluate the relation between funding liquidity and bank lending growth (BLG). An empirical analysis between bank capital and the funding liquidity ratio on bank lending growth (BLG) using the generalized method of moments (GMM) approach for the sustainable business has been not identified before. Therefore, this study tries to fill this gap.* **METHODOLOGY:** *The data was collected from 59 commercial banks in India from 2010 to 2022 which comprises of 21 public sector banks, 18 private sector banks, and 20 foreign banks. The GMM approach was what we employed. This strategy is typically utilized in situations in which the distribution of the data is uncertain and there is a concern with over identification. GMM offers a consistent, asymptotically normal, and efficient estimator in comparison to all of the other estimators that merely use the information presented by the moment conditions.* **FINDINGS:** *Findings suggests that there is a significantly negative influence of bank capital and funding liquidity on bank lending. This indicates that higher capital can limit the effect of funding liquidity on the growth of the banks' loans, therefore the findings are consistent with the hypothesis that higher capital can lower the effect of funding liquidity. This study's model also reveals the significantly favorable impact that funding liquidity has on the expansion of banks' loan portfolios, which ultimately results in a more sophisticated increase in the growth rate of bank lending.* **IMPLICATIONS:** *This can be an*

1 Erum Shaikh, Ph.D. in Business Administration, Assistant Professor of the Department of Business Administration, Shaheed Benazir Bhutto University, Sanghar Campus, Sindh, Pakistan, e-mail: erumshaikh0@gmail.com (ORCID: https://orcid.org/0000-0002-3198-2786).

2 Muhammad Nawaz Tunio, Ph.D. in Entrepreneurship, Innovation and Economic Development, Assistant Professor of the Department of Business Administration, University of Sufism and Modern Sciences, Bhitshah, Sindh, Pakistan, e-mail: mntunio@gmail.com (ORCID: https://orcid.org/0000-0003-1376-5371).

3 Vishal Dagar, Ph.D. in Economics, Assistant Professor of the Department of Economics, Amity School of Economics, Amity University, Noida – 201 301, India, e-mail: vdagar@vf.amity.edu (ORCID: https://orcid.org/0000-0001-5032-1783).

*importance piece of information for policy makers in taking accurate decisions to induce the BLG in the presence of an interactive association of funding liquidity and the lending growth rate at different capital levels. We found that the banks' lending growth rate is significantly influenced by its past values with a significant p-value of less than 1%. The findings imply that capital funds and liquidity funds support the BLG rate in India by strengthening and neutralising the risk involved and absorbing the losses generated by stressed assets. **ORIGINALITY AND VALUE:** This study makes a significant contribution to the creation of a more in-depth understanding of the potential relationship between banks' funding liquidity, capital funds, and bankers' lending behavior, in particular with reference to developing market nations like India.*

Keywords: funding liquidity, generalized method of moments, GMM, system GMM, bank capital, bank lending growth, liquidity

INTRODUCTION

This study aims to find out the relation between Funding Liquidity and Bank Lending Growth (BLG). In order to answer this question, a quantitative approach was used to collect and analyze the data. This study can be useful for the financial institutions of India and international institutions, which have an impact on the economy of the country and its international trade. India is a vibrant and emerging economy in the region and has international importance because of its tourism, film industry, and technological growth. Therefore, India was chosen for this study, and emerging scholars, research students, think tanks, policy makers, and financial analysts can be the greater audience.

Financial institutions like banks play a pivotal role in fuelling the economic development of a country by bridging the gap between funding surplus units and deficit units. Banks serve the essential function of mobilizing the savings of individuals and institutions, and channelling them to those individuals and institutions willing to invest in economic activities or in other productive use. Both the existing theoretical and empirical literature suggest that bank lending is a fundamental process that fuels economic growth by creating jobs, fulfilling demands, and thereby enhancing the living standard of people. Moreover, banks create liquidity during this transformation process by holding illiquid assets, financing long-term bank assets (loans) with short term liabilities (bank deposits), and fulfilling the liquidity requirements of an economy (Diamond & Dybvig, 1983; Staszkiewicz & Werner, 2021). This transition at times, may leave banks susceptible to funding liquidity risk when these long-term assets and short-term liabilities misalign. Nevertheless, this misalignment, which is known as funding liquidity risk in the theory of banking, is known to have played a key role in nearly all historical banking crises. Evidently, the global financial crisis of

2007–2009 illustrated how a funding liquidity crisis led to a severe inter-market collapse (Drehmann & Nikolaou, 2013; Bhattarai & Subedi, 2021).

In the upshot of the global financial crisis of 2007–2009, bank liquidity became one of the prominently explored areas for setting up global financial regulatory reforms. The Basel III accord (2010) introduced new liquidity coverage ratios, capital regulations, and net stable funding ratio measures to ensure the stability and soundness of banking systems and do away with the dangers of liquidity crunches in the short run. However, it was uncertain whether the new funding liquidity requirements and other crucial capital regulatory reforms would ensure the stability of the banking sector in the long run (Fidrmuc & Lind, 2020; Basten, 2020; Nguyen et al., 2019; Allen et al., 2012; Singh, 2019). Many academicians argued that the regulatory reforms may prove to be a costlier precaution than handling a financial crisis after it has taken place.

As far as role of liquidity is concerned, the literature strongly supports that it plays a key role in the stability and soundness of the banking industry. However, the source of liquidity redefines their interrelations and magnitude of impact on its performance in different business cycle horizons. Brunnermeier and Pedersen (2009) in their study found a mutually reinforcing association between market liquidity and funding liquidity. That is, if banks face a phenomenon of tight funding liquidity, they become reluctant to take capital intensive positions even in high edge securities. This eventually cuts market liquidity and leads to even higher volatility, which in turn increases the cost of lending given the Basel III regulatory norms that are in place.

The global financial environment has recently gone through an overall downfall due to volatile crude prices, geographical tensions, and escalating trade wars. As far as other emerging market economies (EMEs), banks profitability has been impinged due to the weak loan growth and high delinquencies. To address the situation, monetary policies have turned to be accommodative and no more regulative, so as to counter the global slowdown and prevent its deepening in their respective countries. Moreover, to get aligned with Basel III requirements, building up bank capital and liquidity buffers are the crucial on-going regulatory reforms all over the world. At the same time, witnessing the fall in bank lending and other financial fragility globally, this has attracted most of the research in the area.

Moreover, as far as availability of funding liquidity and its impact over the lending behavior of banks is concerned, very little is known to date. On the one hand, there is considerable agreement that it significantly moderates commercial banks' lending (Dahir et al., 2018a; Mor et al., 2020; Yusoff et al., 2021), while on the other hand, a large amount of literature exists that does not support the fact and states that funding liquidity exerts a moderate impact on bank lending. However, there are no established relationships that have been identified

between these variables to date. The impact of funding liquidity on the lending growth rate in developed countries and BRICS (Brazil, Russia, India, China, and South Africa) countries taken together is significantly negative, whereas the same is insignificant for many emerging market economies, including India. To fill this existing gap in the literature, we have undertaken this study to develop a better understanding of the potential relation between banks funding liquidity, capital funds and bankers' lending behavior, especially in reference to emerging market economies like India. In this context, funding liquidity is considered to be the ability of an individual bank to arrange funds as and when the agreed-upon payments become due with no extra cost incurred (Drehmann & Nikolaou, 2013).

