Journal of
Risk and Financial Management

MDPI

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The Role of ERM and Corporate Governance in Managing COVID-19 Impacts: SMEs Perspective

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Abstract: SMEs are perceived as more exposed to the consequences of external shocks. The purpose of our work is to examine whether the ERM sophistication or corporate governance mechanisms could be relevant in resistance to COVID-19 shock in the SMEs. In particular, we hypothesize that the SMEs with greater degree of ERM sophistication and stronger CG mechanisms will have a clearer understanding about the severity of the impacts from COVID-19. Our empirical evidence is based on the results of a survey conducted within a large sample of SMEs operating in Poland and in Germany within different experimental settings. We have found that the ERM and CG sophistication influence the perception of COVID-19 interruptions and will alert companies to adjust their business strategy and organizational structure to better cope with effects of the current crisis. The proposed framework can also be a valuable tool for consultants to use to enhance the ERM systems in SMEs.

Keywords: SMEs; ERM; corporate governance; COVID-19

Citation: Wieczorek-Kosmala, Monika, and Thomas Henschel. 2022. The Role of ERM and Corporate Governance in Managing COVID-19 Impacts: SMEs Perspective. *Journal of Risk and Financial Management* 15: 587. https://doi.org/10.3390/jrfm15120587

Academic Editor: Ştefan Cristian Gherghina

Received: 2 November 2022
Accepted: 5 December 2022
Published: 7 December 2022

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

1. Introduction

It is not surprising that COVID-19 has inspired the academic community to examine the different facets of the pandemic's impact, from the variety of economic and management perspectives which are visible in a tremendous increase in the related literature (De Vito and Gómez 2020; Juergensen et al. 2020; Gourinchas et al. 2021). As noted by Bryce et al. (2020), COVID-19 is perceived as a test of organizational resilience, and the routes to businesses recovery, the related challenges and opportunities, as well as response and adaptation strategies to COVID-19 shock are the themes that widely attract the research attention. Inevitably, the impact of COVID-19 pandemic will exert a longitude effect on the business's performance, due to its power to intensify the turbulences in the business's environment. The observed worsening of economic conditions is amplified by the anxieties over the manageability of the cyclical dynamics of pandemic, as the phases of improvement and recovery are followed by periodic relapses. As a result, the businesses performance is challenged by both the immediate pandemic effects, as well as by the related long-term implications (Juergensen et al. 2020; Qiu 2020).

Our work aspires to add to this emerging academic debate by revising the relevance of Enterprise Risk Management (hereafter referred to as 'ERM') and corporate governance mechanisms in managing COVID-19 impact (as a shock) in the SMEs (Small and Medium Sized Enterprises). In our study, we refer to the relevance of the ERM in building a firm's resilience to shock. Firms that implement ERM procedures tend to perform better McShane (2018), and thus are regarded as better-prepared for responding to external shocks. Similarly, it was empirically confirmed that firms with stronger corporate governance mechanisms are better in preventing failures (Ellul 2015).

Our study is based on the results of a survey, which was conducted among the Polish and German SMEs after the second hit of the pandemic wave (Jan/Feb 2021). Germany and Poland have been hit by COVID-19 and its consecutive waves in a similar vein if we

consider the peaks of infections and the periods of lockdowns. The survey respondents have been asked the same set of questions, ones that helped to scale their ERM maturity, strength of corporate governance mechanisms, and the various fields of COVID-19 impacts. We intentionally compare Poland and Germany as two contrasting experimental settings. Germany is a representative of the core EU countries, as it remains one of the strongest economies in the EU. Poland is a representative of the non-core EU countries, as it remains a leader among the European emerging economies. Thus, our work offers a unique results that could shed some light on the COVID-19 interruptions that are of either similar, or different impact, if the two different experimental settings are compared (in our case—Germany vs. Poland).

Our study contributes to the existing literature on SMEs vulnerabilities to crisis and their resilience capabilities within. First, we add to this stream of the literature by providing some evidence on the SMEs' vulnerabilities to COVID-19 (as manifest in this very recent crisis). The SMEs have been always perceived as the backbones of the economy and thus remain a subject of attention for policymakers (e.g., Floyd and McManus 2005). According to the European Commission, Germany and Poland have a similar number of enterprises operating as SMEs (more than 2 millions), and the SMEs sector represents 99.6% of German and 99.8% of the Polish population of all enterprises (European Commission 2021a, 2021b). These figures are similar as for the average rate for the whole European Union, which is 99.8%. Our study provides some empirical evidence on the COVID-19 impacts perceived by the German and Polish SMEs. In this regard, we add to the emerging debate on the COVID-19 impacts on SMEs. This debate has been recently initiated by e.g., Caballero-Morales (2021), Gourinchas et al. (2021), or Juergensen et al. (2020).

Second, our research shows that SMEs with higher ERM and governance sophistication could better estimate the necessary strategic responses during the COVID-19 pandemic. In the prior literature, SMEs are perceived to be more vulnerable to exogenous shocks, as they tend to hold lower slack holdings that are supportive in resilience capabilities (Eggers 2020). On the other hand, however, the SMEs are perceived as being able to build greater resilience capabilities due to their greater agility and flexibility in responding to a shock, which is induced by smaller size and simpler organizational structure (Eggers 2020; Antony et al. 2008; Burnard and Bhamra 2011).

Our study adds to this discussion by illuminating the moderating role of ERM sophistication and the strength of corporate governance mechanisms in perceiving the impact of COVID-19 as a shock. Both ERM sophistication and strength of corporate governance are commonly attributed to large firms, and thus the prevalent empirical evidence on its state and correlation is offered on public companies (see, e.g., Beasley et al. 2015 or Farrell and Gallagher 2019) for ERM maturity, and Abor and Adjasi 2007 for corporate governance). The literature on the ERM maturity and corporate governance in SMEs is still scarce, with the evolving empirical approaches and a prevalence of survey-based methodologies (Linke and Florio 2019). Thus, our work adds also to this stream of the literature, in both methodical and empirical dimensions. Motivated by the Brustbauer (2016) approach to scaling ERM sophistication in SMEs, and by the former evidence on the distinctive features of corporate governance in SMEs (Abor and Adjasi 2007), we developed a survey-based approach that could support further studies on the moderating role of ERM and corporate governance in the SMEs. In the context of empirical evidence, our work is the first to report ERM sophistication and strength of corporate governance among the SMEs both for Germany and for Poland.

The remainder of this work is organized as follows. In Section 2 we revise the literature to define three constructs that are subject of our analysis (COVID-19 perceptions, ERM sophistication, and strength of corporate governance). In Section 3 we explain in detail the design of our research. As our approach was complex, we present the conceptual model of empirical investigations (the three stages). We also explain how we operationalized the constructs in our survey. In Section 4 we discuss the results. In Section 5 we conclude and highlight further research avenues.

2. Literature Review: Defining the Constructs

2.1. COVID-19 Perceptions Construct

It is not surprising that COVID-19 has inspired the academic community to examine the different facets of the pandemic impact from the variety of economic and managerial perspectives visible in the tremendous increase in the related literature (De Vito and Gómez 2020; Juergensen et al. 2020; Gourinchas et al. 2021). As noted by Bryce et al. (2020), COVID-19 is perceived as a test of organizational resilience, and the routes to businesses recovery, the related challenges and opportunities, as well as response and adaptation strategies.

From the perspective of SMEs' resilience, the results of the COVID-19 shock could be analyzed in at least two dimensions: immediate and prolonged effects. The immediate effects are driven by the first hit of the COVID-19 pandemic outbreak: the consequences faced due to the lockdown and the related restrictions. As the immediate effects of the COVID-19 hit, we classified all interruptions that were influential on SMEs operating profit (EBIT) and that had their underpinning in the business risk drivers (Brigham and Ehrhardt 2011). First, during the lockdown, numerous businesses were not able to operate, and thus were left without the ability to generate sales revenues. Due to the growing number of infections, firms have faced the problem of availability of workers. The lockdown has also severely disrupted the supply chains (Bonadio et al. 2020). These aspects have amplified the anxieties over the ability to continue production and sales. Many businesses have also faced increases in operating costs, for instance due to the implementation of safety and protective measures. From the break-even-point analysis point of view, the immediate effects of COVID-19 impacts led to the simultaneous decrease of sales revenues and increases in operating costs, together with an increased threat of facing operating losses.

The operating-profit-oriented turbulences, within the immediate effects, may ultimately exert an impact on firm's financial condition, which we perceive in this study as the prolonged effects of the pandemic. Overall, any worsening of operating performance and unprofitability leads to financial constraints and the related increase of the bankruptcy threat. In the literature, the financial constraints are defined as the limited availability of external funding, as driven by limited supply of capital for a company (Stiglitz and Weiss (1981), Almeida and Campello (2002), Whited (1992). In the broadened context, financial constraints are driven by the increased cost of capital (Petersen et al. 1988), Farre-Mensa and Ljungqvist (2016). Firms that face these constraints are highly dependent on their ability to obtain funding, in order to maintain liquidity. However, the short-term funding was restricted to firms in poor financial condition. COVID-19 amplified this effect, as it has also impacted the macroeconomic conditions, and thus the long-term availability of external financing. Ultimately, from an SMEs perspective, the prolonged effects of the impact from COVID-19 may result in a struggle to maintain financial liquidity in the restricted external financing environment. Thus, we find the prolonged effects of COVID-19 linked to financing risk.

