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The Role of Digitalisation in SME Performance in Emerging Economies

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Abstract

This thesis studies the relationship between digitalisation and firm performance for small-medium enterprises in emerging economies. Additionally, this thesis negatively moderates the mentioned relationship for effect of weak formal institutions. To test the expected relationships, data from the GESIS Flash Eurobarometer survey data of the European Commission was utilised. Following a binary logistic regression, the results indicate that the role of digitalisation has a positive effect in the firm performance of SMEs in EEs. This result proves to be robust even when the cut-off value for firm performance is increased from 0.50 to 0.75. Additionally, the original model shows that the relationship between digitalisation and firm performance is positively moderated by weak formal institutions, which is in contrast with the current body of literature. The robustness check with the increased cut-off value of firm performance provides a different perspective, as the interaction effect demonstrates an insignificant negative effect. The model of the robustness check provided a better model fit, leading to an intriguing discussion on the appropriate cut-off value for firm performance for future research.

Key words

Digitalisation, digital technologies, digitisation, emerging economies, EEs, firm performance, formal institutions, institutional theory, small-medium enterprises, SMEs

Paper type

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1. Introduction

The role of digitalisation has been an important aspect for firms in the past decades (Autio, 2017). The stream of research that has been conducted has mainly analysed the positive implications of digitalisation on the firm's performance from a Resource-Based View (RBV) and transaction cost theory angle (e.g. Bai & Wang, 2021; Shumakova, 2020). These papers provide assumptions that the majority of elements are in the firm's control to adopt digitalisation. However, this seems not to be the case for small- and medium enterprises (SMEs), who find themselves also constrained by elements that are beyond their control. Therefore, analyses from an institutional theory standpoint are of growing importance.

According to Zimmermann (2016), the extent of digitalisation in SMEs is not nearly as great as might be expected. Pioneers – companies that already rely on digital products and services, apps, or Industry 4.0 - remain a minority, representing just under a fifth of the total. The OECD (2021), which is a unique platform where governments work together to address the economic, social, and environmental challenges of globalisation, identifies three gaps that could potentially improve their performance: 1) an internal skills gap, which prevents managers and workers in SMEs from identifying the digital solutions they need; 2) a financial gap, which prevents SMEs from securing a loan; and 3) an infrastructure gap, which prevents SMEs from accessing high-speed broadband.

The findings of the OECD (2021) are in line with what Zimmermann (2016) found in his paper. He found that SMEs experience an internal skills gap, with 54% of the firms lacking information about possible applications and benefits. Furthermore, SMEs also seem to experience a financial gap, although this is less significant, with 32% of the firms experiencing a lack of adequate financing resources. Last, the infrastructure gap seems to also be relevant, as 58% of the firms report that internet connection speed is an obstacle to implementing digital technologies.

When looking at the challenges that SMEs face in making use of digitalisation, there have been many studies dedicated to this subject, especially in countries that are more advanced. First, being among the first studies that highlighted these challenges, Sommer (2015) researched how Industry 4.0 challenged German manufacturing SMEs. Furthermore, Paiola (2017) looked at the

challenge of effectively digitalising SMEs in Italy. The results of both studies indicate that firms face a variety of challenges during their digital transformation, which were underscored.

The body of literature has substantially expanded since the publications of authors like Sommer (2015), Zimmermann (2016), and Paiola (2017). Between 2009 and 2019, 124 articles have been written dedicated to this topic (Pfister & Lehmann, 2021). The growing importance of this topic also made government institutions aware, like the OECD (2021), who have dedicated a report to this topic. They state that governments should provide incentives to scale up SME internal capacity, ease SME access to strategic resources, create the right business environment for SME transformation, and promote a holistic government approach. Therefore, they are especially critical of the role of governments in explaining why SMEs have not been able to effectively adopt digitalisation and increase their firm performance (OECD, 2021).

Most studies on SME digitalisation focus on the consequences of SME digitalisation in advanced economies. These studies are less applicable to contexts where formal institutions are relatively weak, i.e., emerging economies, which is due to the dynamic nature of EEs and the substantial institutional changes that often occur (Hoskisson et al., 2000; Wright et al., 2005). According to Hoskisson et al. (2000, p. 249), countries from emerging economies are defined as 'low income, rapid-growth countries using economic liberalisation as their primary engine of growth'. These weak formal institutions have negative implications for firm performance, as institutions have the greatest effect on firm strategy and performance (Gaur et al., 2014). This makes the effect of digitalisation on firm performance for SMEs in EEs even more relevant.

In the context of EEs, there have been some studies that have focused on the adoption of digitalisation and its effect on firm performance (Chauhan et al., 2021; Sanchez-Riofrio et al., 2022). However, the paper of Chauhan et al. (2021) primarily focus on contingency and RBV theory, whereas Sanchez-Riofrio et al. (2022) solely focus on institutional theory, but more in the context of market digitalisation, where firms are more forced to adapt digital technologies. Therefore, it is yet unclear how digitalisation will affect SMEs' performance from an institutional standpoint in EEs, especially in the context where SMEs are not facing market pressures of adopting digital technologies.

1.1. Problem statement

Before understanding why the role of digitalisation is important for firms in general, it is best to look at why firms differ. When taking evolutionary theory rather than neoclassical theory, Nelson (1991) argues that differences between firms occur when they are able to generate and gain innovations that are durable and not easily replicated. Digital technologies, and therefore digitalisation, have the potential to boost more inclusive and sustainable growth by spurring innovation, generating efficiencies, and improving services (OECD, n.d.). Furthermore, digital innovations provide many positive implications for firms (de Búrca et al., 2005; Bruque & Moyano, 2007, Pfister & Lehmann et al., 2021), which leads to firms gaining a competitive edge over one another. Therefore, taking the evolutionary theory of Nelson (1991) into account, if SMEs are not able to adopt digitalisation to its fullest potential and thus have fewer possibilities to increase performance on the firm level, firms will be able to differentiate less from other firms.

There is currently sufficient recent evidence of SMEs facing institutional challenges in EEs (Luthra et al., 2020; Sanchez-Riofrio et al., 2022). The central argument is that EEs are characterised by their weak formal institutions (Hoskisson et al., 2000; Wright et al., 2005). This is problematic, as formal institutions serve as a source of external resources that can enhance firm performance (Gaur et al., 2014), thus increasing the possibility of firms differing from one another. Therefore, it is pivotal to understand the implications of digitalisation for SME performance in institutionally weak environments.

1.2. Objective and research question

In this thesis, the objective is to analyse the role of digitalisation in the firm performance of SMEs in EEs, while also negatively moderating the latter effect by the weak formal institutions that SMEs in EEs face. The research question that addresses these relationships adequately is:

"What is the role of digitalisation in the firm performance of SMEs in EEs, and to what extent is this effect negatively moderated by weak formal institutions?"

To be able to provide an answer to this research question, data from the GESIS Flash Eurobarometer survey data of the European Commission will be used.

1.3. Relevance

According to Zimmerman (2016), under a fifth of the SMEs adopts digitalisation, while there is much to gain from digitalisation in relation to an SMEs' firm performance (de Búrca et al., 2005; Bruque & Moyano, 2007; Pfister & Lehmann, 2021). Institutions play a huge role in the adoption of digitalisation by SMEs, especially in EEs (Luthra et al., 2020; Sanchez-Riofrio et al., 2022). Institutions in the latter context are characterised as weak (Hoskisson et al., 2000; Wright et al., 2005), thus decreasing the probability of efficiently digitalising to enhance the firm performance (Gaur et al., 2014). Currently, there has been much attention paid to the effect of digitalisation of SMEs from more advanced economies (Sommer, 2015; Zimmermann, 2016; Paiola 2017), while SMEs from EEs are still under highlighted.

This thesis will therefore try to add theoretical relevance in two ways. First, this thesis will aim to provide theoretical substantiation that, besides SMEs from advanced countries, SMEs from EEs may also benefit from digitalisation. Second, this thesis will aim to provide theoretical substantiation that weak formal institutions may negatively moderate the relationship between digitalisation and the firm performance of SMEs in EEs. As a result, the current body of literature that is focused on emerging economies and institutional theory will be extended on.

As for practical relevance, new perspectives will be provided for policymakers that serve a country's government that originates from an EE and for managers that represent SMEs in EEs.

1.4. Outline of the paper

The second section of this paper focuses on the theoretical background based on existing literature. Within the section, a literature review will be conducted where fundamental concepts and potential relationships will be derived. Subsequently, in section three, the methodology of the research will be outlined.

The remainder of this thesis focuses on the results of the research (section four), whereafter a discussion (section five) and a conclusion (section six) will be provided.

2. Theoretical framework

In this section, the key concepts underlying the research question are discussed in relation to recent literature. The key concepts are digitalisation, firm performance and formal institutions. These concepts will be expounded upon in the context of SMEs in EEs. Each subsection will provide definitions of the concept, a concise overview of the literature, and a hypothesis, to establish the groundwork of the research. To provide an overview of the expected relationships, a graphical representation of the conceptual model will be provided at the end of this section.

2.1. The relevance of digitalisation for SMEs

The idea of digitalisation is widely accepted in modern society. In advanced countries, 80% or more of larger firms already use digitalisation, whereas only 20% to 40% of SMEs do so. SMEs are aware that they can benefit from digitalisation, however, they are constrained by a lack of resources, including time, skills, finances, infrastructure, and data safety and security (Telukdarie et al., 2023; OECD, 2021; Zimmerman, 2016). This stands in contrast to larger firms, who are more capable of investing resources and capital to cope with the costs associated with digitalisation (Bayo-Moriones & Lera-López, 2007).