Overview of lending practices of Indian commercial banks

The Indian economy is engrossed by unprecedented economic slowdown and financial fragility in the recent past, which has caused a sharp decline in real fixed investments induced by a sluggish growth of real consumption in the country. Deceleration in the bank lending growth (BLG) rate is witnessed across all major non-food credit segments, mostly in the service sector. Credit growth rate to the MSME (micro, small, and medium enterprises) sector has eventually turned negative (Economic Survey, 2019–20). Apart from the repercussions of other empirically tested explanatory factors, such decline can also be attributed to the growing risk aversion of banks and built up NPAs (non-performing assets), despite the admission of more than 2000 industry insolvency resolutions since 2017. Moreover, monetary transmission remained weak during this period on all three accounts viz. rate structure, term structure and credit growth (Kumar, 2020).

Recent improvements in the asset quality and profitability of the banking sector are at an amorphous stage. In 2017–18, RBI put forward a revised framework with the Insolvency and Bankruptcy Code (IBC) as a focal point in the pursuit of declogging banks' balance sheets from the overhang of stressed assets. The capital ratios of public sector banks have witnessed an improvement due to recapitalization. To summarise, it can be said that the Indian banking sector is supposed to be stronger due to extra capital cushions for shock absorption, a more stable liquidity status, and streamlining of stressed assets. Confoundingly, on the other hand, banks seem to be reluctant to lend (RBI, 2019). This possible waning of confidence and reluctance to infuse lending can take a heavy toll on overall economic activities.

Figure 1 shows the bank lending growth rate and the growth of deposits in scheduled commercial banks in India over the years. The lending growth has constantly been falling and has been the lowest (i.e., 2.65 in 2021) when the deposit growth rates have shown converse trends, which can be associated with the fact that demonetization in the country led to people withdrawing large

amounts from their bank savings accounts due to concerns about it losing its value. The lowest growth during this period could be explained by the reduced demand for consumption of durables and other luxury goods combined with a fall in demand for institutional loans by producers and industries. Also, post the global financial crisis, the Basel committee made stringent regulations about maintaining minimum capital and a liquidity coverage ratio, which led to a huge induction of capital and liquidity to the banking system all over the world, including the Indian banking sector, since 2016. However, it did not seem to have a positive impact on the BLG rate. Now, the question is, when the literature strongly suggests that capital and liquidity are expected to increase the BLG, why are the actual results varying from the bank theory?
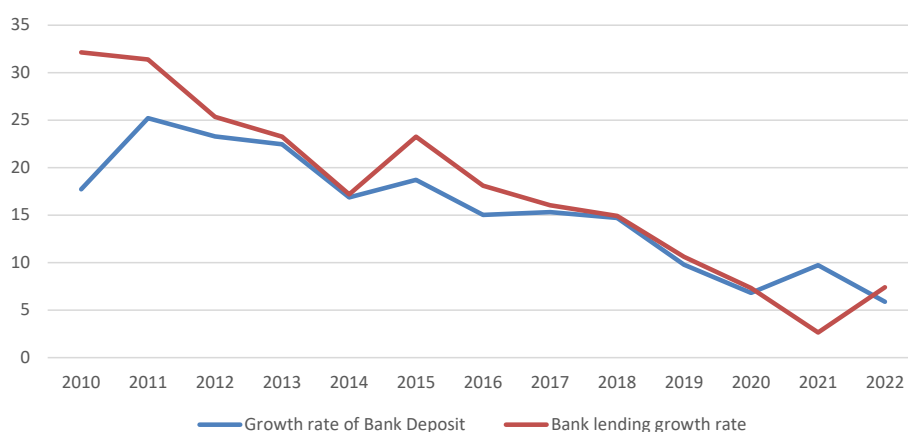
Figure 1. Growth in bank lending and bank total deposits

Source: RBI database and author's own calculations.

At this juncture, it becomes very important to analyze why recapitalization, insolvency and the bankruptcy code, and even regulatory reforms to improve the bank liquidity status, could not solve the problem of the reluctance of bankers to lend more. In our study we have tried to contribute to the on-going debate by bridging the gap between the existing literature and banks' lending behavior in the real world.

The primary objectives of our study are to establish a relation between funding liquidity and BLG in the context of India and how the relation is being reiterated in the presence of bank capital. We have also established a relationship between bank capital and lending growth. The paper contributes to the literature in the following ways. Firstly, it checks the validity of the existing literature on the effect of funding liquidity, bank liquidity and bank capital on BLG and their

implications in the context of India. We have also explored the iterations made by recapitalization on the association between funding liquidity and BLG in the context of India.

Our study bridges this gap by empirically testing the inter-relation hypothesis among funding liquidity, banks capital, and bank lending behavior of scheduled commercials banks in India. The remaining paper is organized as follows: Section II describes the review of the relevant literature. Section III and Section IV present the research methodology and discussion of empirical results, respectively. Section V reports the conclusion and policy implications.

LITERATURE REVIEW

The global financial crisis in 2007–2009 unveiled the phenomenon of regulatory and institutional shortcomings in liquidity risk management at individual institutions (IMF, 2010). A slowdown in global growth and domestic growth impulses in the recent past has also affected bank credit growth. The effects can also be viewed in many emerging markets economies (EMEs). Consequently, the global regulatory environment has undergone directive improvements in banks' liability side items to strengthen the bank credit growth and thereby strengthen the overall economy. Bank regulators' committees recognized the importance of bank capital and the availability of sufficient funding liquidity. In line with this, the Basel Committee introduced regulations to maintain appropriate liquidity and capital. The Basel III framework can be understood as an evolution, largely drawn from the existing Basel II framework, with the objective to build a strong capital base for banks and ensure comprehensive liquidity and leverage ratios to avoid a deepening of an ongoing slowdown or the early development of any financial fragility which can lead to a stressful financial crisis in the future. The underlined objective of the Basel III accords is to ensure the safety and stability of the global banking system.

There is growing literature on the factors affecting the bank credit growth in EMEs, particularly after the recent global financial crisis. The association of bank specific variables and macroeconomic variables with bank lending behavior has been immensely explored by many academicians. Matousek and Solomon (2018) empirically tested the dynamic effects of monetary shocks over the loans by large banks, highly liquid banks, and highly capitalized banks. They found that large banks and higher capitalized banks are comparatively less affected by monetary shocks, whereas the loan disbursement by highly liquid banks is not affected (Matousek & Solomon, 2018; Migliorelli, 2021). King et al. (1993) cite a significant association between the size of the financial system of the country and the level

of the country's economic development, emphasizing the increasing role of financial intermediation, in banks in particular (King & Levine, 1993).

Many studies have explored bank liquidity and the consequences of bank liquidity risk, but very few have talked about funding liquidity so far. The IMF Financial Stability Report 2010 defined funding liquidity as "the ability of a solvent institution to make agreed-upon payments in a timely fashion." In other words, funding liquidity can be defined as the degree of freedom and economic efficiency in the borrowing of financial assets by financial institutions.