2.2. ERM Sophistication Construct

The central concept of ERM is the integrated approach to risk management, one which employs a holistic perspective on the firm's risk and a coordinated management of all risk exposures (Farrell and Gallagher 2015). The ERM is still a relatively young discipline, as the intensified academic debate over ERM emerged in mid-1990s, offering nearly three decades of discussion (McShane 2018). Still, there is no clarity on ERM's definition (Bromiley et al. 2015), as well as no unified approach to measuring ERM and its sophistication (Linke and Florio 2019). Nevertheless, in the academic works that address ERM, the prevalent theme is ERM's power to increase a firm's value, with mixed results (see Florio and Leoni 2017 or McShane 2018 for the overview).

In this study, however, we refer to ERM's relevance in building a firm's resilience to shock. As noted by McShane (2018), for a firm to be resilient while facing uncertainty, it must develop the capability to adapt to changing circumstances. This is, in fact, the essence of

the concept of organizational resilience and its related dynamic capabilities. The concept of organizational resilience emphasizes a firm's ability to absorb, recover and adapt after a shock has occurred (Bonss 2016; Lorenz and Dittmer 2016; McManus et al. 2008; Mallak 1998). A firm's dynamic capabilities are regarded as critical in building resilience and reflect a firm's capacity to create, extent or modify its resources in the adaptation to a changing and turbulent environment (Eisenhardt and Martin 2000; Helfat et al. 2007). Bogodistov and Wohlgemuth (2017) have pointed on the interplay between the ERM and dynamic capabilities—the ERM concept is strengthened if considered from a dynamic capabilities perspective, as it clarifies the priorities in ERM implementation in the context of firm's resilience. This voice gives a justification for considering the importance of firm's ERM sophistication in responding to COVID-19 shock. If we assume that ERM is an important component in building dynamic capabilities and of a firm's resilience, a greater degree of ERM sophistication should result in a clearer understanding of COVID-19's impact. In other words, the surveyed SMEs that distinguish with greater degree of ERM sophistication are more aware of the COVID-19 interruptions, in comparison to the SMEs that demonstrate a lower degree of ERM sophistication. Thus, our first hypothesis is as follows:

Hypothesis 1 (H1). *SMEs that are distinguished by a higher level of ERM sophistication perceive COVID-19 interruptions as more severe.*

2.3. Corporate Governance Construct

Corporate governance is now an important topic that is widely discussed by academics, the business community and the media. However, this discussion is mainly focused on public limited companies (PLCs), and covers the problems of executive remuneration, board structures and other issues that are largely caused by agency theory (Jensen 1986). A considerably lower level of attention is paid to corporate governance issues from the perspective of the specifics of the performance of the SMEs. Nevertheless, as pointed out by Abor and Adjasi (2007), the corporate governance mechanisms observed in large firms are applicable in the SMEs and proved to be beneficial to their performance.

The most-recognized definition and principles of corporate governance are provided by the Organization for Economic Co-operation and Development (OECD): "Corporate governance involves a set of relationships between a company, its board, its shareholders and other stakeholders. Corporate governance also provides the structure through which the objectives of the company are set, and the means of attaining those objectives and monitoring performance are determined. Good corporate governance should provide proper incentives for the board and management to pursue objectives that are in the interests of the company and its shareholders and should facilitate effective monitoring" (OECD 2020). The OECD (2020) recognizes four basic pillars of corporate governance: (1) transparency, (2) accountability, (3) fairness and (4) responsibility. "Transparency" refers to the company's processes. "Accountability" covers the managing directors being accountable to the shareholders, who are the owners of the company. "Fairness" is defined by the OECD (2020) as "all shareholders should be treated fairly". "Responsibility" acknowledges the company's responsibility to communities, employees, clients, suppliers and governance (the stakeholders of the company).

Negative consequences of illegal and unethical corporate practices have shaped current research in the fields of finance, accounting and management and driven us to re-examine the changing roles, responsibilities and public expectations for corporate governance (Banham and He 2010; Gibson 2009). Previous research has investigated several Corporate Governance characteristics, including the role of ownership (Nguyen and Dang 2022), board of directors and managerial features, and the role of the audit committee (Al-ahdal and Hashim 2021), as well as the country's institutional quality (Nguyen and Dang 2022 and the influence of risk-taking behavior (Abid et al. 2021) as structural characteristics of Corporate Governance to foster Enterprise Risk Management in large corporations. However, little research has been carried out in the field of corporate governance of the

SMEs. Conversely, empirical evidence is still lacking on SMEs, which are a business form typical of Germany and Poland. The reason behind this gap is that researchers are challenged by the conceptualization of theory of corporate governance in the context of the specifics of the SMEs' performance. These challenges were identified and addressed by several conceptual papers, with the aim to create a common ground within the range of the topic (Gibson 2009; Abor and Adjasi 2007; Banham and He 2010).

Moreover, corporate governance research is multidimensional. It revolves around both organizational structure questions (such as the facilitation of internal control), and process-oriented questions (such as how processes are implemented to ensure efficiency of existing controls) (Gibson 2009). Gibson (2009) found challenging the broadness of the topic of corporate governance. Corporate governance is addressed in the context of the organization (institutional, ownership structure and life cycle stages), as well as outside the boundaries of the organization (e.g., board structure; stakeholder capital theories; and other internal governance mechanisms such as reporting systems, executive remunerations, etc.). These challenges make clear that the combination of the corporate guidance topic and SMEs needs to be multifaceted.

Many researchers point out that SMEs depend on their owners, who are frequently also performing the function of the SMEs' managers (Brunninge et al. 2007; Segaro 2010; Solange and Perelli 2013; Calabrò and Mussolino 2011; Meiseberg and Ehrmann 2013; Coulson-Thomas 2007). There is a common understanding that the success of the SME is dependent on the owner-manager's commitment and behavior (Brunninge et al. 2007; Segaro 2010). Solange and Perelli (2013) mention that "the organizational size and the overlap of management and ownership add complexity to governance in the SME context. On the other hand, SMEs are highly flexible in adapting to change and there is no typical principal-agency issue which often occurs when the governance theories are applied to PLCs".

In this study, we consider corporate governance mechanisms in their potentially supportive role in responding to a shock. Corporate governance is perceived as a first line of defense to meet risk-related challenges (Kirkpatrick 2009). In this context, Stein and Wiedemann (2016) highlight the interplay of risk governance and risk management, given the holistic perspective intrinsic to the ERM concept. For large firms, there is empirical evidence that confirms the relevance of boards in strengthening risk management (Beasley et al. 2021), as well as in preventing the failures in managing risk (in recognizing its negative consequences) (Ellul 2015). In the SMEs context, there is some evidence to support the view that stronger corporate governance mechanisms add complexity to the governance of the SMEs (Banham and He 2010). Thus, it seems that corporate governance mechanisms are influential on the perceptions of and the response to a risk, which is now no longer dependent on a single-person's (the owner's) perspective. In other words, the stronger corporate governance mechanisms may potentially limit the biased view of the impact of the external shocks (such as COVID-19) and prevent the chaotic risk response. In this regard, our second hypothesis is as follows:

Hypothesis 2 (H2). *SMEs that distinguish with stronger corporate governance mechanisms, perceive COVID-19 interruptions as more severe.*

3. Research Design

3.1. Conceptual Map of Empirical Investigations

In Figure 1 we draw the conceptual map of how we designed our empirical investigation. As we outlined in the previous section, for the purpose of our work we have identified and defined three constructs: COVID-19 impacts, ERM sophistication and strength of corporate governance mechanisms. Our survey was targeted at German and Polish SMEs within different experimental settings. Thus, the first stage of our empirical analysis was the exploration of the survey dataset, to learn whether German and Polish SMEs differ, if the three constructs are considered. In this aspect, our study is novel and original, and

provides a first insight into the specifics of researched SMEs. In a methodical context, we tested the statistical significance of the differences between German and Polish SMEs, and for each construct separately.

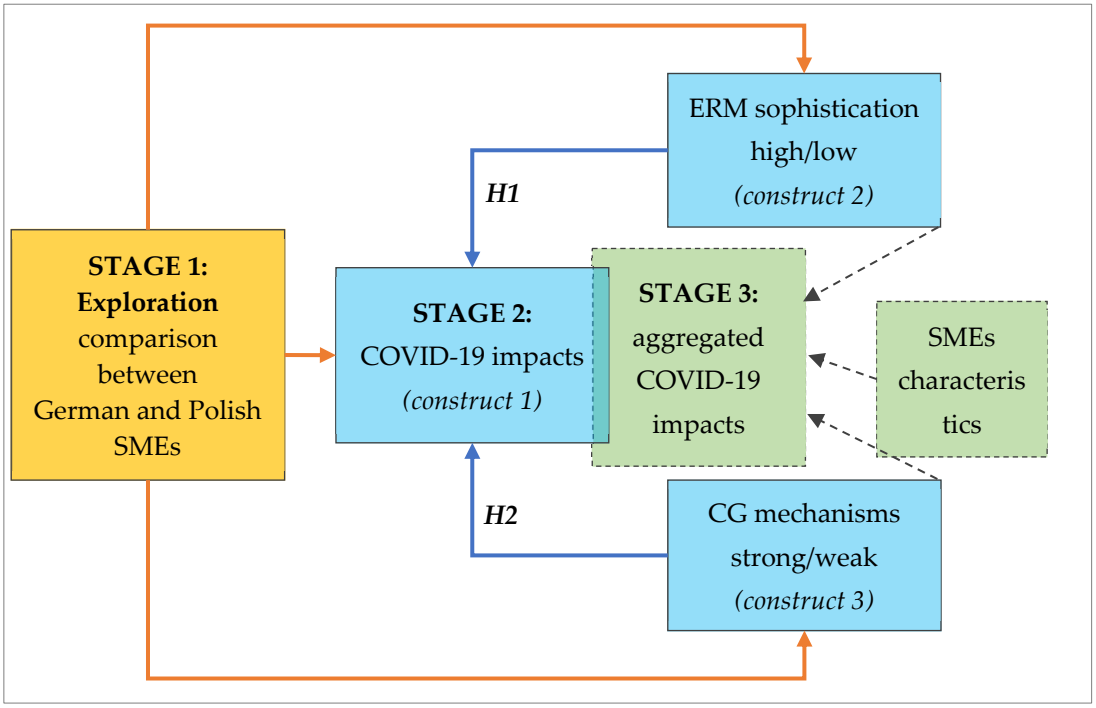


Figure 1. Conceptual map of the empirical analysis.