Given the challenges SMEs face in competing in today's rapidly-changing markets, many of them should consider investing in digital solutions in response to the constant internal and external pressures and leverage the vast opportunities that digital technologies may offer (Nguyen, 2009). For many firms, enhanced growth, staying competitive, and enhanced innovation abilities are the leading motives for embracing digitalisation (de Búrca et al., 2005; Bruque & Moyano, 2007).

Apart from the advantages that digitalisation brings to SMEs, these firms also contribute positively to overall societal well-being through their firm performance. It is crucial to foster the growth of SMEs as they are a significant source of innovation and new products, which in turn have a considerable impact on the economic development of a country. Currently, SMEs constitute 99% of all businesses in Europe, where the employment rate is approximately 66%, underscoring their importance in society (Lopez-Nicolas & Soto-Acosta, 2010; Rotar et al., 2019). In total, SMEs contribute to about 90% of business and 50% of job creation, which makes

them play a pivotal role in economic development, poverty alleviation, and job creation (Bayraktar & Algan, 2019).

This thesis will use the definition from Parida et al. (2019), who define digitalisation as "the use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business." This definition is comprehensive enough for this research to capture that digitalisation should entail some sort of transition within the business model while also stating the potential advantages that it could provide.

2.2. The role of digitalisation in firm performance of SMEs

2.2.1. Firm performance of SMEs

Existing literature indicates that scholars have identified various factors that influence firm performance. Firstly, Ippinaiye et al. (2016) show that firm growth is determined by a combination of firm characteristics, strategy, and macroeconomic conditions. Secondly, corporate governance, sustainability, and government regulation have been shown to positively affect firm performance (Mishra & Mohanty, 2014; Cantele & Cassia, 2020). Therefore, many variables and indicators prove viable to measure firm performance. However, performance seems to be conceptualised, rationalised, and measured in different ways, thus making cross-comparison difficult (Eniola & Entebang, 2015).

It is important to measure firm performance via multiple angles, as 'using only profitability measures is an inadequate decision and can cause misleading information' (Tarutė & Gatautis, 2014, p. 1223). According to Santos & Brito (2012, p. 109), 'financial performance influences growth and profitability while strategic performance is an overarching performance conceptualisation covering all non-financial aspects'. As a result, this thesis will focus on the relationship between digitalisation and a combination of financial and strategic indicators that represent firm performance. In addition, this thesis will use the earlier mentioned description about the financial and strategic performance presented by Santos & Brito (2012) as its definition.

2.2.2. The measurements of firm performance of SMEs

Digitalisation stands out as a key factor among the antecedents mentioned earlier that have a positive impact on the firm performance. Pfister & Lehmann (2021) report that there were 124 publications from 2009 to 2019 that examined the influence of digitalisation on the firm performance of SMEs. By analysing these articles, they have come up with 14 different dimensions where digitalisation can create growth for SMEs. These dimensions are then categorized according to their impact on financial, which covers all growth and profitability related aspects, and strategic performance, which cover all non-financial aspects as an overarching conceptualisation on performance (Santos & Brito, 2012; Pfister & Lehmann, 2021). In addition, some dimensions may be scaled under both financial and strategic performance.

Out of the possible 14 different dimensions where digitalisation can create growth for SMEs, this thesis will accentuate five that align with the data that the GESIS Flash Eurobarometer survey of the European Commission provides. The dimensions that will be underscored are 1) environmental improvement (strategic), 2) employee growth (strategic), 3) innovation development (financial and strategic), 4) access to new markets (financial and strategic) and 5) sales increase (financial).

2.2.3. The role of digitalisation in the financial firm performance of SMEs

For financial performance, there is substantiation that digitalisation has a positive effect on several dimensions. Firstly, the use of digital technologies increase brand awareness and improve brand image, which translates into firm growth via sales. In addition, SMEs that utilise digital technologies are more likely to experience an increase in sales than those who do not (Saridakis et al., 2018).

Secondly, the use of digital technologies increases the likelihood of SMEs accessing new foreign markets, as there is a significant reduction in the amount of assets needed for operations, as well as cost of location specificity. Additionally, SMEs operating digitally in international markets appear to be able to generate alternative revenues without making significant investments (Schmitt & Rico, 2020).

Lastly, innovation development is anticipated to have a positive impact from the use of digital technologies, as digital technologies help to develop and design new products, services and processes (Ross & Blumenstein, 2015). These types of innovations positively relate to the growth and profitability of firms (Cho & Pucik, 2005).

2.2.4. The role of digitalisation in the strategic firm performance of SMEs

For strategic performance, there is also substantiation that digitalisation has a positive effect on several dimensions. Firstly, digitalisation plays a crucial role in promoting innovation development. More specifically, digitalisation is the creator of new products and services, enhancer of existing products and services, and prominent in innovation opportunities analysis and ideation for SMEs. This results in increased value offerings, opportunities for diversification, and differentiation from competitors (Zaverzhenets & Lobacz, 2021; Le-Dain et al., 2023; Blichfeldt & Faullant, 2021).

Secondly, digitalisation has a positive influence on environmental improvement, by reducing environmental pollution and enhancing social well-being. Additionally, it enables firms to utilise the capabilities and natural resources in a dynamic way, ensuring sustainability (Jayashree et al., 2021). These effects contribute to the positive corporate reputation of SMEs (Martinez & Rodriguez-del-Bosque, 2014).

Thirdly, the current literature is divided on whether digitalisation will result in an increase of employee growth (Müller et al., 2018; Mhlanga, 2021; Okundaye et al., 2018). On one hand, it is expected that further automation of simple tasks will lead to a decrease in the number of employees. On the other hand, digital transformation requires new mindsets, leading to an increase in employees (Müller et al., 2018). Overall, the use of digital technologies is likely to create new job profiles, attracting highly skilled employees and positively impacting strategic performance (Pfister & Lehmann, 2021).

Lastly, digitalisation facilitates SMEs' ability to internationalise more quickly, access new markets, and export more. This has a positive impact on strategic performance by creating a competitive edge (Denicolai et al., 2021; Westerlund, 2020; Bellakhal & Mouelhi, 2021).

2.2.5. The role of digitalisation in firm performance of SMEs in EEs

When examining the effects of digitalisation on the firm performance for SMEs in EEs, it is evident that SMEs in EEs also can use digitalisation to appropriate economic value and enhance financial and strategic performance (Chauhan et al., 2021). The means by which they use digitalisation for higher performance can include the creativity and innovativeness of their employees that compensates for the lack of financial resources (Cucculelli & Bettinelli, 2015; De Martino & Magnotti, 2018) as well as the network of external relations they build, which guarantees access to external resources (Jørgensen & Ulhøi, 2010). Therefore the first hypothesis is:

Hypothesis 1: *The role of digitalisation has a positive effect in firm performance of SMEs in EEs*

Although the impact of digitalisation on the performance of SMEs in EEs is evident, its adoption is still in its early stages due to the high initial costs involved (Chauhan et al., 2021). As a result, countries originating from EEs are generally not prepared. For instance, in India, internet connectivity is still lacking, the internet speed is below the global average, and digital literacy is inadequate (Paul et al., 2020). While governments can play an active role in promoting digitalisation by creating and facilitating the necessary infrastructure, there is a lack of government support and policies (Chauhan et al., 2021).

2.3. An institutional theory perspective: the moderating effect of formal institutions among SMEs in EEs

As previously stated, there are numerous intrinsic and extrinsic barriers that prohibit the potential that digitalisation may offer on the firm performance of SMEs in EEs (Chauhan et al., 2021). Among these barriers, formal institutions are one of the most impactful that may influence this relationship (Maisiri et al., 2021; Luthra et al., 2020; Chauhan et al., 2021). This thesis will therefore have its scope on formal institutions.

North (1970) defines institutions as “the rules of the game”, and makes a distinction between formal institutions, written rules that are officially enforced, and informal institutions, unwritten cultural and normative rules. Based on the initial and most prominent research that concentrated on EE institutions, the results indicate that institutions in the latter context are

generally characterised as weak (Hoskisson et al., 2000; Wright et al., 2005), which is due to the dynamic nature of EEs and the substantial institutional changes that often occur (Hoskisson et al., 2000).

The government is a crucial institution that can play a vital role in facilitating SMEs to adopt digitalization (Müller et al., 2018; Maisiri et al., 2021; Luthra et al., 2020; Chauhan et al., 2021). According to Müller et al. (2018), SMEs lack the expertise to overcome the challenges that come with adopting digital technologies and require external assistance, which can be provided by governmental institutions. Several studies have highlighted the significance of this issue in EEs, where SMEs' adoption of digital technologies is hindered by a lack of government support or inadequate regulations (Maisiri et al., 2021; Luthra et al., 2020; Chauhan et al., 2021). When SMEs are prohibited in ways by weak formal institutions, it has negative implications for firm performance, as Gaur et al. (2014) state that institutions have the greatest effect on firm strategy and performance.

Therefore, based on the institutional theory within the context of EEs, this thesis will expect weak formal institutions as a moderator that negatively affects the role of digitalisation in the firm performance of SMEs from EEs. This leads the second hypothesis to be:

Hypothesis 2: *The role of digitalisation in firm performance of SMEs from EEs is negatively moderated by weak formal institutions.*

2.4. Conceptual model

Based on the theoretical framework and the associated hypotheses, a conceptual model has been made to visually display the relationships.