Acharya and Naqvi (2012) studied how macroeconomic risk alters the availability of funding liquidity with banks and thereby encourages them to invest in more risky assets. They argue that when there is high macroeconomic risk in the economy, investors avoid direct investments in the financial assets market – rather they perceive bank demandable deposits to be a safer outlay to invest with. Therefore, excessive liquidity induces more risk-taking behavior on the part of the bank (Acharya & Naqvi, 2012; Gatey & Strahan, 2006; Myers & Rajan, 1998).

Hugonnier and Morellec (2017) explored the relationship between bank capital, liquid reserves and insolvency risk, and found that the choice of bank policy for imposing liquidity requirements lowers the bank losses in default by increasing the likelihood of default. Whereas combining liquidity requirements with leverage requirements was found to reduce both the likelihood of default and the total bank losses in default.

As far as emerging economies are concerned, studies conducted on the analysis and implications of funding liquidity lack empirical evidence. Several of the recent studies talk about funding liquidity risk and its effects on bank lending behavior and its performance (Khan et al., 2017; Drehmann & Nikolaou, 2013; Umar & Sun, 2016; Dahir et al., 2018b; Motkuri & Mishra, 2020), but most of the propositions and hypotheses drawn have mostly been empirically tested on the banking systems of developed countries. A few which have empirically tested such propositions on BRICS countries or other EMEs like Vietnam and others, have broadly ignored the fact that some such EMEs (like India), which were slightly resilient to the recent global crisis, are likely to exert a different behavior (Dahir et al., 2018b)

Moreover, the joint effect of capital levels and funding liquidity on loan growth and the interaction effect of these two vital factors have been raised lately. Dahir et al. (2018b) explored such a relation in data pertaining to BRICS countries (Brazil, Russia, India, China, and South Africa) and paved the way for further exploration in this area. However, based on our empirical results, we found the conclusions are quite contradictory if tested on Indian commercial banks' lending behavior. Averaging out of the variables from various BRICS countries seems to have created such implications.

To sum up, broadly the theories of empirical implications of funding liquidity on bank lending are based on developed economies and BRICS countries. These implications seem to veriate when tested for India. Based on these existing propositions, we have tested the following hypothesis[4:]

H1: Funding liquidity and banks' lending behavior has a positive association in the context of India.

Plenty of literature supports the hypotheses, suggesting the availability of sufficient deposits leads to an increase in the BLG (Acharya & Naqvi, 2012). In addition, evidence shows that adequate funding liquidity saves banks from possible exposure to a liquidity crisis, which may further lead to bank crises (Acharya & Merrouche, 2013). However, regulatory liquidity seems to have a contradictory impact over bank lending as it is a compulsory reserve that banks need to maintain, which in turn leads to reduce the lending (Korzeb & Samaniego-Medina, 2019). Thus, funding liquidity exerts a negative impact over the growth rate of bank lending.

H2: Banks with higher capital tend to increase their loan growth rate.

Košak et al. (2015) studied the impact of tier 1 capital and tier 2 capital on bank lending growth and reported a very interesting set of findings. The authors concluded that tier 1 capital had a significantly positive impact over bank lending during the recent financial crisis, whereas tier 2 capital did not show any such associations. In the same line, Ibrahim and Rizvi (2018) found no such significant impact of bank capital on their lending behavior during the 2007–2009 global financial crisis, under both the banking systems vis. the conventional banking system, as well as the Islamic banking system (Ibrahim & Rizvi, 2018). Therefore, the conventional literature on linkage between bank capital and BLG does seem conclusive.

However, Basten (2020) claimed that a higher bank capital requirement may cause a fall in the BLG rate as it evidently calls for a higher mortgage price. Also, a high capital requirement may affect the economy adversely as it prevents the extension of more lending (Fidrmuc & Lind, 2020; Karkowska, 2019).

H3: The impact of funding liquidity on BLG is positively associated with different levels of bank capital.

---

4 Hypothesis are borrowed from empirical study conducted by Dahir A. M., Mahat, Razak, & Bany-Ariffin A. N. (2018) to explore the association between bank capital, funding liquidity and BLG in emerging economies using the LSDVC approach on BRICS countries. A attemt has been made to anayse the variation in results when India is taken in Isolation and constucted a detailed anaysis and indentify the causes therof.

The literature suggests that adding an interaction term to the analytical model greatly expands the understanding of the relationships among the variables in the model. Inclusion of an interaction term (i.e., capital) in an analytical model provides a better representation and understanding of the existing relationship between funding liquidity and BLG. We have attempted to analyze how the induction of more capital has affected the positive association between funding liquidity and BLG during the period 2010–2022 in India.

Not much work has been done so far on the integration effect of bank capital and funding liquidity. However, Dahir et al. (2018a) empirically tested the association between the effect of funding liquidity on the lending practices of bank and the level of bank capital in BRICS countries, and claimed that a fall in funding liquidity is positively associated with bank capital.

METHODOLOGY AND RESEARCH METHODS

In this section we present the econometric model and empirical estimations to examine the lending behavior of commercial banks in India. Moreover, we also discuss the data specifications and variable measures. Existing empirical work done on identifying factors determining an individual bank's lending behavior over the years suggests a dynamic panel model. It is believed that the current year's lending decisions are normally dynamic in nature, as previous years' lending decisions, along with other explanatory variables, may affect their lending behaviors. Hence, to explore the bank lending behavior, we employed the dynamic panel data approach which is represented by the following equation:

$$blg_{it} = \alpha_0 + \rho_1 * blg_{it-1} + \beta_1 * ful_{it} + \beta_2 * pcap_{it} + \beta_3 * (ful_{it} * pcap_{it}) + \beta_4 * liq_{it} + \beta_5 * size_{it} + \phi_i Y_{t} + \varepsilon_{it}$$

$$(1)$$

Where blg_{it} is BLG as a proxy for bank lending behavior, blg_{it-1} is lagged BLG of commercial banks chosen to study. ful_{it} and $pcap_{it}$ represents the funding liquidity and the proxy for bank capital respectively. $ful_{it} * pcap_{it}$ is an interaction variable, which intends to capture the effect of funding liquidity when banks are recapitalised and bank capital increases suddenly due to an external force.

Liquidity and bank size is measured by liq_{it} and $size_{it}$ respectively. We also control the time effect in our model. Y_t is the vector of the time effect for year 2010 to 2022. We have studied the impact of funding liquidity, bank capital and the interaction effect of bank capital and funding liquidity on BLG rate of banks in India. We have controlled the other bank specific variables like liquidity, bank size and other exogenous macroeconomic variable in our model. Anything kept

constant or constrained in a research study is referred to as a control variable. Despite not being relevant to the study's goals, this variable is controlled because it might have an impact on the results. Designing well-defined empirical testing of causal effects requires careful consideration of the selection of acceptable control variables (Whited et al., 2022; Abbas et al., 2023).

Estimation method

The inclusion of the lagged dependent variable as the explanatory variable allows dynamic adjustments in an econometric model. However, it gives rise to the problem of endogeneity as the lagged variable is correlated with the dependent variable. To take care of an endogeneity issue, Das (2019) suggested two alternative methods viz. instrumental variable (IV) methods and the generalised method of moments (GMM) to be very useful. Also, the GMM estimator has become very popular in the area of finance as it provides asymptotically efficient inference by using a minimal set of statistical assumptions.