The second stage of our empirical analysis was designed to address the two hypotheses we formulated. Thus, we have subdivided the SMEs into groups of high and low ERM sophistication (construct 2), and those of strong and weak CG mechanisms (construct 3). Then, we inquired if these groups have differed at a statistically significant level with respect to the perceptions of COVID-19's impacts (construct 1).

The third stage of our empirical analysis was designed to investigate the interdependencies between COVID-19 impacts (on aggregated level) and the ERM sophistication, strength of corporate governance mechanisms. However, in this analysis we have also included the major characteristics of the surveyed SMEs.

At each stage of our empirical analysis, we used different statistical methods. Thus, for clarity, we explain the methodical aspects together with the discussion of the results.

3.2. Survey Design

COVID-19 impacts construct. In Table 1 we present the variables and the related survey questions that were used in our survey to capture the construct of the COVID-19 impacts. We distinguish between the immediate and prolonged effects of COVID-19. We also developed some aggregated measures for these effects.

To measure the immediate COVID-19 effects, we followed the results of the first COVID-19 monitoring surveys that have illuminated the major concerns due to interruptions in supply chains, anxieties over the accessibility of workers, as well as the anxieties over the ability to continue production and sales (e.g., Bongini et al. 2020). These aspects were a direct consequence of the growing number of infections and the related restrictions (including the lockdown periods). For many businesses, these items remained strongly correlated, and in some branches the coincidence of these immediate COVID-19 interruptions was very high. For the businesses that were able to continue operating activity, the first hit of pandemic brought an increase in operating costs. Thus, we have asked our respondents

about the costs induced by the obligation to implement safety measures (such as masks, gloves or disinfectant liquid).

Table 1. The variables and the related survey questions in COVID-19 perceptions construct.

Variables	Definition
Immediate COVID-19 effect/interruptions (survey-based)	
C.WORK	The COVID-19 pandemic resulted in limited accessibility of workers.
C.COSTS	The COVID-19 pandemic resulted in additional costs of the implementation of required safety measures.
C.PROD	The COVID-19 pandemic resulted in inability to continue production.
C.SALES	The COVID-19 pandemic resulted in inability to continue sales.
C.SUPPLY	The COVID-19 pandemic resulted in delayed delivery of production components/materials etc. or produced goods to the customers.
Prolonged COVID-19 effect/interruptions (survey based)	
C.LIQ	The COVID-19 pandemic resulted in worsening of financial liquidity.
C.LOANS	The COVID-19 pandemic resulted in limited accessibility of bank loans.
C.SURV	The overall impact of COVID-19 related interruptions threatened the survival of our company
Aggregated measures of COVID-19 interruptions:	
C.Overall	The score that reflects the consolidated COVID-19 impact, computed as the mean of the scores assigned by each of the respondents for particular impacts (8 variables)
C.Imm	The score that reflects the consolidated COVID-19 impact for the immediate pandemic effects (computed as the mean of the scores assigned to 5 variables: C.Work, C.Costs, C.Sales, C.Prod, C.Supply)
C.Prol	The score that reflects the consolidated COVID-19 impact for the prolonged effects (computed as the mean of the scores assigned to 3 variables: C.Liq, C.Loans, C.Surv)

To measure the prolonged COVID-19 effect and the related anxieties over the financial constraints and business survival, our survey covered the second set of questions, which was concerned about ability to maintain liquidity and the possible difficulties in accessing external funding. Also, we added one more general question that refers to firms' agility, by asking the respondents to evaluate how strongly COVID-19 has worsened their situation and threatened the survival of the company.

These 8 questions on the perceptions of COVID-19 interruptions were evaluated by the respondents on 7-point Likert scale: 1—strongly disagree, 2—disagree, 3—somewhat disagree, 4—neither agree nor disagree, 5—somewhat agree, 6—agree, 7—strongly agree.

Additionally, we computed aggregated scores, as the mean values of the scores assigned by respondents for all COVID-19 related interruptions asked in the survey (C.Overall), and then the mean values of the scores assigned for COVID-19 immediate impacts (C.Imm) and prolonged impacts (C.Prol).

ERM sophistication construct. In the existing body of the literature, we find a variety of methodical approaches designed to capture a firm's ERM sophistication (Linke and Florio 2019). Some works follow the risk maturity models (e.g., the RIMS RMM) to rank the ERM sophistication in a firm and implement the attributes of risk maturity in the survey (e.g., Farrell and Gallagher 2015; Farrell and Gallagher 2019; Beasley et al. 2015; Tan and Lee 2021). In our study, we follow the approach proposed by Brustbauer (2016), as it was designed for examining the ERM implementation in the SMEs. A detailed list of questions that we used in our survey to capture ERM sophistication construct is presented in Table 2.

Table 2. The variables and the related survey questions in ERM sophistication construct.

Variables	Definition
Risk analysis (identification and evaluation)	
ERM.exp	Our company employs external experts to identify risks *
ERM.report	Our company writes reports on intensified risks *
ERM.ident	Our risk identification considers all aspects of our performance
ERM.list	We regularly review our list of identified risks
ERM.eval	We always evaluate risk impact from the perspective of our business objectives **
Risk monitoring and response	
ERM.cust	Our company regularly surveys customers' satisfaction **
ERM.prev	To prevent errors, we always follow the predefined procedures/plans **
ERM.cont	We have contingency plans for emergencies *
ERM.owners	Our company defined "risk owners", that is key persons who are responsible for monitoring and handling particular exposures
ERM.metrics	We have implemented risk measures/metrics that are helpful in monitoring the first symptoms of risk
Aggregated measures of ERM sophistication	
ERM.Soph	mean of all ERM practices (10)
ERM.analysis	mean of risk analysis ERM practices (5)
ERM.m&r	mean of risk monitoring and response ERM practices (5)

Notes: * questions directly repeated from Brustbauer's (2016) survey, ** modified questions from Brustbauer's survey. The remaining questions are the Author's questions.

The original survey by Brustbauer's covered a set of 12 simple questions that enabled researchers to scale SME's activities within risk identification, risk assessment and risk monitoring. For the purposes of our study, we have followed the construction and methodical approach suggested by Brustbauer, by defining two sets of questions that address (i) risk analysis (identification and evaluation) and (ii) risk monitoring and response. We have also followed the evaluation scale, by applying a 7-point Likert scale, ranging from 1—strongly disagree to 7—strongly agree. However, we have reduced the number of questions to 10 and we slightly modified their wording, to better address the holistic approach, which is the core of the ERM concept.

In the set of 10 questions we have asked, 3 were repeating the Brustbauer's survey (ERM exp, ERM_report and ERM_cont), and the further 3 were slightly modified in wording (ERM_eval, ERM_cust and ERM_prev). There were 4 additional questions that were motivated by Brustbauer's approach, but were more-in-depth reformulated. First of all, we addressed an integration and continuity of risk identification (ERM_ident and ERM_list). Second, we addressed the presence of "risk owners" and key risk indicators (ERM_owners and ERM_metrics), as the relevant attributes of ERM sophistication.

As in the case of COVID-19 questions, the ERM sophistication was evaluated by the respondents on 7-point Likert scale (consistently with Brustabuer's approach). Respondents were asked to assign the scores depending on how far they agree that their firm is following the given ERM-related practice (1—strongly disagree, 2—disagree, 3—somewhat disagree, 4—neither agree nor disagree; 5—somewhat agree; 6—agree; 7—strongly agree). Thus, the higher the assigned scores—the greater ERM sophistication.

Based on the survey answers, we controlled for three additional aggregated variables: ERM.soph, which reflects the overall ERM sophistication score (which is a mean value of all 10 ERM practices considered in the survey); ERM.analysis score (mean of the scores assigned for risk analysis questions); and ERM.m&r score (mean of the scores assigned for 5 risk monitoring and response questions).

Strength of corporate governance mechanisms construct. As our literature review has evidenced, SMEs have a completely different understanding of the corporate governance construct, in contrast to large firms. Therefore, to evaluate the strength of corporate gover-

nance mechanisms in SMEs more comprehensively, we developed two sets of questions. These questions are presented in detail in Table 3.

Table 3. The variables and the related survey questions in a corporate governance construct.

Variables	Definition
CG strategic thinking	
CG.succ	Does the company have any plan of succession? (who will run the business in the case the owner is retired or ill?) 1—no, 2—yes, but informal, 3—yes, formal
CG.strat	Does a company have a formal business strategy plan? 1—no, 2—yes, with 1-year horizon; 3—yes, with a horizon up to 3 years, 4—yes, with a horizon exceeding 3 years perspective
CG internal organisational structure	
How important is each of the below-listed elements of the internal organizational structure? (all questions evaluated on 3-point Likert scale: 1 minor importance, 2 moderately important, 3 very important)	
CG.rules	clearly defined rules of decision making
CG.com	control of internal and external communication
CG.confl	handling of conflicts of interests
CG.r&o	defined rights and obligations of the management team
CG.dcr	qualifications and competences of the management team
CG.size	size and composition of the management team
Aggregated measure of strength of CG mechanisms	
CG.score	computed as the mean of the scores assigned for all CG characteristics

The first set of questions outlined in Table 3 is concerned with the SMEs' strategic thinking process and its succession regulations (Durst and Henschel 2014). The corporate governance strategic thinking is covered with two questions that refer to long-term and thus strategic thinking. The first addressed the succession plan, while the second the implementation of formal business strategy. Higher scores are assigned for the practices that correspond to a greater degree of strategic orientation.