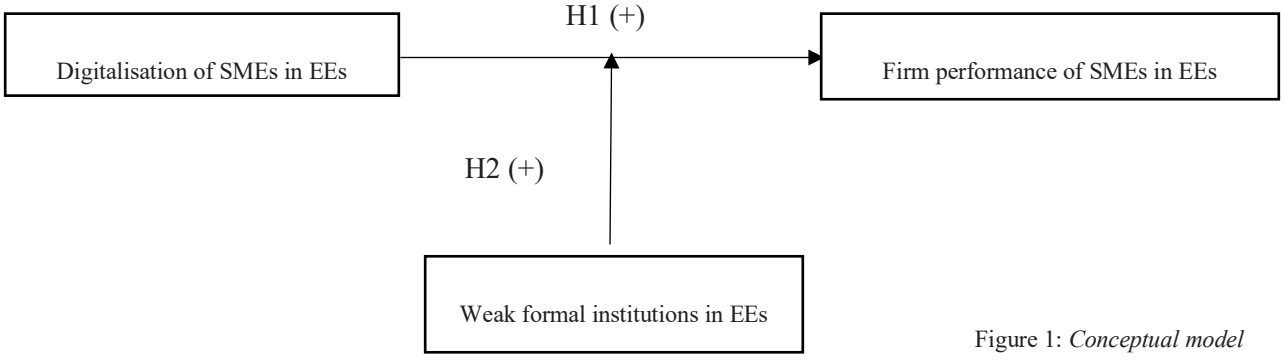

Figure 1: *Conceptual model*

3. Methodology

This section discusses the methods and data used during this thesis. To lay the groundwork for the analysis, a description of the data collection, sample, variables and model will be provided. At the end of this section, research ethics will be discussed to which this thesis must adhere to.

3.1. Data collection

In order to provide an answer to the research question, data from the GESIS Flash Eurobarometer survey conducted by TNS Political & Social on behalf of the European Commission, Directorate-General for Internal Market, Entrepreneurship and SMEs, and organised by the Directorate-General for Communication, will be utilised. The survey was carried out via phone interviews between February 2020 and May 2020, with participation from 16,365 companies located in the 27 member states of the European Union and in Bosnia and Herzegovina, Brazil, Canada, Iceland, Japan, North Macedonia, Norway, Serbia, Turkey, UK, USA, and Kosovo. Additionally, the survey encompasses businesses that employ at least one person and operate in a wide range of sectors. For a simplified summary of the procedures outlined in sections 3.1. & 3.2., please refer to appendix 8.1.

Out of this dataset, only countries that are classified as an EE are of interest. Countries from EEs are defined as: 'low-income, rapid-growth countries using economic liberalisation as their primary engine of growth' (Hoskisson et al., 2000, p. 249). With a definition alone, it is difficult to filter out countries that are characterised as an EE. Therefore, the MSCI index is utilised (2022a), which is built on the MSCI Market Classification Framework. The framework is based on three key factors: economic development, size and liquidity, and market accessibility (MSCI, 2022b).

Prior to filtering countries from the dataset, the initial phase entails generating an outline of all the countries that are considered to be an EE. Based on the MSCI Market Classification Framework, 24 countries are merged to represent the EEs, which are presented in table 1. The subsequent step involves specifying SMEs since only firms that are classified as an SME are of interest. The generally accepted term for SME is a firm that employs fewer than 250 people (OECD, n.d.; European Commission, n.d.). As a result, the dataset will be filtered based on the

countries that exhibit traits of an EE and firms that have a workforce of fewer than 250 employees.

Country			
Brazil	Hungary	Peru	Thailand
Chile	India	Philippines	Turkey
China	Indonesia	Poland	United Arab Emirates
Colombia	Korea	Qatar	
Czech Republic	Kuwait	Saudi Arabia	
Egypt	Malaysia	South Africa	
Greece	Mexico	Taiwan	

Table 1: *EE countries in general (MSCI, 2022a)*

3.2. Sample description

The initial step involves identifying the relevant countries from the GESIS Flash Eurobarometer data. The dataset comprises 39 countries. Among these, the following countries are classified as EE countries: Greece, Czech Republic, Hungary, Poland, Turkey, and Brazil. Since the survey was conducted in 2020, the MSCI Market Index for that period was analysed to determine if additional countries could be included in the study. From the time period 2020 – 2023, Kuwait was reclassified as an EE, while Pakistan, Argentina and Russia were reclassified to standalones and frontier markets, respectively (MSCI, 2022a). However, since none of these countries are included in the dataset, the sample size cannot be expanded. Therefore, the chosen countries previously mentioned will be included in the dataset, which will consist of 2,645 firms, excluding 13,720 firms.

The second step involves excluding firms with 250 employees or more. Of the 2,645 firms characterised as EE countries in the dataset, 2,493 can be classified as SMEs. The

respondents who had a missing value on the amount of employees, have been excluded for reliability purposes. Table 2 shows the filtered dataset, mainly comprising SMEs from the European Union, accounting for a total of 75.8%.

Country	Number of SMEs	Percentage
Turkey	273	11,0%
Brazil	332	13,3%
Poland	463	18,6%
Czech Republic	471	18,9%
Greece	474	19,0%
Hungary	480	19,3%
Total	**2,493**	**100%**

Table 2: *Filtered dataset of SMEs in EEs*

3.3. Variables

For a comprehensive overview of all the variables, dimensions, indicators and references, please refer to table 3 at the end of this section.

3.3.1. Dependent variable

Firm performance can be measured in multiple ways. According to Pfister & Lehmann (2021), there are fourteen different dimensions where digitalisation can create growth for SMEs. For this thesis, firm performance is defined as “a subset of organisational effectiveness that covers operational and financial outcomes” (Santos & Brito, 2012, p. 98).

Within the dataset, there are five dimensions that this thesis will scale under firm performance: 1) environmental improvement, 2) employee growth, 3) innovation development, 4)

access to new markets and 5) sales increase. Based on the dimensions that Pfister & Lehman (2021) provide, and respecting the questions of the survey, the indicators that can be distinguished are: 1) number of projects to improve/recover the environment (Santos & Brito, 2012), 2) increasing rate of number of employees (Scuotto et al., 2021), 3) degree of product innovation (Blichfeldt & Faullant, 2021), 4) degree of internationalisation (Bellakhal & Mouelhi, 2021) and 5) increase in turnover (Saridakis et al., 2018).

Based on the type of questions that are in the dataset the dependent variable "firm performance" will be measured in a binary manner, similar to the method used by Gu & Gera (2004). Consequently, it is necessary to create binary variables. For a comprehensive summary of all the questions in the dataset that represent the indicators and the transformation of the variables, please refer to appendix 8.2.

3.3.2. Independent variable

For the independent variable, the single question that represents the independent variable is: '*Which of the following digital technologies, if any, has your enterprise adopted to date?'* Within the dataset, there are no other questions that accurately create a composite measure.

The common approach for measuring digitalisation is by converting each type of technology into a binary variable. The scores can then be summed, where "0" indicates a low use of technologies and scores close to 8 indicates a high use of technologies (Joensuu-Salo et al. (2018; Martin-Peña et al., 2021). However, this thesis defines digitalisation as "the use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business" (Parida et al., 2019). It implies that the adoption of any amount of digital technologies is sufficient to call it digitalisation Therefore, the absolute change will be measured, where digitalisation can take place if a firm has adopted at least one digital technology.

3.3.3. Moderating variable

Regarding the moderating variable, this thesis will use a similar approach as Chauhan et al. (2021), who used the moderating variable "extrinsic barriers" on the relationship between

industry 4.0 adoption and performance, where government policy and regulation was an indicator.

The dataset that is used by this thesis qualifies barriers on the adoption of digital technologies with the following question: "*Which of the following, if any, is a barrier to digitalisation in your enterprise?"* Respondents were able to provide various answers on a nominal scale, where "regulatory obstacles" was the only outcome that is related to the moderating variable. Therefore, only the regulatory obstacles will be able to be measured. Furthermore, the variable will be recoded into a binary variable, where a value of "1" represents an SME experiencing regulatory obstacles or "0" when an SME does not experience any regulatory obstacles.

3.3.4. Control variables

To improve the reliability and validity, firm age, country, and mode of ownership will be used as control variables.

Firstly, firm age may influence the firm performance, as older organisations may positively influence its operations and decision-making (Guo & Xu, 2021). The influence of a firm's age is considerably greater than any industry effects, which explain little about the performance of a firm (McNamara et al., 2005). This notion is also supported by Fairfield et al. (2009), who state that commonly used industry controls may be more appropriate for growth metrics than for performance metrics. As a result, this thesis will control for firm age and not consider any industry effects. Within the dataset, the variable firm age is a continuous variable, which does not require any transformation.

Secondly, it is expected that country-specific effects could influence a company's performance. According to Helpman (2004), countries with higher per capita income possess more resources. If these resources are valuable, rare, inimitable and nonsubstitutable, it may positively affect the firm performance (Lin & Wu, 2014). Following the classification of the World Bank (n.d.), Czech Republic, Hungary, Poland and Greece are classified as high-income countries and will therefore be converted into a dummy variable. The reference category will be Brazil and Turkey, which are classified as upper middle income countries.

Finally, firms that are family owned or part of a business group have lower monitoring and agency costs, which may result in a higher firm performance (Miller & Le Breton-Miller, 2006; Singh & Gaur, 2009). Consequently, this thesis will account for the mode of ownership in its analysis by generating dummy variables to indicate whether the company is family-owned or part of a business group.