The generalized method of moments (GMM), utilized to estimate the dynamic panel data and solve the endogeneity, heteroskedasticity and serial correlation problem, turns out to be a handy and useful instrument in the area of banking and finance. The estimator is also known as the Arellano-Bond estimator, used to estimate the dynamic panel models. It contains both the levels and the first difference GMM estimator. But when the variance of fixed effect term across observations is high or in cases when the stochastic process is approaching random walk, this estimator may produce biased results in finite samples. To address this problem, Blundell and Bond (1998) derived a condition in which the estimator allows an additional set of moment conditions. This configuration helps to improve the performance of estimators (Blundell & Bond, 1998).

Moreover, by removing the bias generated by panel models, system GMM is known for generating efficient and consistent estimates (Dahir et al., 2018a). It also allows the use of multiple instruments, which is one of the biggest advantages in the comprehensive analysis of the problem. The consistency of the system GMM estimator depends on two specification tests viz. the Sargan–Hansen test for over-identification restrictions and a serial correlation test of the error terms.

Furthermore, our paper covers a panel of 59 scheduled commercial banks comprising of 21 public sector banks, 18 private sector banks, and 20 foreign sector banks. The dataset is considered small; however, it has a balanced ownership representation.

Data measurement and estimation

In this section, definitions, abbreviations, variable estimations, and their expected signs have been discussed. Our sample consists of 59 scheduled commercial banks in India for the period 2010–2022. The data has been collected from the RBI databank. The final dataset is a strongly balance panel. Moreover, the original dataset included nearly 90 commercial banks including 26 public sector banks (six State Bank of India and associates were merged and converted to one bank in 2018), 21 private sector banks and 47 foreign banks for which the database was available for the years 2010 to 2022. However, we dropped banks that were closed during the study period or established in between to avoid the omitted and unnecessary data outliers. In doing so, the data became a strongly balanced panel of 59 banks having 12 years observations for each subunit.

We used the BLG rate (a proxy for bank lending behavior) as the dependent variable, following previous studies (Kim & Hohn, 2017; Ibrahim & Rizvi, 2018; Vo, 2018). The BLG rate can be defined as a variation of banks gross loans from year t to t-1 (Ibrahim & Rizvi, 2018; Vo, 2018).

The explanatory variables used in the model are funding liquidity and bank capital. Funding liquidity has been defined in the literature as the degree of freedom and economic efficiency in the borrowing of financial assets by financial institutions. It is related to the ability of a bank to pay-off the liability as and when they become due in a timely manner. To study its impact, we have taken the ratio of total bank deposits and total assets as the proxy for funding liquidity (Khan et al., 2017; Dahir et al., 2018a; Shaikh et al., 2021a; Shaikh et al., 2021b). Distinguin et al. (2013) suggest a negative and significant impact of funding liquidity on the lending behavior of banks in BRICS countries.

The ratio of total bank capital divided by total assets is used as the proxy for capital (Dahir et al., 2018a). The theoretical literature suggests a significant and positive impact of the capital ratio on the BLG rate of commercial banks (Fidrmuc & Lind, 2020; Karkowska, 2019; Govindarajo et al., 2021).

Moreover, bank size is expected to exert a significant association with bank lending behavior, funding liquidity, and bank capital. Hence, to analyze the partial effect of our explanatory variables, we took bank size as well as the liquidity ratio as the control variables. The literature suggests bank size is likely to have a positive impact on BLG (Dahir et al., 2018a; Dahir et al., 2018b). The natural log value of the total assets of the bank has been taken as the proxy for bank size. The liquidity ratio is calculated by dividing the liquid assets of the bank with the bank's total assets (Diamond & Dybvig, 1983; Dahir et al., 2018a; Xiang et al., 2022; Raza et al., 2022).

The liquidity has been defined by the RBI as the sum total of cash with the bank, balances with the RBI, balances in current accounts with other banks,

money at call and short notice, interbank placements (within 30 days), and security held under the heading "held for trading and available for sale." Bank liquidity is expected to exert a positive impact on the BLG rate (Khan et al., 2017). Considering the macroeconomic variables like GDP growth rate, inflation level over the years and other time related disturbances, a time effect model has been employed. The time effect model captures the long-run, cross-section, invariant disturbances and produces unbiased results. Further interaction effects between funding liquidity and bank capital have been studied. Dahir et al. (2018b) examined such an effect on BRICS countries in their study using the LSDVC approach and found that the effect of a decrease in funding liquidity on BLG has a positive relation with bank capital.

RESULTS AND DISCUSSION

In this section, the described statistics and correlation matrix analysis of variables of interest are discussed. A detailed system GMM estimation results and robustness check estimators are also reported. Table 1 represents the descriptive statistics of bank lending behavior (BLG ratio) and the independent variables used in dynamic panel data analysis. Table describes the independent variable with a short description in column 1. These values of 767 observations are in ratio, except the natural log of total bank assets which is in crore.

Table 1. Summary statistics

Variable	Description	Mean	Median	Std Dev	Minimum	Maximum	Observations
blg_{it}	BLG (%)	0.2268	0.1816	0.4802	-0.7607	9.5651	767
ful_{it}	Funding liquidity (ratio)	0.7174	0.8066	0.1888	0.0692	0.9257	767
$pcap_{it}$	Capital (ratio)	0.073023	0.098821	0.204871	-0.409020	0.328513	767
liq_{it}	Liquidity (ratio)	0.1335	0.0843	0.1373	0.0156	0.7994	767
$size_{it}$	Natural log of bank assets (in crore)	10.1840	10.7548	2.4132	3.4037	15.0553	767

It shows that the BLG has a mean value of 0.22, which is ranging from -0.76 to 9.56 with a standard deviation score of 0.48, suggesting that bank lending in India roughly grows at a 0.22 rate annually. The average funding liquidity is 71% with a variability 18.89% which is ranging between 6% and 92%. It suggests that there is a high degree of variation among the funding liquidity content in various banks. The capital has a 0.73 mean value ranging from -0.40 capital to 0.3285 and variability of 20.48%. The liquidity ratio, having an average value of 13.35% with variability of 13.73%, ranges from 1.56% to as high as 79.9%. Moreover,

the size of the commercial banks in Indian seems to be quite stable as the mean and median values are very close to each other with a variability of 2.41 units. However, it ranges from 3.40 to 15.055, depicting a significant size difference among the public, private, and foreign bank holdings.

Table 2 reports the correlation matrix of the dependent and the independent variables. It describes that the dependent variable is negatively correlated with most of the variables in our study except bank capital, suggesting the BLG is expecting to have increasing trends when funding liquidity, bank liquidity, and size are reducing. Similarly, funding liquidity seems to have a negative correlation with bank capital and bank liquidity. Bank capital shows a positive association with BLG and bank liquidity, suggesting an increase in bank capital supports the BLG and bank liquidity to absorb the shocks.