The second set of questions deals with the organization's internal structure (Spielmann 2012). The majority of SMEs are owner-managed firms and succession planning is of great importance for the long-term continuity of the firm. With the second set of questions, we try to gauge the formalization of the corporate governance mechanisms in SMEs. In particular, the elements of the internal organizational structure play a significant role in how formal the corporate governance mechanisms are established in SMEs (Banham and He 2010; Brunninge et al. 2007). The questions we asked to capture the internal structure of corporate governance have been empirically tested and are regarded as useful in evaluating governance mechanisms in small firms (Spielmann 2012). These questions were evaluated on 3-point Likert scale, ranging from 1 (minor importance) to 3 (very important). Again, higher scores correspond with a greater degree of CG internal organizational structure.

Finally, we have computed the overall CG score, to address the strength of corporate governance mechanisms in a given SME, as the mean of the scores assigned for all CG characteristics.

Demographic variables. As a demographic variables, we considered several SMEs' features that are commonly revised in the survey-based works (e.g., Semrau et al. 2016). We present these measures in Table 4.

Table 4. The definitions of business demographic variables in the survey.

Variables	Definition
	Size—the number of employees:
micro	up to 9 persons
small	10–49 persons
medium	50–249 persons
	Age—the number of years the company actively performs on the market:
infant	up to 5 years
young	6–10 years
intermediate	11–20 years
mature	21 years or more
	The legal form of business performance
SP	sole proprietor
P-personal	partnership—personal (owners bear whole responsibility for the business)
P-capital	partnership—capital (owners bear limited liability for the business)
	Do you consider your business as a family firm? (the members of the family/the relatives are engaged in the business)
Fam	YES—family firm
N-Fam	NO—non-family firm
	Sector
T	trade
P	production
S	services

As a measure of an SMEs' size, we controlled for firm's employment, to distinguish between micro, small and medium sized ones. Further, we have considered the SME's age by considering the number of years the firms actively perform on the market. In this regard, we have distinguished between the infant, young, immediate and mature SMEs. Further, we have considered two characteristics that could be associated with a firm's corporate governance policies. First of all, we controlled for the legal form of SMEs' performance. The considered businesses characteristics distinguish between sole proprietors and the type of partnership (in the context of the SME's liability for the partnership performance). We have also asked our respondents whether they find their business to be a family firm or not. Finally, we considered the general sector to which the business belongs by asking whether the SME is a producer, trader or services provider.

3.3. Sample Selection Scheme

The survey was conducted in January/February 2021. At that time, Poland and Germany were after the second peak wave of infections and the related lockdowns (WHO 2021), the first governmental aid packages have been offered for the businesses. Our survey respondents have already been "familiar" with the COVID-19 and its potential impact (scale and severity of the turbulences caused by pandemic to their businesses, thus the SMEs could more reasonably assess the impacts of pandemic on their performance).

The online questionnaire was initially pilot tested on ten SMEs. The pre-test raised no concerns. Because the completion of the survey was voluntary, there was potential for bias if those choosing to respond differed significantly from those who did not respond. Our study's results may be limited to the extent such bias exists. All survey responses were anonymous, and all data used in this study, including the demographic variables, were self-reported by the survey respondents and cannot be independently verified. Despite these limitations, we believe the responses obtained provide a unique opportunity to examine the SMEs' perceptions of COVID-19 impacts, in association with ERM sophistication and strength of CG mechanisms.

In Poland, the survey was carried out by a professional survey agency that used its own database of SMEs across the whole of Poland (random sample). In Germany, we drew a random sample of 4460 firms from the Firmenwissen database. We selected all enterprises that match the definition of the SMEs, in accordance with the European Union criteria on the number of employees.

The SMEs were invited to participate anonymously in the survey via an established online survey system. No extrinsic incentive was used. We did one reminder. In Poland, the response rate was 12.5%. After the consistency checks, we received 526 complete questionnaires. In Germany, the response rate was 9.9% (453 firms). After consistency checks, 238 of the survey responses were removed, due to incompleteness. A total of 215 were valid, with an effective questionnaire response rate of 4.8%.

The sample characteristics, with reference to the demographic variables of the surveyed SMEs, are reported in Table 5.

Table 5. Sample characteristics (business demography).

Variables		Germany		Poland	
		N	%	N	%
In total		215	100.00%	526	100.00%
Size	micro	41	19.07%	181	34.41%
	small	147	68.37%	206	39.16%
	medium	27	12.56%	139	26.43%
Age	infant	15	6.98%	86	16.35%
	young	32	14.88%	137	26.05%
	intermediate	53	24.65%	185	35.17%
	mature	115	53.49%	118	22.43%
Legal form	SP	23	10.70%	195	37.07%
	P-personal	67	31.16%	77	14.64%
	P-capital	125	58.14%	254	48.29%
Family business	Fam	125	58.14%	167	31.75%
	N-Fam	90	41.86%	359	68.25%
Sector	trade	36	16.74%	95	18.06%
	production	45	20.93%	198	37.64%
	services	134	62.33%	233	44.30%
In total		215	100.00%	526	100.00%

4. Results

4.1. Exploration of Similarities and Differences between Germany and Poland: The Constructs

In accordance with the conceptual map of our investigations, we have first explored the similarities and differences between Germany and Poland, for each construct subject of our survey. The reason behind this was that there is no prior research that was addressing the comparisons of Germany (as an advanced economy) with Poland (as less developed), in each aspect considered in our survey, namely the COVID-19 impacts, ERM sophistication, and strength of CG mechanisms. In this aspect our study is pioneering, and the differences we have identified were critical for designing the directions of further empirical procedures applied to our data (in methodical context).

To compare the survey results within the three constructs of our interest, we have applied non-parametric ANOVA (U Mann-Whitney test). The diagnostic test (normality check) has shown that the data we obtained in the survey are not normally distributed (see Appendix A). Thus, for obtaining reliable results in cross-country dimension, we applied the non-parametric analysis. With the U Mann-Whitney test, we verified whether there are any statistically significant differences between the German and Polish samples, if we consider the constructs subject of our study (COVID-19 impacts, ERM sophistication and

Corporate Governance mechanisms). In addition, this part of our empirical analysis offers some first insights into the constructs in focus.

In Figure 2 we provide the results of the survey, given the SMEs perceptions of the COVID-19 impacts (the mean scores). In Table 6 we report the results of U Mann-Whitney test for the COVID-19 impacts construct, to verify the statistical significance of the differences between German and Polish SMEs. The results clearly indicate that, with the exception of continuity or production (C.PROD), German and Polish SMEs have significantly differed with their perceptions of COVID-19 impact. The differences in means ranks of U Mann-Whitney test for the considered COVID-19 impacts illuminate that, in the majority, the impacts considered in this study were evaluated as more severe by Polish SMEs than by the German ones. The exceptions are the costs (C.COSTS) and continuity of production (C.PROD), which were evaluated as more interruptive by the German SMEs.

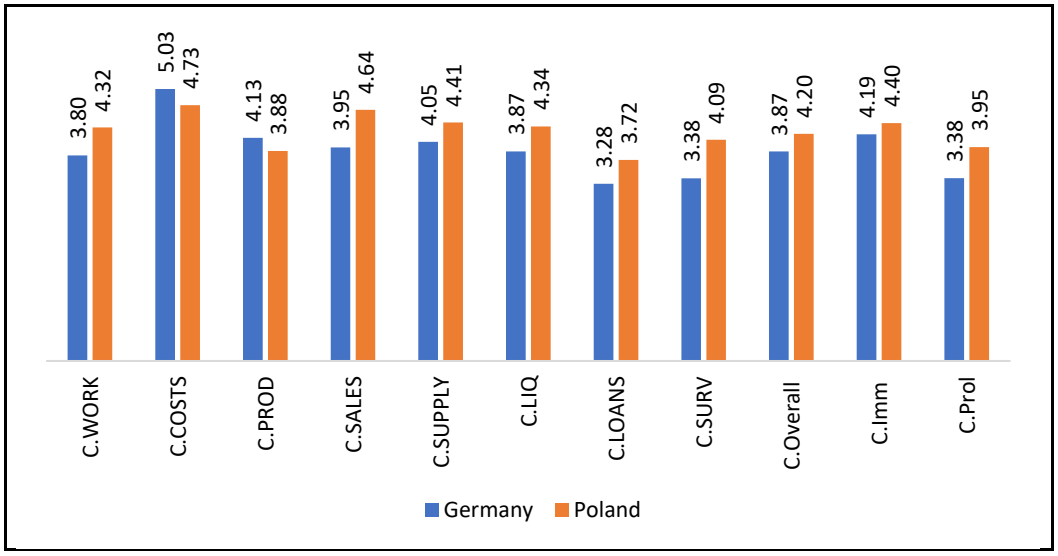


Figure 2. COVID-19 impacts construct: Survey results for SMEs in Germany and Poland.

Table 6. COVID-19 impacts construct: SMEs in Germany vs. SMEs in Poland.