Variable	Dimension	Indicator	Illustrative reference
Firm performance1	Environmental improvement	Number of projects to improve/recover the environment	Santos & Brito, 2012
Firm performance2	Employee growth	Increasing rate of number of employees	Scuotto et al., 2021
Firm performance3	Innovation development	Degree of product innovation	Blichfeldt & Faullant, 2021
Firm performance4	Access new markets	Degree of internationalisation	Bellakhal & Mouelhi, 2021
Firm performance5	Sales increase	Increase in turnover	Saridakis et al., 2018
Digitalisation	Adoption of digitalisation	Use of technologies	Martin-Peña et al, 2021; Joensuu-Salo et al., 2018
WeakFormIns	Extrinsic barriers	Government policy and regulation	Chauhan et al., 2021

Table 3: *Tabulation of operationalisation*

3.4. Model

Considering the type of variables that are at hand, a binary logistic regression will be performed to find out how the relationships influence one another. A binary logistic regression looks for a relationship between one independent variable of any type of measure, and one binary dependent variable. The objective of a binary logistic regression is of complementary nature: explanation and prediction. (Hair et al., 2018). ‘Logistic regression has gained widespread application in situations involving a binary outcome. The prevalence of this outcome, coupled with the ease of

use and robust estimation properties, have made logistic regression one of the most widely used techniques in the social sciences today' (Hair et al., 2018, p. 549).

For the logistic regression, a formula will be employed. In theory, the formula for logistic regression will look as follows:

$$Yi = b_0 + b_1X_{1i} + b_2X_{2i} + ... + b_nX_{ni} + \varepsilon$$

In this equation, Y is the outcome, b_0 is the intercept, X is the predictor variable, ε is the error in the prediction, and the bs quantify the relationship between each predictor and outcome (Field, 2018, p. 879). In cases where there are moderating effects, interaction terms have to be taken into account. For the variables that are at hand in this thesis, the following formula will be employed:

$$Firm\ performance = intercept + b1Digitalisation + b2WeakFormIns + b3xDigitalisationxWeakFormIns + b4FirmAge + b5Country\_IncomeHigh + b6Ownership\_Group + b7Ownership\_Family + \varepsilon$$

Prior to conducting a depth analysis, assumptions have to be met. According to Hair et al. (2018, p. 557), there are five assumptions that a logistic regression requires. Firstly, the dependent variable should be binary. Secondly, the independent variable should be either metric- or non-metrically scaled. Thirdly, sample size should be at least 400 to achieve best results with maximum likelihood estimation. Fourthly, there should be independence of observations. Lastly, there should be linearity of independent variables.

3.5. Research ethics

This thesis will adhere to the research ethics of the European Code of Conduct for Research Integrity (2017). The main principles of the code of conduct are reliability, honesty, respect and accountability.

The data that is used in this research is gathered from the Flash Eurobarometer surveys, which is conducted on behalf of the European Commission. Flash Eurobarometer surveys are ad-hoc thematic surveys, carried out within a short timespan on a wide variety of specific topics

relevant to the activities of the European institutions. They are characterised by reliance on either telephone or online interviewing methods. Telephone surveys rely on a random selection of respondents who are contacted either by landline or mobile phone and asked to participate in a survey (Eurobarometer, n.d.). Additionally, the basic bilingual English/French questionnaires are translated into the respective national language(s) by the local institutes. Central revision of the translation is mentioned occasionally (Gesis, n.d.). Finally, this thesis will be stored in the Radboud Educational Repository, which will be accessible by other students.

4. Results

This section discusses the applied methodology and the outcomes obtained as a result of it. To give an adequate insight into the process and how the results were derived, this section will elaborate on the statistics of the data and the analysis. The analysis will provide answers on the hypotheses that were formulated in section 2. Prior to commencing the analysis, data assumptions have to be met, which can be found in appendix 8.5. Finally, a subsection will be devoted to the robustness of the results.

4.1. Data statistics

4.1.1. Data frequencies

Prior to commencing the analysis, it is mandatory to initially examine the data frequencies, and if required, adjust, to meet the required assumptions provided in appendix 8.5. The data frequencies are presented in table 4.

The table comprises five dependent variables, namely Sustainability (*FirmPerformance1*), Employee growth (*FirmPerformance2*), Innovation (*FirmPerformance3*), Internationalisation (*FirmPerformance4*), and Turnover growth (*FirmPerformance5*). Additionally, the table also includes the independent variable (*Digitalisation*) and the moderating variable (*WeakFormIns*). To convert all the aforementioned variables into binary variables, a binary transformation has been applied. Finally, the control variables including *FirmAge*, *Ownership_Family* (dummied), *Ownership_Group* (dummied), and *Country_IncomeHigh* (dummied) have also been incorporated.

Statistics

		FirmPerformance1	FirmPerformance2	FirmPerformance3	FirmPerformance4	FirmPerformance5	Digitalisation	FirmAge	WeakFormalIns	Ownership_Family	Ownership_Group	Country_IncomeHigh
N	Valid	2471	1184	2483	2444	2380	2472	2451	2454	2485	2485	2493
	Missing	22	1309	10	49	113	21	42	39	8	8	0
Mean		,90	,50	,62	,33	,57	,67	1999,48	,19	,22	,06	,76
Median		1,00	1,00	1,00	,00	1,00	1,00	2002,00	,00	,00	,00	1,00
Std. Deviation		,302	,500	,485	,469	,495	,469	16,046	,389	,411	,233	,429
Skewness		-2,639	-,007	-,508	,744	-,301	-,747	-2,307	1,613	1,383	3,802	-1,201
Std. Error of Skewness		,049	,071	,049	,050	,050	,049	,049	,049	,049	,049	,049
Kurtosis		4,970	-2,003	-1,743	-1,447	-1,911	-1,444	8,759	,602	-,087	12,466	-,558
Std. Error of Kurtosis		,098	,142	,098	,099	,100	,098	,099	,099	,098	,098	,098

Table 4: *Data frequencies*

4.1.2. Missing values

While examining for missing values, it is apparent that the variable *FirmPerformance2* has missing values that go beyond the threshold of 10 percent. This implies that the variable is Not Missing at Random, as the majority of the missing values are associated with micro firms (1-9 employees), leading to the exclusion of an entire group and a potential bias (Hair et al., p. 64). Nevertheless, other indicators of firm performance can still effectively measure it. Consequently, it has been decided to remove FirmPerformance2 as an indicator from the analysis.

Following the removal of *FirmPerformance2*, all variables fall below the 10 percent threshold, which should not pose any problems for the analysis (Field, 2013). Please refer to appendix 8.3 for the results of the missing value analysis.

4.1.3. Distributional assumption

After addressing the missing values, the subsequent step is to examine the distribution of the variables. Although logistic regression does not rely on distributional assumptions, they may still have an impact on the interpretation of the As a result, variables that exceed a kurtosis and/or skewness level of +/- 3 should be subjected to a logarithmic or square root transformation. (Field, 2013). The variables that violate the assumption of distribution are *FirmPerformance1, FirmAge, and Ownership_Group.* The variables *FirmPerformance 1* and *Ownership_Group* cannot be transformed, as the logarithmic transformation cannot be applied to binary variables. The variable *FirmAge* will not be transformed, as neither the square root nor the log transformation improves the kurtosis.

4.1.4. Composite dependent variable

After establishing the final data frequencies, it is now possible to create a composite variable for firm performance, as a binary logistic regression permits only one dependent variable for analysis. Typically, a confirmatory composite analysis is necessary to evaluate the reliability, validity, and measurement error, and to assign sufficient weightings from the indicators to the composite variable (Hair et al., 2018, p. 764). However, for indicators that are of a binary nature, this is not possible. Consequently, the reliability, validity, and measurement error cannot be

evaluated, and each indicator will be assigned equal weightings, with the mean utilised to construct a composite dependent variable: *FirmPerformance.*

Following the transformation, the composite variable takes on a ratio character, necessitating its reconversion into a binary variable. A cut-off value of 0.50 will be applied in this thesis, given that the highest possible score is 1.00. Firms that score equal to or exceed this threshold will be deemed to have a positive firm performance. As a result of the conversion of the composite variable, 1907 respondents are classified as having a positive firm performance, while 410 have a negative or stable firm performance. The composite variable is supplemented by 176 missing values. For further information concerning the statistics of the composite dependent variable, please refer to appendix 8.4.

4.2. Binary logistic regression analysis

Now that the assumptions have been met and that the relevant data have been correctly transformed, it is now possible to perform a binary logistic regression. For the binary logistic regression, this thesis will use a stepwise procedure where a base model is first estimated to provide a standard for comparison. Subsequently, more models will be added to work towards the final model (Hair et al., 2018, p. 582).

In total, this thesis will include three models. The initial model will test the effect of all of the control variables on the dependent variable. Subsequently, the independent variable will be added to the analysis, constituting the second model. Lastly, the moderating variable and its interaction effect with the independent variable will be incorporated, thereby concluding the final model.

For a binary logistic regression, the odds ratio will be used to interpret the results. Table 5 contains the outcomes of all three models, with significant results ($p = < .05$) indicated by an asterisk. For the specific results of each model, please refer to appendix 8.6.

Variable	Model 1		Model 2		Model 3	
	Sig.	ExpB	Sig.	ExpB	Sig.	ExpB
FirmAge	.015*	1.009*	.016*	1.009*	.018*	1.009*
Ownership_Family(1)	.023*	1.401*	.058	1.331	.087	1.297
Ownership_Group(1)	.017*	2.092*	.055	1.828	.063	1.799
Country_IncomeHigh(1)	.017*	.458*	< .001*	.572*	.004*	.629*
Digitalisation(1)			< .001*	2.825*	< .001*	2.414*
WeakFormIns(1)					.721	1.095
Digitalisation * WeakFormIns					.002*	3.531*
Nagelkerke R^2	.038		.094		.113	

Table 5: *Binary logistic regression results*

4.2.1. Model 1

The output of the first model shows all significant results for the control variables, where the overall results show that 3.8% variance can be explained by the covariates (Nagelkerke R^2 = .038).