Table 2. Correlation matrix analysis

Variable	blg_{it}	ful_{it}	$pcap_{it}$	liq_{it}	$size_{it}$
blg_{it}	1				
	-0.14**				
ful_{it}	(.829)	1			
	0.8**	-0.65**			
$pcap_{it}$	(.223)	(1.344)	1		
	-0.2**	-0.2**	0.4**		
liq_{it}	(1.334)	(1.343)	(1.233)	1	
	-0.1**	0.47**	-0.7**	-0.65**	
$size_{it}$	(1.223)	(0.3482)	(0.340)	(0.2338)	1

Empirical linear regression analysis

Table 3 reports the results of our estimation model using the system GMM estimations. We had 708 observations (excluding the missing values), with 59 groups (banks) having 12 observations per group, indicating a strong panel. The model reports a Windmeijer bias-corrected (WC) robust standard error to ensure the robustness of estimators. The results indicate that the lagged dependent variable (BLGt-1) is positive and statistically significant at 1% significance level, suggesting that bank lending in Indian banks is sustained for the next year. It indicates the commercial banks in India are persistent as far as their lending decisions are concerned. As far as explanatory variables are concerned, bank capital and its interaction effect on the relation of funding liquidity with bank lending are significant at a 10% significance level.

It shows that bank capital indeed has a positive impact on bank lending and is also significantly associated with the relationship between funding liquidity and the banks' lending decisions. Hence, we reject H1, which hypothesized a significant positive relation between funding liquidity and BLG. However, we do

not reject H2, which postulates a positive and significant impact of bank capital on bank lending, suggesting an increase in bank capital significantly contributes to the further growth of bank lending. Also, we reject H3, which hypothesizes that the effect of funding liquidity on BLG is positively associated with the level of bank capital. The interaction effect of funding liquidity and bank capital on BLG is considerably greater than their individual effects.

Table 3. System GMM estimation results

blg	Coeff.	WC-Robust Std. Error	t value	p> t	[95% confidence. Interval]	
Blg$_{it-1}$	0.9885	0.2879	3.43	0.001***	0.4121	1.5649
Ful$_{it-1}$	0.2297	0.2353	0.98	0.333	-0.2412	0.7008
Pcap$_{it-1}$	5.1419	2.8270	1.82	0.074*	-0.5170	10.8010
Liq$_{it-1}$	0.9622	0.2548	3.78	0.000***	0.4529	1.4724
Ful$_{it-1}$*pcap$_{it-1}$	-12.6430	6.6451	-1.90	0.062**	-25.9448	0.6587
Size$_{it-1}$	0.001853	0.0207	0.09	0.929	-0.0397	0.0434
Year						
2010	-0.1273	0.1382	-0.92	0.361	-0.4041	0.1494
2011	-0.2201	0.0978	-2.25	0.028**	-0.4159	-0.0243
2012	-0.0016	0.1101	-0.02	0.988	-0.2221	0.2187
2013	0.1068	0.1166	0.92	0.364	-0.1266	0.3403
2014	-0.1810	0.1087	-1.66	0.101	-0.3987	0.0366
2015	-0.0745	0.1000	-0.75	0.459	-0.2748	0.1256
2016	-0.0658	0.1049	-0.63	0.533	-0.2759	0.1443
2017	-0.0395	0.1112	-0.36	0.724	-0.2622	0.1832
2018	-0.1081	0.1059	-1.02	0.312	-0.3202	0.1039
2019	-0.0293	0.1500	-0.20	0.846	-0.3297	0.2710
2020	0.0239	0.1463	0.16	0.871	-0.2690	0.3168
_cons	-0.2067	0.3481	-0.59	0.555	-0.9036	0.4901

Note: * p<0.1, ** p< 0.05, ***p< 0.01.

A significant ρ-value of the interaction term coefficient depicts that the linear relationship between funding liquidity and BLG changes with a variation in the level of capital. Our results show that a high capital level reduces the effects of funding liquidity on BLG. This impact can be associated with the fact that the recent recapitalization of under-performing public sector banks could not increase their lending performance by much. The capital, so induced (given a resulting increase in funding liquidity in 2017 due to demonetization), was

sufficient to meet the minimum capital maintenance regulations and had no significant positive impact over the correlation between funding liquidity and BLG. Moreover, the liquidity seems to exert a positive and highly significant impact with a 0 p-value, indicating the increase in bank liquidity leads to an increase in the BLG rate.

The theories revealed by earlier studies conducted on developed economies, other emerging market economies, and BRICS countries to check the impact of funding liquidity on bank lending, do not go in line with the Indian banking system. For example, Dahir et al. (2018b) found a significant and negative impact of funding liquidity on BLG; however, we found it to be insignificant (p-value 0.3330) and positive.

To check the robustness of the results, we have employed the WC robust standard error, which ensures the estimation is producing unbiased and robust results. To check the consistency of results given by system GMM estimations, the Sargan–Hansen test of over identification of instrument variables and a serial correlation test are performed. The Sargan–Hansen test for over-identification restrictions has been used to detect whether the model is well specified, by analyzing the overall validity of instruments used that shall not be correlated with the error term.

The null hypothesis for the Sargan–Hansen test is that over-identifying restrictions are valid. We do not reject the null hypothesis with chi2 (2) value 0.7203 (p-value 0.72) and chi2 (2) value 2.3502 (p-value 0.30) at 2 step weighting matrix and 3-step weighting matrix respectively. It implies that the model is appropriately specified. For the serial correlation test of the error terms we reject the null hypothesis, which states that there is no first order serial correlation (AR (1)) with a p-value of 0.0000 for order 1, whereas we do not reject the null hypothesis stating that the second order serial correlation does not exists in disturbances (AR (2)) with a p-value of 0.2045.

CONCLUSION

Commercial banks are the most important financial intermediaries because of their size and role in the financial markets. Hence, lending practices of commercial banks have a crucial and significant impact over the growth and development of industries and production units and thereby growth and development of the country. Considering India's experiences with BLG and various key policy measures taken by policy makers in recent time, we have analyzed how the bank's lending policy reacts to various levels of funding liquidity and capital. The findings suggest that there is a significantly negative impact of bank capital and funding liquidity on bank lending, which shows that higher capital can reduce

the effect of funding liquidity on the loan growth of the banks. The model of this study also exposes the significantly positive impact of funding liquidity on the loan growth of the banks which leads to the sophisticated growth in bank lending growth rate. This study develops a better understanding of the potential relation between banks funding liquidity, capital funds and bankers' lending behavior, especially in reference to emerging market economies like India.

Practical implications

The findings revealed that funding liquidity in the context of India does not have any significant impact on the banks' lending behavior. Conversely, bank capital has a significant positive impact on bank lending, which suggests that an increase in capital increases the bank loan growth rate. Besides, bank liquidity also has a significant positive impact on the BLG rate, suggesting the banks' lending rates improve with the increase in bank liquidity funds.

Theoretical implications

The presence of interaction effects in our model explains how funding liquidity and different levels of capital work together to determine the BLG of commercial banks in India. A significant value of β3 represents a strong positive impact of capital levels on the association of funding liquidity on BLG. It can be interpreted as the effect of funding liquidity on lending behavior of banks is different depending on different levels of bank capital. Further, we discovered that the impact of funding liquidity on such lending reduces at high capital levels. In other words, the impact of funding liquidity is significantly conditioned over the different levels of bank capital.

This can be an importance piece of information for policy makers in taking accurate decisions to induce the BLG in the presence of an interactive association of funding liquidity and the lending growth rate at different capital levels. Moreover, the inclusion of a lagged BLG rate as an explanatory variable allows us to check the impact of past lending practices of banks on the current year's lending rate under the dynamic settings of the econometrics model. We found that the banks' lending growth rate is significantly influenced by its past values, with a significant p-value of less than 1%. The findings imply that capital funds and liquidity funds support the BLG rate in India by strengthening and neutralizing the risk involved and absorbing the losses generated by stressed assets.