Variable	U Mann-Whitney	W-Wilcoxon	Z	Sig.	Mean Ranks of U Mann-Whitney Test	
					Germany	Poland
C.WORK	49,902.000	73,122.000	−2.542	0.011 **	340.10	383.63
C.COSTS	49,439.500	188,040.500	−2.736	0.006 ***	404.05	357.49
C.PROD	52,625.500	191,226.500	−1.498	0.134	389.23	363.55
C.SALES	46,348.000	69,568.000	−3.905	0.000 ***	323.57	390.39
C.SUPPLY	51,064.000	74,284.000	−2.102	0.036 **	345.51	381.42
C.LIQ	49,202.500	72,422.500	−2.810	0.005 ***	336.85	384.96
C.LOANS	37,368.000	52,593.000	−3.700	0.000 ***	302.26	366.46
C.SURV	43,198.500	66,418.500	−5.118	0.000 ***	308.92	396.37
C.Overall	40,182.000	55,407.000	−2.414	0.016 **	318.43	361.11
C.Imm	34,079.500	48,785.500	−4.771	0.000 ***	285.30	369.71
C.Prol	37,549.500	52,774.500	−3.560	0.000 ***	303.30	366.11

Notes: Statistically significant at: *** 0.01, ** 0.05.

In Table 6 we also provide a comparison between German and Polish SMEs for the COVID-19 impacts sores. We observe statistically significant differences for overall COVID-19 impacts score (C.Overall) at 5%, and the mean ranks of U Mann-Whitney test indicate the greater impact perceived by the Polish sample. Similarly, the immediate (C.Imm) and prolonged (C.Prol) COVID-19 impacts were perceived as more interruptive by Polish SMEs,

and the differences between German and Polish SMEs are strongly statistically significant (p-values of 0.000)

In Figure 3 we provide the results of the survey, given the SMEs' responses in ERM sophistication construct (the mean scores). In Table 7 we present the results of U Mann-Whitney test to verify the statistical significance of the differences between German and Polish SMEs for the ERM construct.

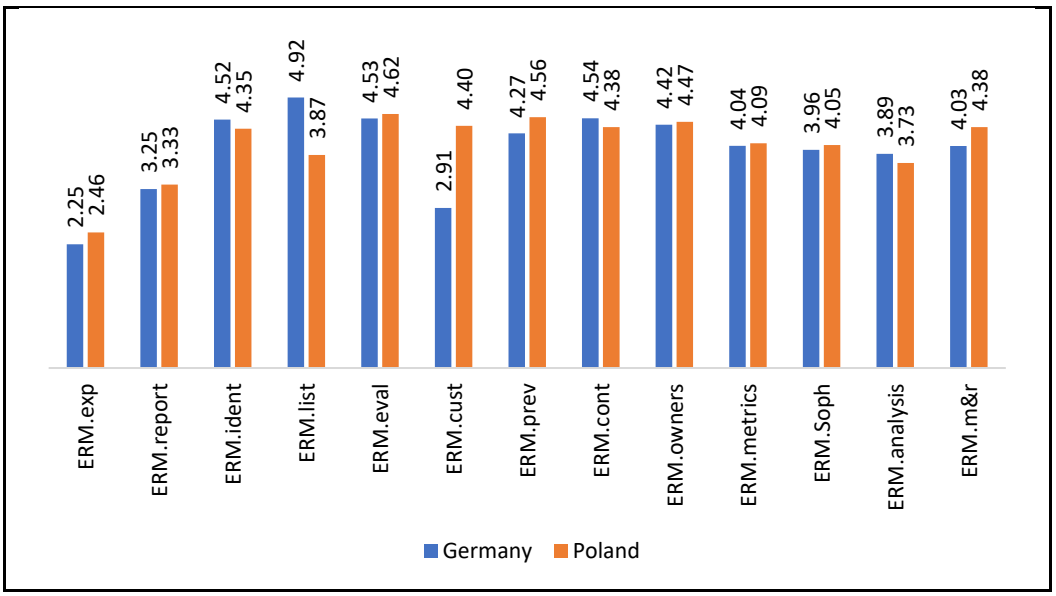


Figure 3. ERM sophistication construct: Survey results for SMEs in Germany and Poland.

Table 7. ERM sophistication construct: SMEs in Germany vs. SMEs in Poland.

Variable	U Mann-Whitney	W-Wilcoxon	Z	Sig.	Mean Ranks of U Mann-Whitney Test	
					Germany	Poland
ERM.exp	48,922.000	72,142.000	−3.003	0.003 ***	335.54	385.49
ERM.report	53,497.500	76,717.500	−1.170	0.242	356.83	376.79
ERM.ident	51,020.000	189,621.000	−2.130	0.033 **	396.70	360.50
ERM.list	35,205.500	173,806.500	−8.196	0.000 ***	470.25	330.43
ERM.eval	56,134.500	194,735.500	−0.159	0.874	372.91	370.22
ERM.cust	30,908.000	54,128.000	−9.814	0.000 ***	251.76	419.74
ERM.prev	52,583.000	75,803.000	−1.530	0.126	352.57	378.53
ERM.cont	52,362.000	190,963.000	−1.616	0.106	390.46	363.05
ERM.owners	53,897.500	192,498.500	−1.022	0.307	383.31	365.97
ERM.metrics	56,057.000	194,658.000	−0.188	0.851	373.27	370.07
ERM.Soph	55,838.000	79,058.000	−0.267	0.789	367.71	372.34
ERM.analysis	50,308.000	188,909.000	−2.362	0.018 **	400.01	359.14
ERM.m&r	48,775.500	71,995.500	−2.943	0.003 ***	334.86	385.77

Notes: Statistically significant at: *** 0.01, ** 0.05.

The weaknesses in the implementation of ERM systems in both countries are very similar. The survey results for the SMEs operating in Poland and Germany reveal the lowest values for ERM experts and the preparation of risk reports. As Crovini et al. (2021a, 2021b) point out, the reason is that risk analysis and risk reporting is embedded in the decision-making process and basically carried out almost unconsciously by the owner-manager of the business.

These observations are also in line with other studies on ERM in SMEs (Kim and Vonortas 2014; de Araújo Lima et al. 2020; Henschel and Lantzsch 2022).

The results of U Mann-Whitney test show that there is no statistically significant difference between German and Polish SMEs if we consider the overall ERM sophistication score (ERM.Soph). However, there are some significant differences if we consider the sub-scores that refer to risk analysis approach (ERM.analysis) or risk monitoring and response practices (ERM.m&r), with *p*-values of 0.018 (sig. at 5%) and 0.003 (sig. at 1%), respectively. Interestingly, the mean ranks of the U Mann-Whitney test indicate that the German SMEs distinguish with greater degree of risk analysis, whereas the Polish SMEs—in risk monitoring.

A closer analysis of the constituents of risk analysis score suggests that the German SMEs distinguish with greater ERM practices in the regular overview of the list of identified risks (ERM.list), with visibly higher mean ranks of U Mann-Whitney test compared to Poland (and *p*-value of 0.000). Also, the German SMEs obtained higher ranks for more integrative approach to risk identification (ERM.ident), which is significant at 5%. However, the Polish SMEs more frequently rely on the external experts in risk identification (ERM.exp), and this difference between German and Polish SMEs is statistically significant at 1%.

A closer analysis of the constituents of risk monitoring and response score (ERM.m&r) suggests that only one item was highly influential on the differences observed between Polish and German SMEs—the survey of customer's satisfaction (ERM.cust). Following Brustbauer (2016), the regular surveys on customers' satisfaction are informative in the context of the regular and continuous revision of risk (in this case—customer loss). Accordingly, based on the differences between Poland and Germany in ERM.cust (which is significant at 0.1%) Polish SMEs seem to be more focused on continuous risk monitoring in comparison to the German ones. There are no statistically significant differences between German and Polish SMEs in the remaining constituents of ERM risk monitoring and response score (namely the prevention, contingency plans implementation, risk owners and the risk metrics).

In Figure 4 we illustrate the results of the survey for the strength of CG mechanisms in German and Polish SMEs. Further, in Table 8 we provide the results of U Mann-Whitney test, to verify the statistical significance of the differences observed between German and Polish SMEs.

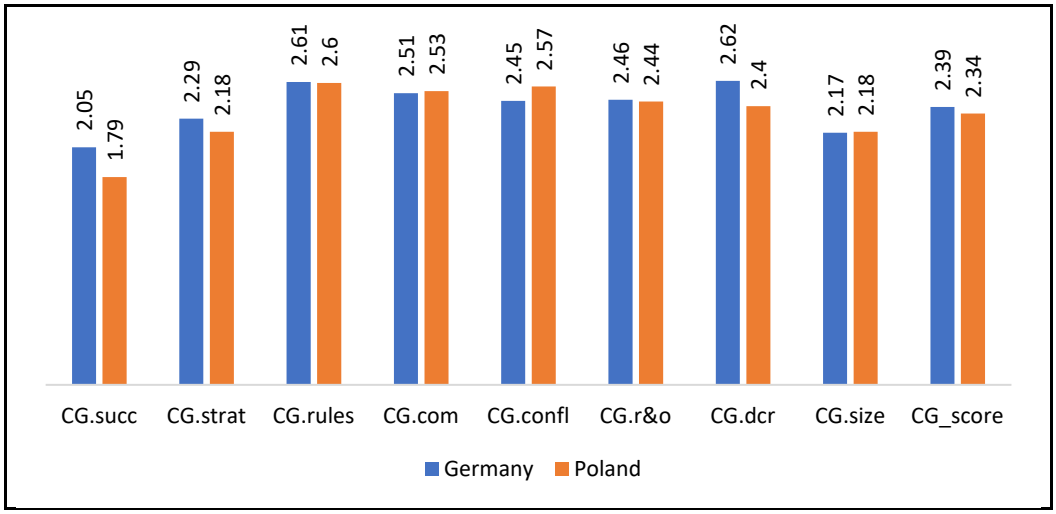


Figure 4. Strength of CG mechanisms construct: Survey results for SMEs in Germany and Poland.