Firstly, *FirmAge* (0.9%) shows a significant result, where younger firms have higher odds of experiencing a better firm performance. The *FirmAge* outcome opposes theoretical expectations, as older firms are typically believed to have better firm performance. Secondly, for both ownership type variables, the results were significant. Firms that are partly family owned have a higher odds of 40.1% to have a better firm performance than those who are not, while firms that are part of a group show to be 109.2% more likely to have a better firm performance. Lastly, in contrast to expectations, higher-income countries are 54.2% less likely to achieve better firm performance than upper-middle-income countries.

4.2.2. Model 2

By introducing the independent variable of digitalisation in the second model, the explanatory power has increased by 5.6% (Nagelkerke R^2 = .094). The results suggest that the inclusion of this variable did affect the significance of the covariates *Ownership_Family* and

Ownership_Group. Additionally, the findings indicate that companies that have implemented digital technologies are 182.5% more likely to experience improved performance, with a statistical significance of $p < .001$.

4.2.3. Model 3

In the last model, the moderating variable and the interaction effect between the moderating variable and the independent variable were included in the block. The model shows an increase of 1.9% (Nagelkerke R2 = .113). As this model represents most of the explanatory power, it will be used as the main model.

With the addition of the moderating variable and the interaction effect between the moderating variable and the independent variable, it appears that the significance of the covariates and the independent variable has not changed from the second model. Additionally, the results reveal that the interaction effect of *Digitalisation* x *WeakFormIns* is significant. Firms that face regulatory obstacles and are digitalised are more likely to have better firm performance than firms that are digitalised and do not encounter regulatory obstacles ($p = < .001$). This contradicts the theory that weak formal institutions have a negative impact on firm performance (Gaur et al., 2014). For a visualisation of the interaction effect, please refer to figure 2.

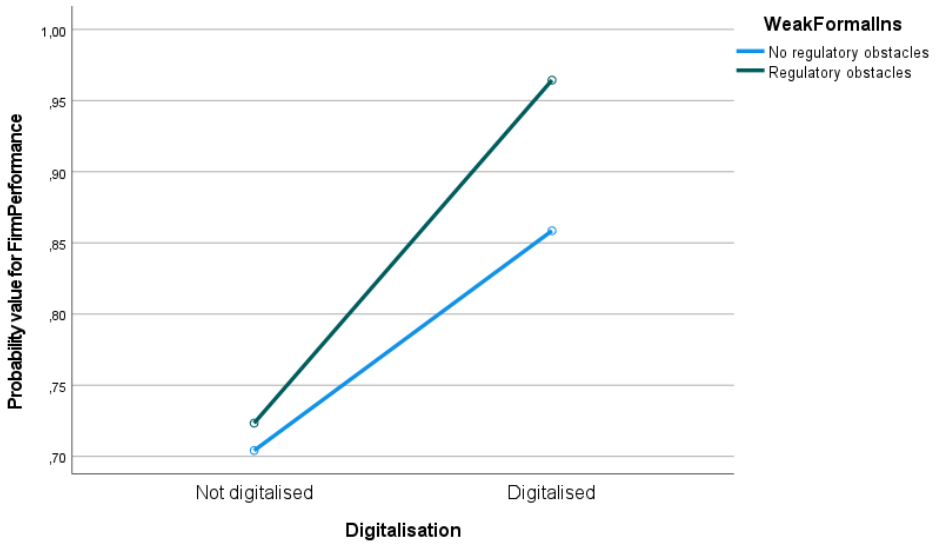

Figure 2: *Interaction graph Digitalisation x WeakFormIns*

4.2.4. Hypotheses

Now that the results have been derived, support may be given to the hypotheses formulated in section two.

For the first hypothesis, the results show a significant effect from digitalisation on firm performance. This indicates that there is substantial backing for the notion that digitalisation plays a significant role in the performance of SMEs in EEs.

For the second hypothesis, the results show that when a firm has adopted digital technologies, while also experiencing regulatory obstacles, they have a higher probability that their firm performance is better than firms who adopted digital technologies and do not experience regulatory obstacles. This means that the role of digitalisation on the firm performance of SMEs from EEs is positively moderated by weak formal institutions. As a result, the second hypothesis has to be rejected.

4.3. Validation of results

For the validation of the results of the binary logistic regression, this thesis will use a hold-out sample, as is one of the recommendations by Hair et al. (2018, p. 596). The validation of results are particularly important in this thesis, as the final model indicates that the Hosmer and Lemeshow test found a poor model fit (p = < .001). The classification table with the corresponding indicators can be found in table 6. The Hosmer and Lemeshow test of the final model can be found in appendix 8.6.

		FirmPerformance			
Observed		0	1	**Percentage Correct**	**Indicators**
FirmPerformance	0	0	387	0%	Specificity
	1	0	1847	100%	Sensitivity
Overall percentage				82.7%	Accuracy

Table 6: *Classification table*

Traditionally, the accuracy rate has been the most used empirical measure. However, in the framework of imbalanced datasets like this one, accuracy is no longer a proper measure, since it does not distinguish between the number of correctly classified examples of different classes (López et al., 2013).

Therefore, it is assumable that the traditional default cut-off value of .50 is too low for firm performance. This causes the model predicting firms having a positive firm performance, when in reality, it should have a negative firm performance (type I error) (Megaravalli, 2017).

As a result, indication is provided that the Hosmer and Lemeshow test predicted the poor model fit correctly. As it stands, the model provides poor validity. Therefore, an additional robustness test will be provided where the cut-off value of firm performance is increased to 0.75, which is more in line with the observed proportion of success of 0.827.

4.3.1 Robustness test FirmPerformance

By implementing a new cut-off value of 0.75, the robustness test demonstrated to have a good model fit according to the Hosmer and Lemeshow test (p. = .134), providing new insights. For the new model, the accuracy dropped. However, specificity increased, which means that the new model is more balanced and contains more validity. For the output of the classification table, please refer to table 7.

		FirmPerformance			
Observed		0	1	**Percentage Correct**	**Indicators**
FirmPerformance	0	505	619	44.9%	Specificity
	1	284	826	74.4%	Sensitivity
Overall percentage		64%	57.2%	59.6%	Accuracy
Indicators		NPV	PPV		

Table 7: *Robustness test classification table*

Following a new binary logistic regression, the three models' findings are presented in table 8, with significant results (p = < .05) indicated by an asterisk. For the specific results of each model, please refer to appendix 8.7.

Variable	Model 1		Model 2		Model 3	
	Sig.	ExpB	Sig.	ExpB	Sig.	ExpB
FirmAge	.006*	1.008*	.006*	1.008*	.007*	1.008*
Ownership_Family(1)	.006*	1.332*	.017*	1.287	.024*	1.271*
Ownership_Group(1)	.150	1.302*	.417	1.163	.453	1.151
Country_IncomeHigh(1)	.048*	.822	.924	.990	.691	1.042
Digitalisation(1)			< .001*	2.577*	< .001*	2.541*
WeakFormIns(1)					.085	1.483
Digitalisation * WeakFormIns					.897	.966
Nagelkerke R^2	.014		.072		.078	

Table 8: *Robustness test results*

When comparing the third model of the robustness test to the third model of the initial test, it is noticeable that the variables *Ownership_Family, Country_IncomeHigh* and *Digitalisation x WeakFormIns* have changed in significance. The results of the interaction effect indicate that firms that adopt digitalisation and face regulatory obstacles have relatively a poorer firm performance than those who adopt digitalisation and do not encounter regulatory obstacles, but the results are insignificant. This is particularly interesting because the original model provided indication that weak formal institutions positively moderated the effect of digitalisation on SMEs' firm performance. Figure 3 depicts a graph of the interaction effect of *Digitalisation x WeakFormIns*.

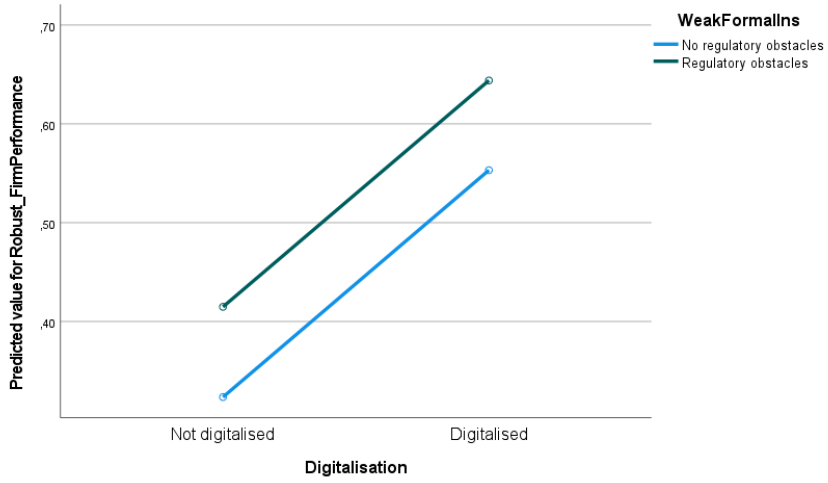

Figure 3: *Robustness test Interaction graph Digitalisation x WeakFormIns*

5. Discussion

In this second-to-last section, the results of the hypothesised main effect, the hypothesised moderating effect, and the effects of the control variables will be discussed and measured to the standards of the current literature. As a result, this section will seek to provide possible explanations for the outcomes of the hypothesised effects and the control effects.