Furthermore, our study provides important implications for academicians and policy makers to appreciate the role of funding liquidity. Our future recommendations are to check more robustness of the model and that some macroeconomic variables can be added to this model.

Acknowledgments

References

Abbas, F., Ali, S., & Ahmad, M. (2023). Does economic growth affect the relationship between banks' capital, liquidity and profitability: Empirical evidence from emerging economies. *Journal of Economic and Administrative Sciences, 39*(2), 366-381. https://doi.org/10.1108/JEAS-03-2021-0056

Acharya, V. V., & Merrouche, O. (2013). Precautionary hoarding of liquidity and interbank markets: Evidences from subprime crisis. *Review of Finance, 17*(1), 107-160. https://doi.org/10.1093/rof/rfs022

Acharya, V., & Naqvi, H. (2012). The seeds of a crisis: A theory of bank liquidity and risk taking over the business cycle. *Journal of Financial Economics, 106*(2), 349-366. https://doi.org/10.1016/j.jfineco.2012.05.014

Allen, B., Chan, K. K., Milne, A., & Thomas, S. (2012). Basel III: Is the cure worse than the disease? *International Review of Financial Analysis, 25*(5), 159-166. https://doi.org/10.1016/j.irfa.2012.08.004

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies, 58*(2), 277-297. https://doi.org/10.2307/2297968

Basten, C. (2020). Higher bank capital requirements and mortgage pricing: Evidence from the counter-cyclical capital buffer. *Review of Finance, 24*(2), 453-495. https://doi.org/10.1093/rof/rfz009

Bhattarai, G., & Subedi, B. (2021). Impact of COVID-19 on FDIs, remittances and foreign aids: A case study of Nepal. *Millennial Asia, 12*(2), 145-161. https://doi.org/10.1177/0976399620974202

Blundell, R., & Bond, S. (1998) Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics, 87*(1), 115-143. https://doi.org/10.1016/S0304-4076(98)00009-8

Dahir, A. M., Mahat, F. B., & Ali, N. A. B. (2018). Funding liquidity risk and bank risk-taking in BRICS countries: An application of system GMM approach. *International Journal of Emerging Markets, 13*(1), 231-248. https://doi.org/10.1108/IJoEM-03-2017-0086

Dahir, A. M., Mahat, F., Razak, N. H. A., & Bany-Ariffin, A. N. (2019). Capital, funding liquidity, and bank lending in emerging economies: An application of the LSDVC approach. *Borsa Istanbul Review, 19*(2), 139-148. https://doi.org/10.1016/j.bir.2018.08.002

Das, P. (2019). *Econometrics in Theory and Practice. Analysis of Cross Section, Time Series and Panel Data with Stata 15.1*. Singapore: Springer. https://doi.org/10.1007/978-981-32-9019-8

Diamond, D. W., & Dybvig, P. H. (1983). Bank runs, deposit insurance, and liquidity. *Journal of Political Economy, 91*(3), 401-419. https://doi.org/10.1086/261155

Distinguin, I., Roulet, C., & Tarazi, A. (2013). Bank regulatory capital and liquidity: Evidence from US and European publicly traded banks. *Journal of Banking & Finance, 37*(9), 3295-3317. https://doi.org/10.1016/j.jbankfin.2013.04.027

Drehmann, M., & Nikolaou, K. (2013). Funding liquidity risk: definition and measurement. *Journal of Banking & Finance, 37*(7), 2173-2182. https://doi.org/10.1016/j.jbankfin.2012.01.002

Fidrmuc, J., & Lind, R. (2020). Macroeconomic impact of Basel III: Evidence from a meta-analysis. *Journal of Banking & Finance, 112*(3), 105359. https://doi.org/10.1016/j.jbankfin.2018.05.017

Gatey, E., & Strahan, P. (2006). Banks, advantage in hedging liquidity risk: Theory and evidence from the commercial paper market. *Journal of Finance, 61*(2), 867-892. https://doi.org/10.1111/j.1540-6261.2006.00857.x

Government of India, Ministry of Finance. (2020). *Economic Survey 2019-2020*. New Delhi: India.

Govindarajo, N. S., Kumar, D., Shaikh, E., Kumar, M., & Kumar, P. (2021). Industry 4.0 and business policy development: Strategic imperatives for SME performance. *Etikonomi, 20*(2), 239-258. https://doi.org/10.15408/etk.v20i2.20143.

Hugonnier, J., & Morellec, E. (2017). Bank capital, liquid reserves and insolvency risk. *Journal of Financial Economics, 125*(2), 266-285. https://doi.org/10.1016/j.jfineco.2017.05.006

Ibrahim, M. H., & Rizvi, S. A. R. (2018). Bank lending, deposits and risk-taking in times of crisis: A panel analysis of Islamic and conventional banks. *Emerging Markets Review, 35*(2), 31-47. https://doi.org/10.1016/j.ememar.2017.12.003

IMF. (2010). *Financial Stability Report International Monetary Fund, Washington*, D.C., United States.

Karkowska, R. (2019). Business model as a concept of sustainability in the banking sector. *Sustainability, 12*(1), 1-1. https://doi.org/10.3390/su12010111

Khan, M. S., Scheule, H., & Wu, E. (2017). Funding liquidity and bank risk taking. *Journal of Banking & Finance, 82*(9), 203-216. https://doi.org/10.1016/j.jbankfin.2016.09.005

Kim, D., & Hohn, W. (2017). The effect of bank capital on lending: Does liquidity matter?. *Journal of Banking and Finance, 77*(4), 95-107. https://doi.org/10.1016/j.jbankfin.2017.01.011

King, R. G., & Levine, R. (1993). Finance, entrepreneurship and growth. *Journal of Monetary Economics, 32*(3), 513-542. https://doi.org/10.1016/0304-3932(93)90028-E

Korzeb, Z., & Samaniego-Medina, R. (2019). Sustainability performance. A comparative analysis in the polish banking sector. *Sustainability, 11*(3), 653. https://doi.org/10.3390/su11030653

Košak, M., Li, S., Lončarski, I., & Marinč, M. (2015). Quality of bank capital and bank lending behavior during the global financial crisis. *International Review of Financial Analysis, 37*(1), 168-183. https://doi.org/10.1016/j.irfa.2014.11.008

Kumar, V. (2020). Social innovation for agricultural development: A study of system of rice intensification in Bihar, India. *Millennial Asia, 11*(1), 99-118. https://doi.org/10.1177/0976399619900615

Matousek, R., & Solomon, H. (2018). Bank lending channel and monetary policy in Nigeria. *Research in International Business and Finance, 45*(3), 467-474. https://doi.org/10.1016/j.ribaf.2017.07.180

Migliorelli, M. (2021). What do we mean by sustainable finance? Assessing existing frameworks and policy risks. *Sustainability, 13*(2), 975. https://doi.org/10.3390/su13020975

Mor, S., Madan, S., Archer, G. R., & Ashta, A. (2020). Survival of the smallest: A study of microenterprises in Haryana, India. *Millennial Asia, 11*(1), 54-78. https://doi.org/10.1177/0976399619900609

Motkuri, V., & Mishra, U. S. (2020). Human resources in healthcare and health outcomes in India. *Millennial Asia, 11*(2), 133-159. https://doi.org/10.1177/0976399620926141

Myers, S., & Rajan, R. (1998). The paradox of liquidity. *The Quarterly Journal of Economics, 113*(3), 733-771. https://doi.org/10.1162/003355398555739

Nguyen, Q. T. T., Gan, C., & Li, Z. (2019). Bank capital regulation: How do Asian banks respond?. *Pacific-Basin Finance Journal, 57*(5), 101-196. https://doi.org/10.1016/j.pacfin.2019.101196

Raza, A., Shaikh, E., Tursoy, T., & Almashaqbeh, H. A. (2022). Economics and business perspectives of sustainable HRM. In *Sustainable Development of Human Resources in a Globalization Period* (pp. 36-48). IGI Global. https://doi.org/10.4018/978-1-6684-4981-3.ch003

RBI. (2019). *Report on trends and progress of banking in India 2018-2019.* Mumbai: Reserve Bank of India.