Table 8. Strength of corporate governance mechanisms construct: SMEs in Germany vs. SMEs in Poland.

Variable	U Mann-Whitney	W-Wilcoxon	Z	Sig.	Mean Ranks of U Mann-Whitney Test	
					Germany	Poland
CG.succ	46,167.000	184,768.000	−4.195	0.000 ***	419.27	351.27
CG.strat	52,049.000	190,650.000	−1.776	0.076 *	391.91	362.45
CG.rules	55,529.500	194,130.500	−0.463	0.644	375.72	369.07
CG.com	56,320.500	79,540.500	−0.098	0.922	369.96	371.43
CG.confl	51,654.000	74,874.000	−2.148	0.032 **	348.25	380.30
CG.r&o	55,764.000	194,365.000	−0.332	0.740	374.63	369.52
CG.dcr	46,517.500	185,118.500	−4.291	0.000 ***	417.64	351.94
CG.size	56,180.500	79,400.500	−0.148	0.883	369.30	371.69
CG_score	50,236.500	188,837.500	−2.395	0.017 **	400.34	359.01

Notes: Statistically significant at: *** 0.01, ** 0.05, * 0.1.

First of all, there are statistically significant differences between German and Polish SMEs for the overall corporate governance score (CG.score), with *p*-value of 0.017, statistically significant at 5%. The mean ranks of U Mann-Whitney test indicate that the German SMEs were distinguished by a higher corporate governance score, in comparison to Polish SMEs. The constituents of the corporate governance score clearly indicate that this is driven primarily by succession plans (CG.succ) and qualification and competences of the management team (CG.dcr) which is in line with the findings from the international literature (Crossan and Henschel 2012; Crossan et al. 2018; Durst and Henschel 2014). For these constituents the differences between German and Polish SMEs are statistically significant at 0.1%. German SMEs differ from the Polish ones also with respect to the strategic plans (CG.strat), at 10% of statistical significance. Interestingly, the mean ranks of U Mann-Whitney test indicate that the Polish SMEs are stronger in handling conflicts of interest (CG.confl) compared to the German ones, which is also statistically significant at 5%.

The above analysis of the differences we observe between surveyed German and Polish SMEs lead to the conclusion that given the COVID-19 impacts, these differences are visible in various levels of analysis (single factors or our aggregated measures). The differences observed in the ERM sophistication and corporate governance constructs are less obvious and are driven by specific factors (constituents) we consider as a building blocks of these constructs. However, as there are some statistically significant differences between Germany and Poland; further in this study we revise our hypotheses for each country selectively and compare the obtained results to draw conclusions. In other words, as we detected statistically significant differences between German and Polish SMEs, we were mandated to run further analysis (and test our hypotheses) separately for each country.

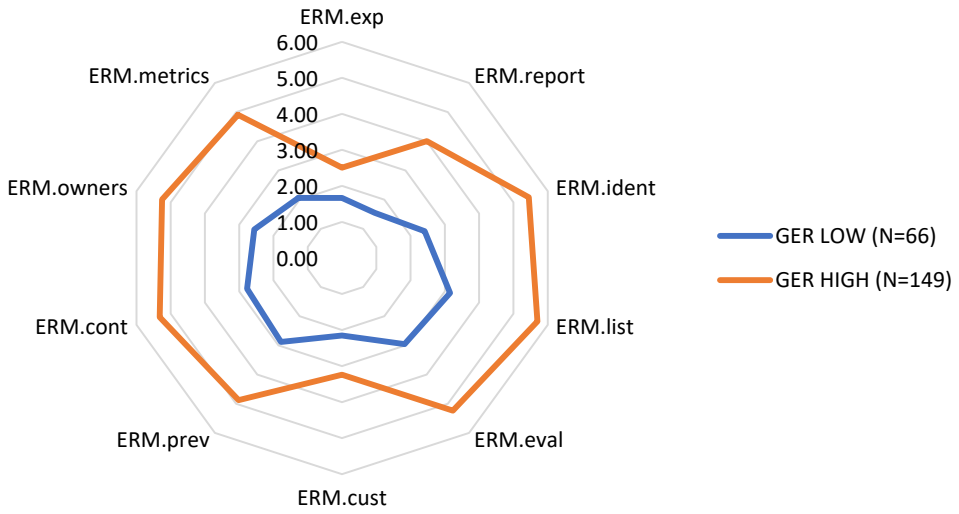
4.2. COVID-19 Impacts and ERM Sophistication (Hypothesis 1)

Our first hypothesis is that SMEs that distinguish with higher level of ERM sophistication perceive COVID-19 interruptions as more severe. To test this hypothesis, we applied the methodical approach used by Brustbauer (2016). First, we applied a k-mean clustering algorithm to assign our respondents to the group of high or low ERM sophistication. The results of clustering are presented in Appendix B. The k-means rank method offers a possibility to define the number of clusters and is designed to classify objects by their means. The method is based on minimising within-cluster variances (so called squared Euclidean distances) to achieve intergroup homogeneity (Everitt et al. 2011). Thus, consistently with the Brustbauer (2016) approach, we controlled the means of the features of ERM sophistication. Further, we tested the statistical significance of the COVID-19 impacts between the group of low and high ERM sophistication. For those purposes, we ap-

plied U Mann-Whitney test. The application of the non-parametric method was justified, given the distribution of the variables (see the results of diagnostic test of normality of the distribution, provided in Appendix A).

The clustering was performed separately for Germany and Poland, given our prior findings on some statistically significant differences between these countries if the ERM sophistication construct is considered. As can be seen in Figure 5, with the application of k-mean clustering algorithm, we have obtained the cluster of firms that distinguish with LOW ERM sophistication, which covered 66 (31%) German and 249 (47%) Polish SMEs, which gives, in total, 315 (42.5%) out of 741 respondents. In the cluster of high ERM sophistication we classified 149 (69.3%) German and 277 (52.6%) Polish SMEs, which gives 426 (57.5%) out of 741 respondents in total. It is worth noticing that for Poland the clusters of ERM sophistication are relatively balanced in the number of SMEs, while for Germany—the number of SMEs that fall in the cluster of low ERM sophistication is considerably smaller, in comparison to the cluster of high ERM sophistication.

Panel A. Germany



Panel B. Poland

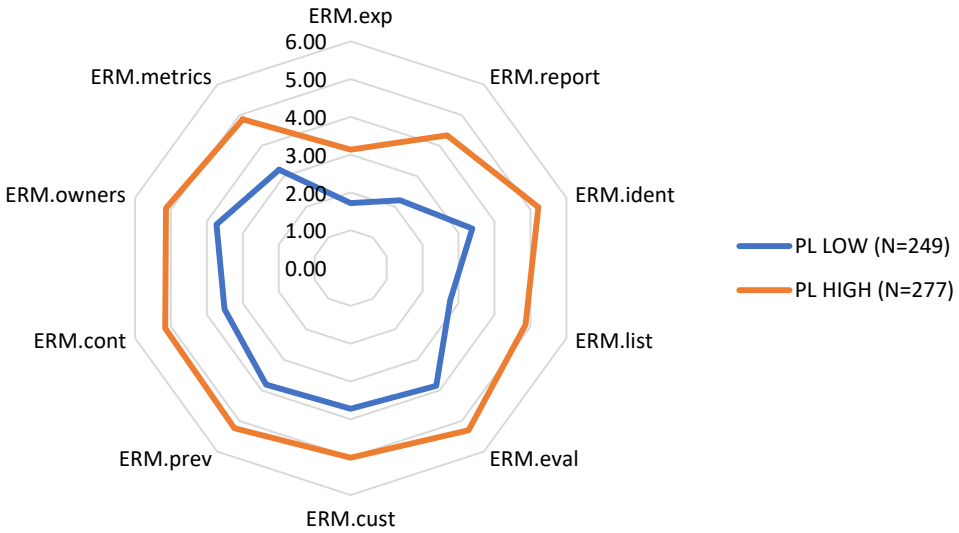


Figure 5. Clusters of low and high ERM sophistication (mean values of the scores, for Germany and Poland).

Further, we have performed the U Mann-Whitney test to verify whether SMEs of higher/lower ERM sophistication have differed in their perceptions of COVID-19 impacts (overall, immediate and prolonged). The results are provided in Table 9, with the mean ranks of U Mann-Whitney test.

Table 9. Results of U Mann-Whitney test for the perceptions of COVID-19 impacts and the ERM sophistication (group of low vs. high ERM sophistication).