5.1. The role of digitalisation in firm performance of SMEs in EEs

The main hypothesised effect posited that the role of digitalisation for SMEs in EEs has a positive effect on the firm performance. The binary logistic regression produced a statistically significant finding: firms that adopt digital technologies are 3.5 times more likely to exhibit positive firm performance as compared to those who do not. However, the original model indicated a poor model fit. Therefore a robustness check was conducted, which increased the cut-off value for firm performance from 0.50 to 0.75.

The robustness check provided substantiation that, with a cut-off value of 0.75 for firm performance and with a better model fit, digitalisation still has a positive and significant effect on firm performance of SMEs in EEs.

This predicted outcome aligns with the findings of scholars like Sommer (2015), Zimmermann (2016), and Paiola (2017) who, aside from discussing the digital challenges that SMEs face in more advanced countries, also highlight the importance of adopting digital technologies for SMEs in more advanced countries. The results of this thesis indicate that adopting digital technologies is equally important for SMEs in EEs. Additionally, this predicted outcome supports Pfister and Lehmann's (2021) literature review's findings, which described the positive effects that digitalisation has on individual indicators of firm performance.

Despite facing multiple intrinsic and extrinsic barriers, it is plausible that digitalisation has a positive impact on the firm performance of SMEs in EEs due to the fact that their methods of appropriating economic value and enhancing firm performance are only slightly different from those of SMEs in more advanced countries (Chauhan et al., 2021). For these firms, the use digitalisation for higher performance can include the creativity and innovativeness of their

employees, which compensate for the lack of financial resources (Cucculelli & Bettinelli, 2015; De Martino & Magnotti, 2018) as well as the network of external relations they build, which guarantees access to external resources (Jørgensen & Ulhøi, 2010).

Finally, SMEs from EEs have to protect themselves from foreign inward direct investment, in which they are usually outperformed by MNEs who have much more resources at their disposal (Groh & Wich, 2012; Narula & Dunning, 2010). In the context of innovation, SMEs from EEs learn to be more innovative in the early phase of the innovation process by imitating MNEs (Vujanović et al., 2022). This could also be a plausible explanation in the context of digitalisation, where SMEs that imitate MNEs may gain more knowledge about the effective implementation of digital technologies, resulting in better firm performance compared to those that have not adopted digital technologies. Additionally, firms may form partnerships with MNEs, leading to the adoption of digital technologies through learning (Hennart, 2020).

5.2. Formal institutions as a moderator

The second hypothesis stated that the variable weak formal institutions has a negative moderating effect on the relationship between the digitalisation and firm performance of SMEs in EEs. Following the binary logistic regression, the results came out to be positive and significant. This is a surprising result, considering that scholars such as Hoskisson et al. (2000) and Wright et al. (2005) argue that institutions in EEs are characterised as weak, whereas Gaur et al. (2014) state that institutions have the greatest effect on firm strategy and performance. The government, particularly, can play a pivotal role, as the adoption of digital technologies by SMEs is hindered by insufficient government support or inadequate regulations (Maisiri et al., 2021; Luthra et al., 2020; Chauhan et al., 2021).

The robustness check, with a cut-off value of 0.75 for firm performance and a better model fit, demonstrated that the original model indeed had an unexpected finding. With higher validity, the robustness check was able to establish that weak formal institutions have a negative moderating impact on the relationship between digitalisation and firm performance of SMEs in EEs, albeit without significance. This is much more in line with what scholars mention in the literature (Hoskisson et al., 2000; Wright et al., 2005; Gaur et al., 2014; Maisiri et al., 2021; Luthra et al., 2020; Chauhan et al., 2021).

Additionally, this thesis used the measurement of regulatory obstacles, which was computed as a binary variable for either facing regulatory obstacles or facing other or no obstacles. Therefore, the measurement used in this thesis is relative to other or no obstacles that SMEs in EEs face. This may imply that the RBV theory could provide more explanation, as obstacles like a lack of financial resources, a lack of skills, and internal resistance to change were included as possible answers. Additionally, SMEs from EEs might experience more barriers from voids in informal institutions, like IT security issues, a lack of information on the technological infrastructure, and uncertainty about future digital standards, which were among the last possible answers.

According to Zimmermann (2016), shortage of IT skills among employees, which can be considered as part of RBV, pose to be the biggest obstacle for SMEs. However, after conducting a robustness check, it has been observed that SMEs that are digitalised and have a lack of skilled employees still have a better firm performance than firms that face other obstacles. The output of the robustness check can be found in appendix 8.8.

Based on the aforementioned robustness checks, it is likely that the firm performance cut-off value of 0.75 offers a better explanation than the relativity of regulatory obstacles. Additionally, although not statistically significant, the robustness check provides an indication that weak formal institutions are still a relevant variable to moderate for.

5.3. Control variables

Some results of the control variables call for further discussion. This is primarily the case for the variables that were controlled for high-income countries and firm age, which displayed results that stand in contradiction with theory.

There is a mixed consensus on firm age, with some arguing that younger firms are more adaptable and innovative, while older firms are more rigid (Grazzi & Moschella, 2017). Conversely, others claim that older firms have better corporate governance, with a focus on long-term risky innovation strategies (Bianchini et al., 2017). Furthermore, younger firms tend to face more difficulty acquiring financial support (Pellegrino, 2017). The results of this thesis revealed that younger firms have better firm performance, causing the discussion to persist.

Regarding the variable that is controlled for high-income countries, the results are so adversely strong that an explanation is difficult to provide. Usually, countries with a higher income per capita are able to leverage more resources, which would positively affect firm performance (Helpman, 2004; Lin & Wu, 2014). However, the results of this research showed that upper middle income countries are twice as likely to have better firm performance than high-income countries.

Upon conducting a robustness check with a cut-off value of 0.75 for firm performance and an improved model fit, it was observed that the significant effect diminishes. The outcomes demonstrate that higher-income countries do indeed have better firm performance, although it is not statistically significant. This is much more consistent with the current literature (Helpman, 2004; Lin & Wu, 2014).

6. Conclusion

The start of this last section will conclude the most important findings of section four. Subsequent to the conclusion, the subsection thereafter will be dedicated to providing theoretical and practical implications. As with any other paper, this thesis has its limitations, which will be elaborated on in the second to last subsection. To wrap up, guidance on future research directions will be provided.

6.1. Concluding remarks

With the general consensus being that digitalisation has a positive effect on the firm performance of SMEs in more developed countries, the aim of this thesis was to find out whether this relationship still holds in the context of EEs. As theory mentions that EEs are characterised by their weak institutions, the additional aim was to find out whether weak formal institutions negatively moderate the relationship between digitalisation and firm performance of SMEs in EEs. The first section of this thesis provided a research question that served as its guiding principle. The research question was formulated as follows:

"What is the role of digitalisation in the firm performance of SMEs in EEs, and to what extent is this effect negatively moderated by the support that weak formal institutions provide?"

Based on the outcome of the binary logistic regression, the original model found support for the first hypothesised relationship. Specifically, SMEs in EEs that have adopted digital technologies are more likely to have better firm performance than those who have not. However, the original model found no support for the second hypothesised relationship, which entails that weak formal institutions negatively moderate the first hypothesised relationship. As demonstrated by the interaction graph presented in section 4.2, SMEs in EEs that are digitalised tend to have better firm performance when experiencing regulatory obstacles. Conversely, when these digitalised SMEs do not experience regulatory obstacles, their firm performance is significantly lower.

The validation of the results indicated that the original model had a poor model fit, suggesting that the traditional default cut-off value of .50 might be too low for measuring firm performance adequately. What followed was a robustness check, which increased the firm performance cut-off value to 0.75. This model was found to have a good fit, leading to an increase in validity. The results on the relationship between digitalisation and firm performance of SMEs in EEs was found to have a statistically significant effect. In contrast to the original model, the results including the moderating effect demonstrated that, although statistically insignificant, weak formal institutions negatively moderates the relationship between digitalisation and firm performance.

6.2. Implications

Since the conclusion of this thesis is set, the implications that were mentioned in section 1.3. can now be adequately addressed. The implications are broken down into: theoretical implications, where the aim is to contribute this thesis' results to the body of existing literature, and practical implications, where the aim is to contribute this thesis' results to the knowledge of policymakers that serve the government, and managers representing SMEs in EEs. Additionally, this thesis will provide implications based on the model from the robustness check instead of the original model, as it provides more validity.

6.2.1. Theoretical implications

Where the current body of literature outlines the importance of digitalisation for SMEs in more advanced countries, this thesis' results provide an indication that digitalisation is equally

important for SMEs in emerging countries. This finding mainly contributes to the existing body of literature that is focused on emerging economies. In addition, this thesis found no statistically significant effect in the robustness check when assessing the interaction effect of digitalisation and formal institutions, which contributes to the existing body of literature on institutional theory. The graph displays that digitalised SMEs who experience regulatory obstacles do not statistically differ in firm performance than digitalised SMEs who do not experience regulatory obstacles. This finding may provide new insights on the current body of literature that is focused on the institutional theory of EEs, as it contradicts the statement of Gaur et al. (2014). They imply that institutions have the biggest effect on firm performance, while this thesis provides indication that formal institutions may not have the biggest impact on firm performance.

6.2.2. Practical implications

Besides the theoretical implications, there are also practical implications that are primarily relevant for policymakers that serve a country's government that originates from an EE, and managers that represent SMEs in EEs. These implications are particularly relevant to provide a new perspective.