Shaikh, E., Mishra, V., Ahmed, F., Krishnan, D., & Dagar, V. (2021b). Exchange rate, stock price and trade volume in US-China trade war during COVID-19: An empirical study. *Studies of Applied Economics, 39*(8), 1-18. https://doi.org/10.25115/eea.v39i8.5327

Shaikh, E., Tunio, M.N., & Qureshi, F. (2021a). Finance and women's entrepreneurship in DETEs: A literature review. *Entrepreneurial Finance, Innovation and Development*, 191-209. https://ssrn.com/abstract=4235550

Singh, S. (2019). Examining global competitiveness of Indian agribusiness in the twenty-first-century Asian context: Opportunities and challenges. *Millennial Asia, 10*(3), 299-321. https://doi.org/10.1177/09763996198798

Staszkiewicz, P., & Werner, A. (2021). Reporting and disclosure of investments in sustainable development. *Sustainability, 13*(2), 1-15. https://doi.org/10.3390/su13020908

Umar, M., & Sun, G. (2016). Interaction among funding liquidity, liquidity creation and stock liquidity of banks: Evidence from BRICS countries. *Journal of Financial Regulation and Compliance, 24*(4), 430-452. https://doi.org/10.1108/JFRC-11-2015-0062

Vo, X. V. (2018). Bank lending behavior in emerging markets. *Finance Research Letters, 27*(3), 129-134. https://doi.org/10.1016/j.frl.2018.02.011

Whited, R. L., Swanquist, Q. T., Shipman, J. E., & Moon Jr, J. R. (2022). Out of control: The (over) use of controls in accounting research. *The Accounting Review, 97*(3), 395-413. https://doi.org/10.2308/TAR-2019-0637

Xiang, H., Shaikh, E., Tunio, M. N., Watto, W. A., & Lyu, Y. (2022). Impact of corporate governance and CEO remuneration on bank capitalization strategies and payout decision in income shocks period. *Frontiers in Psychology, 13*(1), 901868. https://doi.org/10.3389/fpsyg.2022.901868

Yusoff, M. N. H. B., Zainol, F. A., Ismail, M., Redzuan, R. H., Abdul Rahim Merican, R. M., Razik, M. A., & Afthanorhan, A. (2021). The role of government financial support programmes, risk-taking propensity, and self-confidence on propensity in business ventures. *Sustainability, 13*(1), 1-16. https://doi.org/10.3390/su13010380

Abstrakt

CEL: *Wypełniając lukę w finansowaniu pomiędzy jednostkami z nadwyżką a jednostkami z deficytem, instytucje finansowe, takie jak banki, odgrywają kluczową rolę we wspieraniu rozwoju gospodarczego kraju. Banki pełnią kluczowe zadanie organizowania zasobów indywidualnych i instytucjonalnych oraz kierowania ich do osób przygotowanych do zaangażowania się w przedsięwzięcia biznesowe lub inne produktywne zastosowania. Celem artykułu jest ocena związku pomiędzy płynnością finansowania a wzrostem akcji kredytowej banków (BLG). Nie przeprowadzono wcześniej analizy empirycznej pomiędzy kapitałem banku a wskaźnikiem płynności finansowania w odniesieniu do wzrostu akcji kredytowej banków (BLG) przy użyciu podejścia uogólnionej metody momentów (GMM) dla zrównoważonego biznesu. Dlatego niniejsze badanie stara się wypełnić tę lukę. METODYKA: Dane zebrano od 59 banków komercyjnych w Indiach w latach 2010–2022, w tym 21 banków sektora publicznego, 18 banków sektora prywatnego i 20 banków zagranicznych. Zastosowaliśmy podejście GMM. Strategię tę stosuje się zazwyczaj w sytuacjach, w których rozkład danych jest niepewny i istnieje obawa nadmiernej identyfikacji. GMM oferuje spójny, asymptotycznie normalny i efektywny estymator w porównaniu do wszystkich innych estymatorów, które jedynie korzystają z informacji przedstawionych przez warunki momentowe. WYNIKI: Wyniki sugerują, że istnieje znacząco negatywny wpływ kapitału banku i płynności finansowania na akcję kredytową banków. Wskazuje to, że wyższy kapitał może ograniczyć wpływ płynności finansowania na dynamikę kredytów banków, dlatego też wnioski są spójne z hipotezą, że wyższy kapitał może obniżyć wpływ płynności finansowania. Model zastosowany w tym badaniu ukazuje także znacząco korzystny wpływ płynności finansowania na ekspansję portfeli kredytowych banków, co ostatecznie skutkuje bardziej wyrafinowanym wzrostem dynamiki akcji kredytowej banków. IMPLIKACJE: Może to być ważna informacja dla decydentów przy podejmowaniu trafnych decyzji w celu skłonienia BLG w obecności interaktywnego powiązania płynności finansowania i stopy wzrostu akcji kredytowej na różnych poziomach kapitału. Ustaliliśmy, że na dynamikę akcji kredytowej banków istotny wpływ mają jej przeszłe wartości, przy istotnej wartości p poniżej 1%. Z ustaleń wynika, że fundusze kapitałowe i fundusze płynnościowe wspierają stopę BLG w Indiach poprzez wzmocnienie i neutralizację związanego z tym ryzyka oraz absorpcję strat generowanych przez aktywa*

*obciążone trudnościami. **ORYGINALNOŚĆ I WARTOŚĆ:** Niniejsze badanie wnosi znaczący wkład w stworzenie bardziej dogłębnego zrozumienia potencjalnego związku między płynnością finansowania banków, funduszami kapitałowymi i zachowaniami bankierów w zakresie udzielania kredytów, w szczególności w odniesieniu do krajów rozwijających się, takich jak Indie.*
***Słowa kluczowe:** płynność finansowania, uogólniona metoda momentów, GMM, systemowy GMM, kapitał banku, dynamika akcji kredytowej banków, płynność*

Biographical notes

Erum Shaikh has a Ph.D. from Institute of Business Administration, University of Sindh, Jamshoro, Pakistan. She is currently working as an Assistant Professor and Head of Department at Department of Business Administration, Shaheed Benazir Bhutto University, Sanghar Campus. Her research interests are Corporate Social Responsibility, Finance, Entrepreneurship, Sustainability, Corporate Governance, Management and Entrepreneurial Finance. She has authored more than 30 publications (research papers, conference papers and book chapters) in the above-mentioned areas. She had edited two books and is the editor of five research journals. She has wide experience of teaching and administration and has served more than ten years in academics. She has organised and participated in several research conferences and research workshops as a keynote speaker, session Chair and guest speaker. She is a good teacher, researcher, speaker and trainer.