Variable	U Mann-Whitney	W Wilcoxon	Z	Sig.	Mean Ranks U Mann-Whitney Test		
					Low	High	Diff.
Panel A. Germany							
C.WORK	4764.000	6975.000	−0.376	0.707	105.68	109.03	−3.345
C.COSTS	2954.000	5165.000	−4.767	0.000 ***	78.26	121.17	−42.917
C.PROD	4120.500	6331.500	−1.917	0.055 *	95.93	113.35	−17.414
C.SALES	4559.500	6770.500	−0.861	0.389	102.58	110.40	−7.816
C.SUPPLY	3875.500	6086.500	−2.507	0.012 **	92.22	114.99	−22.770
C.LIQ	4017.500	6228.500	−2.165	0.030 **	94.37	114.04	−19.666
C.LOANS	2661.500	3936.500	−1.488	0.137	78.73	91.04	−12.306
C.SURV	4219.000	6430.000	−1.682	0.093 *	97.42	112.68	−15.260
C.Overall	2320.000	3595.000	−2.595	0.009 ***	71.90	93.79	−21.890
C.Imm	3565.000	5776.000	−3.218	0.001 ***	87.52	117.07	−29.559
C.Prol	2541.500	3816.500	−1.862	0.063*	76.33	92.00	−15.674
Panel B. Poland							
C.WORK	32,641.500	63,766.500	−1.078	0.281	256.09	270.16	−14.070
C.COSTS	34,370.500	65,495.500	−0.068	0.946	263.03	263.92	−0.885
C.PROD	27,392.000	58,517.000	−4.127	0.000 ***	235.01	289.11	−54.104
C.SALES	33,521.500	64,646.500	−0.563	0.573	259.62	266.98	−7.359
C.SUPPLY	31,435.500	62,560.500	−1.786	0.074 *	251.25	274.51	−23.267
C.LIQ	33,696.000	72,199.000	−0.461	0.645	266.67	260.65	6.028
C.LOANS	32,338.500	63,463.500	−1.268	0.205	254.87	271.25	−16.381
C.SURV	34,265.000	72,768.000	−0.130	0.897	264.39	262.70	1.689
C.Overall	31,956.500	63,081.500	−1.454	0.146	253.34	272.63	−19.294
C.Imm	30,853.500	61,978.500	−2.090	0.037 **	248.91	276.62	−27.706
C.Prol	34,334.000	65,459.000	−0.088	0.930	262.89	264.05	−1.163

Notes: Statistically significant at: *** 0.01, ** 0.05, * 0.1.

Data presented in Table 9 show that both for Germany and for Poland we observe that the immediate effects of the pandemic have been perceived as more interruptive by SMEs with higher ERM sophistication. In addition, for Germany, we have statistically significant associations for the perceptions of overall and prolonged effects (significant at 1% for overall and at 10% for prolonged). The mean ranks suggest the same—SMEs with higher ERM sophistication perceived COVID-19 impacts as more interruptive).

An insight into the constituents of immediate effects shows that for Germany the differences at statistically significant level are observed for costs, production and supply chain related COVID-19 interruptions. The observations for Polish SMEs do not include the increased costs. However, in either case both for German and Polish SMEs, we observe the same associations, given the mean ranks of U Mann-Whitney test: SMEs in the clusters of higher ERM sophistication perceived these COVID-19 impacts as more interruptive.

An insight into the constituents of prolonged effects shows that the clusters of German SMEs of high and low ERM sophistication differed statistically significantly with their anxieties over the maintenance of liquidity or overall survival. Again, the main ranks of U Mann-Whitney test indicate that SMEs with higher ERM sophistication were more afraid of liquidity constraints and concerned about their overall ability to survive, in comparison to the cluster of low ERM sophistication. For Poland, we do not observe a statistically

significant differences between the clusters of ERM sophistication within the prolonged COVID-19 interruptions.

In light of this evidence, our first hypothesis found partial support. Although the SMEs with higher ERM sophistication perceived COVID-19 impacts as more severe (both in Germany and in Poland), these differences are statistically significant only for some particular interruptions. Moreover, only for the immediate COVID-19 impacts the differences were significant in both countries.

4.3. COVID-19 Impacts and Strength of CG Mechanisms (Hypothesis 2)

Our second hypothesis is that the SMEs that distinguish with stronger corporate governance mechanisms perceive COVID-19 interruptions as more severe. To test this hypothesis, we applied an empirical procedure as in the case of ERM sophistication construct (in line with Brustbauer (2016)). First of all, we applied a k-means clustering algorithm to assign the SMEs to the group of weak or strong corporate governance mechanisms (the results of clustering are presented in Appendix B). Further, we tested the statistical significance of the COVID-19 impacts between the group of weak and strong CG mechanisms. For those purposes, we applied the U Mann-Whitney test. The application of the non-parametric method was justified, given the distribution of the variables (see the results of diagnostic test of normality of the distribution, provided in Appendix A).

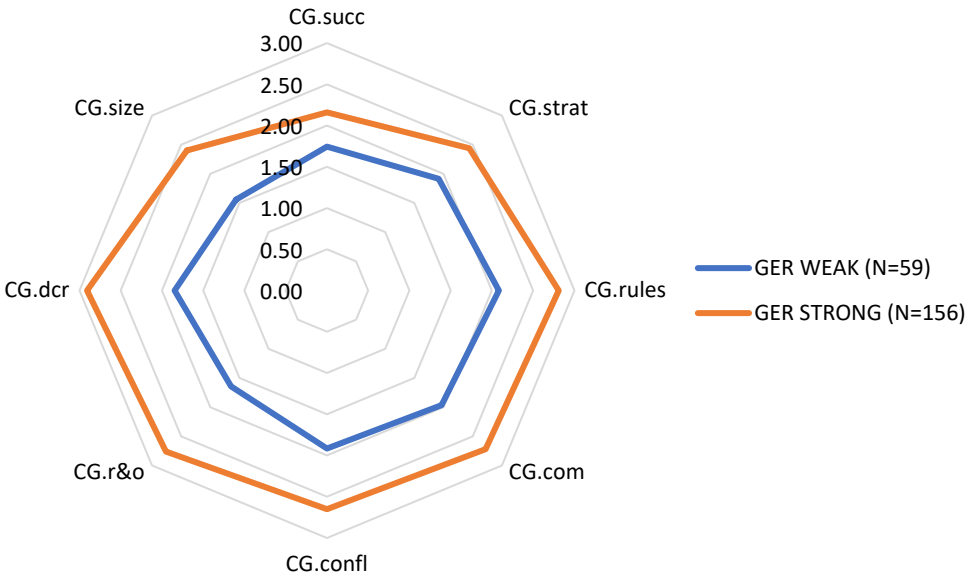
As previously, the clustering was performed separately for Germany and Poland, given our prior findings on some statistically significant differences between these countries with respect to the corporate governance construct. As it can be seen in Figure 6, with the application of k-mean clustering algorithm we have obtained the cluster of firms that distinguish with WEAK corporate governance mechanisms, which covered 59 (27.4%) German and 251 (47.7%) Polish respondents, which gives in total 310 (41.8%) out of 741 respondents in total. In the cluster of STRONG corporate governance mechanisms, we classified 156 (72.5%) German respondents and 275 (52.3%) Polish respondents, which gives in total 431 (58.2%) out of 741 respondents. It is interesting to note that the split between WEAK and STRONG corporate governance mechanisms for the Polish sample firms is nearly the same, whereas for the German sample more than two thirds of the sample firms fall into strong governance mechanism cluster (which is consistent with prior observation for ERM sophistication).

When looking at the individual items of the corporate governance mechanisms, one can see that the succession plan regulations reveal very weak results for both clusters of weak and strong governance in Germany and Poland as well. This finding is in line with recent studies on governance in SMEs (Crossan et al. 2018; Boers and Henschel 2021; Florio et al. 2022). Next, the size and composition of the top-management team is also a big issue for the investigated firms. As there is hardly any such comprehensive CG construct covering both strategic thinking and internal organizational structure in the literature, it is difficult to make comparisons.

We have further performed the U Mann-Whitney test to compare between the cluster of weak and strong corporate governance mechanisms, given the respondents' perceptions of COVID-19 impacts. We provide the results in Table 10, together with the mean ranks of the U Mann-Whitney test.

The results presented in Table 10 suggest that the strength of corporate governance mechanisms is less influential on the perceptions of COVID-19 impacts, in comparison to ERM sophistication. For Germany, we observe statistically significant differences between the SMSs of weak and strong corporate governance mechanisms only for the interruptions in supply chains (significant at 5%) and the mean ranks of U Mann-Whitney test indicate that SMEs of stronger corporate governance mechanisms have perceived these interruptions as more influential.

Panel A. Germany



Panel B. Poland

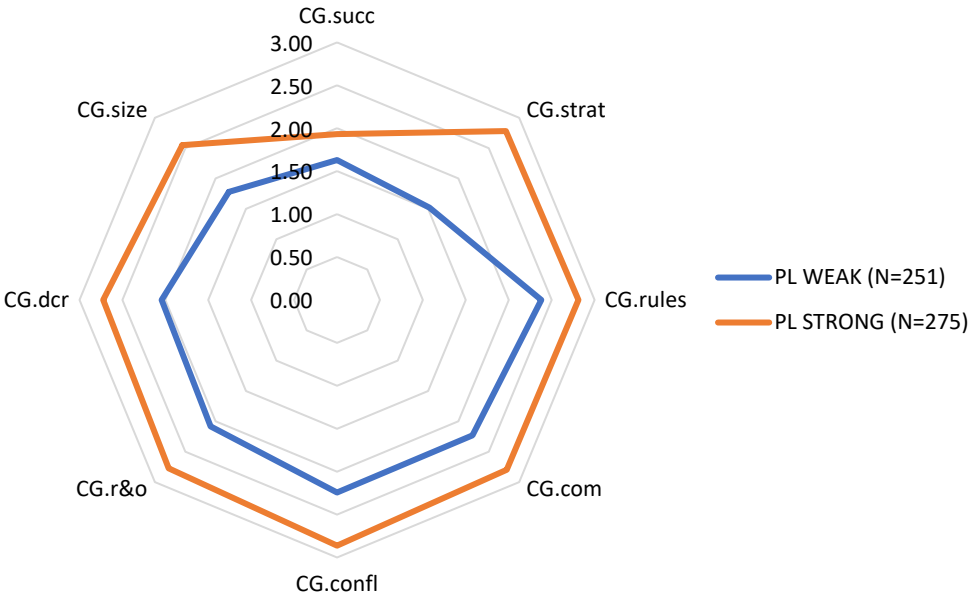


Figure 6. Clusters of weak and strong corporate governance mechanisms (mean values of the scores, for Germany and Poland).