Given the positive relationship between digitalisation and firm performance, it is recommended that managers representing SMEs in EEs implement digital technologies to further develop their business. In addition to the four indicators of firm performance tested in this thesis, the literature identifies ten additional indicators that have been proven to increase after the implementation of digital technologies (Pfister & Lehmann, 2021). With consideration of the interaction effect between digitalisation and formal institutions, managers that represent SMEs from EEs might have to consider focusing more resources on obstacles that are not related to the regulatory environment.

For policymakers that serve a country's government that originates from an EE, it is recommended to incentivise SMEs to implement digital technologies. Digitalisation has the potential to boost more inclusive and sustainable growth by spurring innovation, generating efficiencies, and improving services (OECD, n.d.), which would also be beneficial for the country. Additionally, with weak formal institutions having a negative insignificant effect on the

relationship between digitalisation and firm performance in the robustness check, policymakers might have to consider providing more support on other possible obstacles faced by SMEs.

6.3. Limitations

As with any other paper, this thesis has its limitations. With the limitations in mind, the results that thesis has provided should be interpreted with caution.

In terms of the dataset's sample, the respondents are predominantly from European Union countries, making up 75.8% of the total. The remaining portion of the sample is composed of firms from Turkey and Brazil, resulting in eight emerging countries being represented out of a possible 24. This may create bias, as emerging market economies are not homogeneous and also have manifestly different starting points (Hoskisson et al. 2020). Being part of the European Union harmonises the regulatory dimension of the institutional environment with the laws, rules, and regulations already in place in the developed market economies of Western Europe (Manolova et al., 2008). As a result, formal institutions in African or Asian countries may be substantially worse, which this thesis did not assess. This might hamper the outcome of the moderating relationship between digitalisation and firm performance and weak formal institutions, as results may differ between continents, or even specific countries. Additionally, the thesis does not claim to generalise its findings, as it failed to acquire additional subsamples.

Another limitation to consider is the composite dependent variable. This thesis used a threshold value of .50, where firms that scored on or above this value were considered to have a positive firm performance. In the existing body of literature, there was no paper found that used a cut of value for the composite variable. As a result, the original model was found to have a poor fit. A robustness check provided indication that a more sufficient threshold value would be 0.75.

The final limitation that must be addressed is the lack of moderators in this thesis. As this thesis only built its foundation on institutional theory, other theories like the RBV were not taken into consideration.

6.4. Future research

Upon conclusion of this thesis, there are several potential directions for future research. Firstly, the current body of literature examining the relationship between digitalisation and SME firm performance in EEs should be expanded to include more countries from various continents. This would diminish the possibility of bias and increase the credibility of the analysis.

Additionally, this thesis found that weak formal institutions provide an insignificant moderating effect on the relationship between digitalisation and firm performance of SMEs in EEs. This is in contradiction with theory, as institutions have the biggest effect on firm performance (Gaur et al. 2014). Therefore, a future research direction is to provide substantiation that formal institutions still have the biggest effect on firm performance. In addition, the expansion of the sample to include more countries from various continents would also help to validate whether the statistically insignificant result for weak formal institutions would still remain.

Furthermore, besides institutional theory, additional theories like the RBV theory could be examined as a moderator to provide substantiation to the results of Chauhan et al. (2021), who also based their paper on the RBV theory. Moreover, weak informal institutions could be used as a moderator to determine if this has a significant negative implication on the relationship between digitalisation and firm performance for SMEs in EEs.

Finally, the existing body of literature predominantly employs single indicators that represent firm performance, as can be seen in the literature review of Pfister & Lehmann (2021). The literature review by Santos & Brito (2012) provides indications to how indicators of firm performance may be composited. Nevertheless, they do not provide a clear cut-off value for what is deemed to be a positive firm performance. In addition, this thesis found that a standard cut-off value of 0.75 does provide more adequate results than a standard cut-off value of 0.50. Therefore, future research should focus on a clear cut-off value for firm performance.

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8. Appendices

8.1. Countries in dataset

Step 1: Create an overview of all countries from the dataset.	**Step 2:** Create an overview of all countries that can be characterised as EE (not related to the dataset).	**Step 3:** Define SMEs to be able to filter the dataset accordingly.	**Step 4:** Filter out all EE countries from the dataset. 6 matches have been found when comparing step 1 & 2.	**Step 5:** Filter out all firms that employs more than 249 people. The dataset is finalized.
Belgium, Denmark, Germany, Finland, France, **Greece**, Ireland, Italy, Luxembourg, Netherlands, Austria, Portugal, Sweden, Spain, United Kingdom, Cyprus, **Czech Republic**, Estonia, Latvia, Lithuania, **Hungary**, Malta, **Poland**, Slovakia, Slovenia, Iceland, Norway, Bulgaria, Croatia, Romania, **Turkey**, Japan, Bosnia, **Brazil**, Canada, North Macedonia, Norway, Serbia, United States of America, Kosovo	**Brazil**, Chile, China, Colombia, **Czech Republic**, Egypt, **Greece**, **Hungary**, India, Indonesia, Korea, Kuwait, Malaysia, Mexico, Peru, Philippines, **Poland**, Qatar, Saudi Arabia, South Africa, Taiwan, Thailand, **Turkey**, United Arab Emirates	'The generally accepted term for SME is a firm that employ fewer than 250 people'	Brazil, Czech Republic, Greece, Hungary, Poland, Turkey	2,645 firms in the dataset that are characterised as firms that situated in EE countries. 2,493 of these firms employ less than 250 people.

8.2. The measurement of Firm Performance

Variable	Indicator	Question in the dataset	Binary variable
Firm performance1	Number of projects to improve/recover the environment	'In terms of environmental and social sustainability, which of the following actions, if any, is your enterprise actively taking?	0) Not having partaken in projects to improve/recover the environment 1) Having partaken in projects to improve/recover the environment
Firm performance2	Increasing rate of number of employees	'Since 2016, how much has your enterprise grown, if at all, in terms of: the number of full-time or full-time equivalent employees?'	0) The firm has decreased or remained stable 1) The firm has grown
Firm performance3	Degree of product innovation	'During the past 12 months, has your enterprise introduced any of the following types of innovations?'	0) Not having partaken in product innovation 1) Having partaken in product innovation
Firm performance4	Degree of internationalisation	''To which international markets, if any, did your enterprise export goods or services in 2019?'	0) Not having access to international markets 1) Having access to international markets
Firm performance5	Increase in turnover	'Since 2016, how much has your enterprise grown, if at all, in terms of: Turnover?'	0) The firm has decreased or remained stable 1) The firm has grown

8.3. Missing value analysis

Univariate Statistics

	N	Mean	Std. Deviation	Missing Count	Missing Percent	No. of Extremes[a] Low	No. of Extremes[a] High
FirmAge	2451	1999,48	16,046	42	1,7	100	0
Digitalisation	2472			21	,8		
WeakFormalIns	2454			39	1,6		
Sustainability	2471			22	,9		
Innovation	2483			10	,4		
Internationalization	2444			49	2,0		
Turnover	2380			113	4,5		
Ownership_Family	2485			8	,3		
Ownership_Group	2485			8	,3		
Country_IncomeHigh	2493			0	,0		

a. Number of cases outside the range (Q1 - 1.5*IQR, Q3 + 1.5*IQR).

8.4. Composite dependent variable

Ratio composite dependent variable

FirmPerformance

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	,00	74	3,0	3,2	3,2
	,25	336	13,5	14,5	17,7
	,50	764	30,6	33,0	50,7
	,75	814	32,7	35,1	85,8
	1,00	329	13,2	14,2	100,0
	Total	2317	92,9	100,0	
Missing	System	176	7,1		
Total		2493	100,0		

Binary composite dependent variable (cut of value .50)

FirmPerformance

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	410	16,4	17,7	17,7
	1	1907	76,5	82,3	100,0
	Total	2317	92,9	100,0	
Missing	System	176	7,1		
Total		2493	100,0		

8.5. Data assumptions

In section 3.5, the assumptions that should be adhered to have already been shortly discussed. The assumptions that must be met before a binary logistic regression can be conducted are (Hair et al., 2018, p. 557):

1. The dependent variable must be a binary variable
2. All independent variables must be metric or non-metrically scaled
3. The sample size should be at least 400 to achieve best results with maximum likelihood estimation
4. There should be independence of observations
5. There should be linearity, as well as none to little multicollinearity among the independent variables.

Dependent variable

For a binary logistic regression, the dependent variable requires it to be binary (Hair et al., 2018). In section 4.1, the binary indicators were converted into a composite measure with equal weightings after a thorough process. Respondents who scored above or equal to .50 were categorised as firms with positive performance, while those who scored below were categorised as 'negative or stable'. Therefore, the dependent variable now comprises two distinct groups, thereby meeting the required assumption.

Independent variables

According to Hair et al. (2018), the independent variable(s) must be metric or non-metrically scaled. This condition has been satisfied since both *WeakFormIns* and *Digitalisation* have been converted into a binary variable, thereby making them metrically scaled. The rationale behind including *WeakFormIns* in the second assumption is that a moderator is to be treated as an independent variable (Hair et al., 2018, p. 284).

Sample size

For the third assumption, a sample size of at least 400 is needed to adequately support estimation of the logistic model (Hair et al., 2018). The dataset employed in this thesis, which examines SMEs from EEs, has a sample size of 2,493. Therefore, the third assumption has been met.

Independence of observations

The independence of observations is considered to be an important assumption, where violation of this assumption requires some form of hierarchical/nested model approach (Hair et al., 2018). Given that the dataset used in this thesis employs a unique case id, it is presumed that all observations are independent of one another. Consequently, this assumption is considered to be met.

Multicollinearity

The fifth and final assumption states that there must be no interdependence among the independent variables. To verify this part of the assumption, a variance inflation factor (VIF) and a Pearson correlation will be conducted (Hair et al., 2018).