Muhammad Nawaz Tunio is Assistant Professor at the Department of Business Administration, University of Sufism and Modern Sciences, Bhitshah, Pakistan. Dr. Tunio has the additional role as the Director, QEC. He has more than 35 publications in peer reviewed and international journals. Dr. Tunio has a Ph.D. in Entrepreneurship, Innovation and Economic Development from Alpen Adria University, Klagenfurt, Austria. He is a teacher, researcher and administrator with varied experience in the field of Business, Management and Policy.

Vishal Dagar has a PhD in Economics [Major – Agriculture; Minor – Environment and Energy]. His research focuses on micro and macro level data sets. He uses these to predict shocks with data analysis techniques like ARDL, ARIMA, and ANN to provide the best alternatives of natural input resources. He develops production functions frontiers with SFA and DEA models to measure technical efficiency. He also uses predictive data analytics techniques, i.e., ML-AI, for treatment/simulation processes to improve productivity.

Authorship contribution statement

Erum Shaikh: Literature Review, Data Analysis, and Results. **Muhammad Nawaz Tunio:** Introduction, Policy Recommendation and Conclusions. **Vishal Dagar**: Conceived, Edited, and Conceptualization.

Conflicts of interest

The authors declare no conflict of interest.

Citation (APA Style)

Shaikh, E., Tunio, M.N., & Dagar, V. (2023). Funding liquidity on bank lending growth: The case of India. *Journal of Entrepreneurship, Management, and Innovation*, *19*(4), 218-239. https://doi.org/10.7341/20231947

List of Reviewers cooperating with the Journal of Entrepreneurship, Management and Innovation (JEMI) in 2023

Austen, Agata – University of Economics in Katowice, Poland
Avolio, Beatrice – Centrum PUCP, Pontificia Universidad Católica del Perú, Lima, Perú
Badzińska, Ewa – Poznan University of Technology, Poland
Baier, Elisabeth – European University of Applied Sciences for Innovation and Perspective, Germany
Bartolacci, Francesca – Università degli Studi di Macerata, Italy
Bau, Malte – Otto-von-Guericke-University, Germany
Buchelt, Beata – Cracow University of Economics, Poland
Czernek-Marszałek, Katarzyna – University of Economics in Katowice
Dileo, Ivano – University of Naples Parthenope, Italy
Doś, Anna – University of Economics in Katowice, Poland
Dryglas, Diana – AGH University of Science and Technology, Poland
Dyduch, Woiciech - University of Economics in Katowice, Poland
Dvouletý, Ondřej – University of Economics in Prague, Czech Republic
Eisenbardt, Monika – University of Economics in Katowice, Poland
Filipowicz, Katarzyna – Jagiellonian University; Poland
Florek-Paszkowska, Anna – Centrum PUCP, Pontificia Universidad Católica del Perú, Lima, Perú
Freund, Bożena – Jagiellonian University, Poland
Fryczyńska, Marzena – Warsaw School of Economics, Poland
Gajdka, Łukasz – University of Lodz, Poland
Gancarczyk, Marta – Jagiellonian University; Poland
Gazzola, Patrizia – Università Degli Studi Dell'Insubria, Italy
Gigauri, Iza – St. Andrew the First-Called Georgian University, Georgia
González Pernía, Jose Luis – Deusto Business School, University of Deusto, Spain
Gonzalez-Urango, Hannia – Polytechnic University of Valencia, Spain and Latin American Studies Association (LASA), USA
Grimbert, Francis Stephanie – Deusto Business School, University of Deusto, Spain
Gródek-Szostak, Zofia – Cracow University of Economics, Poland
Gusc, Joanna – University of Groningen, Nederlands
Harima, Aki – University of Bremen, Germany
Hassan, Zubair – International Islamic University of Malaysia, Malaysia
Iñigo Alday, Edurne – Deusto Business School, University of Deusto, Spain

Islam, Rafikul – International Islamic University Malaysia, Malaysia

Kachniewska, Magdalena – University of Warsaw, Poland

Kaczorowska-Spychalska, Dominika – University of Lodz, Poland

Kaleta, Mateusz – Academy of Social and Media Culture, Poland

Kil, Krzysztof – Cracow University of Economics, Poland

Klimas, Patrycja – Wrocław University of Economics and Business, Poland

Klimontowicz, Monika – University of Economics in Katowice, Poland

Kristofik, Peter – University Matej Bel, Slovakia

Królikowska-Pawlak, Monika – University of Economics in Katowice, Poland

Kuźmińska, Anna – University of Warsaw, Poland

Lehmann, Christian – University of Applied Sciences and Arts, Hannover, Germany

Lenart-Gansiniec, Regina – Jagiellonian University, Poland

Matejun, Marek – University of Lodz, Poland

Moczydłowska, Joanna – Bialystok University of Technology, Poland

Monarca, Umberto – University of Foggia, Italy

Montiel-Campos, Héctor – School of Business and Economics, Universidad de las Americas Puebla, Mexico

Mu, Enrique – Carlow University, USA

Najda-Janoszka, Marta – Jagiellonian University, Poland

Ortega-Colomer, Francisco Javier – University of Valencia, Spain

Penneta, Daniela – Università di Modena e Reggio Emilia, Italy

Pereyra-Rojas, Milagros – University of Pittsburgh, USA

Petrolo, Damiano – Università degli Studi di Roma Tor Vergata, Italy

Pleśniak, **Agnieszka** – Warsaw School of Economics, Poland

Prusak, Błażej – Gdańsk University of Technology, Poland

Rossolini, Monica – Università degli Studi di Milano-Bicocca, Italy

Rybaczewska, Maria – University of Stirling, Scotland

Syrek, Robert – Jagiellonian University; Poland

Szarucki, Marek – Cracow University of Economics, Poland

Szeluga-Romańska, Marta – Gdańsk University of Technology, Poland

Szopa, Anna – University of Central Florida, USA

Takács-György, Katalin – Óbuda University Keleti, Hungary

TenBrink, Candace – University of Houston-Downtown, USA

Torkkeli, Lasse - LAB University of Applied Sciences, Finland

Ujwary-Gil, Anna – Institute of Economics, Polish Academy of Sciences, Warsaw, Poland

Wasilczuk, Julita - Gdańsk University of Technology, Poland

Wiśniewski, Radosław – University of Economics and Human Sciences, Poland

Wojnicka-Sycz, Elżbieta – University of Gdansk, Poland

Wójtowicz, Tomasz – AGH University, Poland

Woźniak, Jacek – University of Human and Economics Studies, Poland

Wściubiak, Łukasz – Poznań University of Economics and Business, Poland
Wziątek-Staśko, Anna – Jagiellonian University, Poland
Zabala, Alaitz – Deusto Business School, University of Deusto, Spain
Zbuchea, Alexandra – National University of Political Studies and Public Administration, Romania
Ziemiański, Paweł – Gdańsk University of Technology, Poland

Ministry of Education and Science
Republic of Poland

Table of Contents