The independent variables that will be tested for multicollinearity are *Digitalisation, WeakFormIns* (a moderator also counts as an independent variable)*,* and all of the covariates *(FirmAge, Ownership_Family, Ownership_Group, and Country_IncomeHigh),* as covariates should be metric variables that are related to the outcome, but not to the treatment (Hair et al., 2018, p. 390).

Prior to conducting the VIF, Hair et al. (2018, p. 313) mention that instances of higher degrees of multicollinearity are reflected in lower tolerance values and higher VIF values. According to Field (2013, p. 402), if the VIF is greater than 10 (or the tolerance is below 0.1), then it indicates a serious problem. Additionally, if the average VIF is substantially greater than 1 then the regression may be biased.

After conducting the VIF test, it was observed that all of the tolerance values remained above the threshold of 0.1, and none of the VIF values exceeded the threshold of 10. Thus, it can be concluded that the analysis will not be affected by multicollinearity, and there will be no bias in the regression. For detailed information on the test results, please refer to the table below.

Coefficients[a]

Model		Collinearity Statistics	
		Tolerance	VIF
1	Digitalisation	,950	1,053
	WeakFormalIns	,960	1,042
	FirmAge	,991	1,009
	Ownership_Family	,965	1,036
	Ownership_Group	,994	1,006
	Country_IncomeHigh	,912	1,097

a. Dependent Variable: FirmPerformance

Regarding the Pearson Correlation, the general threshold is .70, where everything above .70 is considered to be highly correlated (Hair et al., 2018, p. 312). Based on the results of the test, there does not appear to be any significant correlation between the variables, indicating that multicollinearity should not be an issue for the analysis. For the output of the conducted test, please refer to the table below.

Correlations

		Digitalisation	WeakFormalIns	FirmAge	Ownership_Family	Ownership_Group	Country_IncomeHigh
Digitalisation	Pearson Correlation	1	,109**	,007	,067**	,072**	-,194**
	Sig. (2-tailed)		<,001	,731	<,001	<,001	<,001
	N	2472	2437	2430	2464	2464	2472
WeakFormalIns	Pearson Correlation	,109**	1	,027	,071**	,037	-,174**
	Sig. (2-tailed)	<,001		,188	<,001	,065	<,001
	N	2437	2454	2412	2446	2446	2454
FirmAge	Pearson Correlation	,007	,027	1	-,033	,011	-,081**
	Sig. (2-tailed)	,731	,188		,108	,573	<,001
	N	2430	2412	2451	2444	2444	2451
Ownership_Family	Pearson Correlation	,067**	,071**	-,033	1	,013	-,168**
	Sig. (2-tailed)	<,001	<,001	,108		,509	<,001
	N	2464	2446	2444	2485	2485	2485
Ownership_Group	Pearson Correlation	,072**	,037	,011	,013	1	-,037
	Sig. (2-tailed)	<,001	,065	,573	,509		,063
	N	2464	2446	2444	2485	2485	2485
Country_IncomeHigh	Pearson Correlation	-,194**	-,174**	-,081**	-,168**	-,037	1
	Sig. (2-tailed)	<,001	<,001	<,001	<,001	,063	
	N	2472	2454	2451	2485	2485	2493

**. Correlation is significant at the 0.01 level (2-tailed).

Linearity

The second part of the fifth assumption is that there should be linearity between the independent variables and the log odds. Nevertheless, this condition is solely applicable to analyses employing

continuous independent variables. As this analysis make use of independent variables that are discrete, the fifth assumption has completely been met, which means that the regression analysis may be conducted.

8.6. Model results

Model 1

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	52,101	4	<,001
	Block	52,101	4	<,001
	Model	52,101	4	<,001

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	2007,531[a]	,023	,038

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	19,142	8	,014

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	FirmAge	,009	,004	5,888	1	,015	1,009
	Ownership_Family(1)	,337	,148	5,161	1	,023	1,401
	Ownership_Group(1)	,738	,311	5,648	1	,017	2,092
	Country_IncomeHigh(1)	-,781	,156	24,946	1	<,001	,458
	Constant	-14,992	7,044	4,530	1	,033	,000

a. Variable(s) entered on step 1: FirmAge, Ownership_Family, Ownership_Group, Country_IncomeHigh.

Model 2

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	78,803	1	<,001
	Block	78,803	1	<,001
	Model	130,904	5	<,001

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1928,728[a]	,057	,094

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	22,807	8	,004

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	FirmAge	,009	,004	5,802	1	,016	1,009
	Ownership_Family(1)	,286	,151	3,585	1	,058	1,331
	Ownership_Group(1)	,603	,315	3,677	1	,055	1,828
	Country_IncomeHigh(1)	-,559	,160	12,124	1	<,001	,572
	Digitalisation(1)	1,039	,117	78,564	1	<,001	2,825
	Constant	-16,239	7,295	4,956	1	,026	,000

a. Variable(s) entered on step 1: FirmAge, Ownership_Family, Ownership_Group, Country_IncomeHigh, Digitalisation.

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	27,199	2	<,001
	Block	27,199	2	<,001
	Model	158,103	7	<,001

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1901,528[a]	,068	,113

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than ,001.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	FirmAge	,009	,004	5,571	1	,018	1,009
	Ownership_Family(1)	,260	,152	2,925	1	,087	1,297
	Ownership_Group(1)	,587	,316	3,458	1	,063	1,799
	Country_IncomeHigh(1)	-,464	,162	8,194	1	,004	,629
	Digitalisation(1)	,881	,123	51,050	1	<,001	2,414
	WeakFormalIns	,091	,256	,127	1	,721	1,095
	Digitalisation(1) by WeakFormalIns	1,262	,399	9,998	1	,002	3,531
	Constant	-16,106	7,350	4,802	1	,028	,000

a. Variable(s) entered on step 1: FirmAge, Ownership_Family, Ownership_Group, Country_IncomeHigh, Digitalisation, WeakFormalIns, Digitalisation * WeakFormalIns .

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	19,150	8	,014

8.7. Robustness check dependent variable

Model 1

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	23,819	4	<,001
	Block	23,819	4	<,001
	Model	23,819	4	<,001

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	3073,075[a]	,011	,014

a. Estimation terminated at iteration number 3 because parameter estimates changed by less than ,001.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	18,872	8	,016

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	FirmAge	,008	,003	7,643	1	,006	1,008
	Ownership_Family(1)	,287	,103	7,691	1	,006	1,332
	Ownership_Group(1)	,264	,183	2,068	1	,150	1,302
	Country_IncomeHigh(1)	-,196	,099	3,899	1	,048	,822
	Constant	-16,090	5,847	7,572	1	,006	,000

a. Variable(s) entered on step 1: FirmAge, Ownership_Family, Ownership_Group, Country_IncomeHigh.

Model 2

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	99,988	1	<,001
	Block	99,988	1	<,001
	Model	123,808	5	<,001

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	2973,086[a]	,054	,072

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than ,001.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	22,201	8	,005

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	FirmAge	,008	,003	7,630	1	,006	1,008
	Ownership_Family(1)	,252	,106	5,717	1	,017	1,287
	Ownership_Group(1)	,151	,187	,658	1	,417	1,163
	Country_IncomeHigh(1)	-,010	,103	,009	1	,924	,990
	Digitalisation(1)	,947	,096	96,272	1	<,001	2,577
	Constant	-17,052	5,923	8,287	1	,004	,000

a. Variable(s) entered on step 1: FirmAge, Ownership_Family, Ownership_Group, Country_IncomeHigh, Digitalisation.

Model 3

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	10,575	2	,005
	Block	10,575	2	,005
	Model	134,383	7	<,001

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	2962,511[a]	,058	,078

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than ,001.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	FirmAge	,008	,003	7,304	1	,007	1,008
	Ownership_Family(1)	,240	,106	5,109	1	,024	1,271
	Ownership_Group(1)	,140	,187	,563	1	,453	1,151
	Country_IncomeHigh(1)	,041	,104	,158	1	,691	1,042
	Digitalisation(1)	,933	,105	79,013	1	<,001	2,541
	WeakFormalIns	,394	,229	2,968	1	,085	1,483
	Digitalisation(1) by WeakFormalIns	-,034	,262	,017	1	,897	,966
	Constant	-16,847	5,942	8,040	1	,005	,000

a. Variable(s) entered on step 1: FirmAge, Ownership_Family, Ownership_Group, Country_IncomeHigh, Digitalisation, WeakFormalIns, Digitalisation * WeakFormalIns .

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	12,399	8	,134

8.8. Robustness check RBV

Model 3

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	5,616	2	,060
	Block	5,616	2	,060
	Model	136,520	7	<,001

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1923,112[a]	,059	,098

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	8,825	8	,357

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	FirmAge	,009	,004	6,238	1	,013	1,009
	Ownership_Family(1)	,263	,151	3,019	1	,082	1,301
	Ownership_Group(1)	,603	,315	3,674	1	,055	1,828
	Country_IncomeHigh(1)	-,530	,161	10,818	1	,001	,589
	Digitalisation(1)	1,012	,125	65,234	1	<,001	2,752
	Robust_RBV(1)	,311	,248	1,577	1	,209	1,365
	Digitalisation(1) by Robust_RBV(1)	,141	,342	,171	1	,679	1,152
	Constant	-16,960	7,299	5,399	1	,020	,000

a. Variable(s) entered on step 1: FirmAge, Ownership_Family, Ownership_Group, Country_IncomeHigh, Digitalisation, Robust_RBV, Digitalisation * Robust_RBV .