Interestingly, for Poland we observe that there were strong, statistically significant differences between the cluster of weak and strong corporate governance mechanisms for the increased costs and the ability to continue production (significant at 1%). Again, we observe that SMEs with stronger corporate governance mechanisms perceived these interruptions as more severe, given the mean ranks of the U Mann-Whitney test. These two constituents were influential for the significance of our aggregated measure of immediate COVID-19 interruptions. The cluster of SMEs of weak and strong corporate governance mechanisms differs with the immediate impacts at 5% of statistical significance, and the mean ranks of U Mann-Whitney test confirm greater perceptions of these interruptions among the SMEs that distinguish with stronger corporate governance mechanisms.

Table 10. Results of U Mann-Whitney test for the perceptions of COVID-19 impacts and the strength of CG mechanisms (group of weak vs. strong ERM sophistication).

Variable	U Mann-Whitney	W Wilcoxon	Z	Sig.	Mean Ranks U Mann-Whitney Test		
					Weak	Strong	Diff.
Panel A. Germany							
C.WORK	4571.000	6341.000	−0.079	0.937	107.47	108.20	−0.724
C.COSTS	4097.500	5867.500	−1.266	0.205	99.45	111.23	−11.785
C.PROD	4527.500	16,773.500	−0.185	0.853	109.26	107.52	1.740
C.SALES	4377.000	16,623.000	−0.560	0.575	111.81	106.56	5.256
C.SUPPLY	3714.000	5484.000	−2.210	0.027 **	92.95	113.69	−20.743
C.LIQ	4594.500	16,840.500	−0.019	0.985	108.13	107.95	0.175
C.LOANS	2639.500	3720.500	−1.060	0.289	80.88	89.88	−8.998
C.SURV	4306.000	6076.000	−0.737	0.461	102.98	109.90	−6.914
C.Overall	2703.500	3784.500	−0.821	0.412	82.27	89.38	−7.107
C.Imm	4226.500	5996.500	−0.924	0.356	101.64	110.41	−8.771
C.Prol	2731.000	3812.000	−0.729	0.466	82.87	89.16	−6.294
Panel B. Poland							
C.WORK	34,277.000	72,227.000	−0.138	0.891	264.44	262.64	1.795
C.COSTS	29,580.000	61,206.000	−2.888	0.004 ***	243.85	281.44	−37.588
C.PROD	28,861.500	60,487.500	−3.286	0.001 ***	240.99	284.05	−43.063
C.SALES	32,362.000	63,988.000	−1.255	0.210	254.93	271.32	−16.388
C.SUPPLY	32,331.000	63,957.000	−1.276	0.202	254.81	271.43	−16.624
C.LIQ	34,135.500	72,085.500	−0.220	0.826	265.00	262.13	2.873
C.LOANS	33,587.000	71,537.000	−0.546	0.585	267.19	260.13	7.053
C.SURV	33,325.000	71,275.000	−0.694	0.488	268.23	259.18	9.049
C.Overall	32,145.500	63,771.500	−1.360	0.174	254.07	272.11	−18.038
C.Imm	30,564.500	62,190.500	−2.270	0.023 **	247.77	277.86	−30.085
C.Prol	33,792.000	71,742.000	−0.415	0.678	266.37	260.88	5.491

Notes: Statistically significant at: *** 0.01, ** 0.05.

Facing this evidence, our second hypothesis found some support for the Polish SMEs. The SMEs with stronger corporate governance mechanisms perceived as more severe only the immediate COVID-19 interruptions, and in particular those related to the increase of the costs and decrease of revenues.

4.4. COVID-19 Impacts and SMEs Characteristics: Results of Quantile Regression

The final stage of our investigations was in revising the perceptions of COVID-19 impacts in the surveyed SMEs, from the perspective of SMEs characteristics. For those purposes, we applied the quantile regression model. Quantile regression is a type of regression analysis that estimates the median regression slope. Quantile regression was proposed by Koenker and Bassett (1978) and is an extension of linear regression and should be used when the conditions of linear regression are not met (which we confirmed for our dataset, by performing diagnostics with normality distribution tests—see Appendix A). Quantile regression is described by the following equitation (Katchova 2013):

$$y_i = x_i\beta_q + e_i$$

where β_q is the vector of unknown parameters associated with the qth quantile. This quantile regression parameter estimates the change in a specified quantile q of the dependent variable y produced by a one unit change in the independent variable x. In our study we computed quantile regression for median ($q = 0.5$).

We performed quantile regression for our aggregated measures of the COVID-19 impacts, as the dependent variable. We analysed three models, respectively, for overall COVID-19 impacts (C.Overall) as Model 1, immediate COVID-19 impacts (C.Immed) as Model 2, and prolonged COVID-19 impacts (C.Prolong) as Model 3.

In the quantile regression model, the aggregated measures of ERM sophistication (ERM_score) and strength of corporate governance mechanisms (CG_score) were considered as the independent variables (denoting the main constructs in focus of our empirical investigation). In addition, in all three models we added the independent variables that cover the business characteristics (size, age, legal form, family business, sector and country). In this regard, our three models tested with quantile regression ($q = 0.5$) were as follows:

Model 1:

$$C.Overall = \beta_{0.5}ERM\_score + \beta_{0.5}CG\_score + \beta_{0.5}Age + \beta_{0.5}Size + \beta_{0.5}LF + \beta_{0.5}FAM + \beta_{0.5}Sector + \beta_{0.5}Country + e_i$$

Model 2:

$$C.Immed = \beta_{0.5}ERM\_score + \beta_{0.5}CG\_score + \beta_{0.5}Age + \beta_{0.5}Size + \beta_{0.5}LF + \beta_{0.5}FAM + \beta_{0.5}Sector + \beta_{0.5}Country + e_i$$

Model 3:

$$C.Prolong = \beta_{0.5}ERM\_score + \beta_{0.5}CG\_score + \beta_{0.5}Age + \beta_{0.5}Size + \beta_{0.5}LF + \beta_{0.5}FAM + \beta_{0.5}Sector + \beta_{0.5}Country + e_i$$

The results of quantile regression are provided in Table 11. The correlation matrix of the dependent and independent variables (Spearman correlation coefficients) is provided in Appendix C. In Model 1 (for the overall COVID-19 impacts), the quantile regression results confirm our prior observation that the greater is the ERM sophistication, the greater is also the perceived overall impact of COVID-19 (as the regression slope is positive, with beta coefficient of 1.866, significant at 0.1%). This provides support for our first hypothesis. In Model 2 (for the immediate COVID-19 impacts), the quantile regression results indicate an association between both ERM sophistication and strength of corporate governance. The regression slope is positive (with beta coefficients of 0.130 for ERM sophistication and 0.390 for strength of corporate governance, statistically significant at 5%). This confirms our prior findings that the more sophisticated ERM and stronger the corporate governance mechanisms, the higher was the perceived interruptive power of the COVID-19 by the surveyed SMEs. Thus, our hypotheses find support, if the immediate COVID-19 impacts are considered. Model 3 (for the prolonged COVID-19 impacts) also confirms the significance of ERM sophistication, with positive regression slope (beta coefficient 0.618, significant at 1%), which supports our first hypothesis.

However, interestingly, in Model 3, for the prolonged COVID-19 impacts, numerous business characteristics we considered emerged to be statistically significant. We observe that the size is positively associated, at 10%, with negative regression slope (that means that smaller firms perceived the prolonged effects of COVID-19 as more interruptive, which is also observed for Model 1—overall COVID19 impacts). Further, we observe that the age is also statistically significant, with negative regression slope (younger firms perceive prolonged effects as more severe), significant at 5%. We also observe the statistical significance of the legal form and sector (at 1%), as well as country (at 5%).

Our initial analysis of the country-level differences has confirmed that German and Polish SMEs differed at statistically significant level with their COVID-19 perceptions, with all aggregated variables and Polish SMEs are overall more anxious about the COVID-19 effects and impacts. However, the quantile regression highlights the strength of these differences for the prolonged COVID-19 impacts. To better understand the interdependencies between the legal form and the sector, we have performed a Kruskal-Wallis test and the results clearly indicate that there firms from production sector differ statistically

significantly from those operating in trade and in services. With the Kruskal-Wallis test we have also found that in legal form dimension, firms that operate as sole proprietors differ at statistically significant level from those that operate as partnerships.

Table 11. Parameter estimates of quantile regression (q = 0.5) for COVID-19 impacts.

Parameter	Model 1 Overall COVID-19 Impact (Dependent Variable: C.Overall)				Model 2 Immediate COVID-19 Impact (Dependent Variable: C.Immed)				Model 3 Prolonged COVID-19 Impact (Dependent Variable: C.Prolong)			
	Coef.	**Std.Err**	**t**	**Sig.**	**Coef.**	**Std.Err**	**t**	**Sig.**	**Coef.**	**Std.Err**	**t**	**Sig.**
Intercept	28.457	5.1396	5.537	0.000 ***	4.033	0.6662	6.053	0.000 ***	8.550	2.2918	3.731	0.000 ***
ERM_score	1.866	0.5079	3.674	0.000 ***	0.130	0.0656	1.982	0.048 **	0.618	0.2265	2.730	0.007 ***
CG_score	1.463	1.3091	1.117	0.264	0.390	0.1710	2.282	0.023 **	0.553	0.5838	0.947	0.344
Size	−1.731	0.8638	−2.004	0.045 **	−0.094	0.1125	−0.838	0.402	−0.950	0.3852	−2.466	0.014 **
Age	−0.187	0.5475	−0.341	0.733	−0.020	0.0717	−0.272	0.786	−0.474	0.2441	−1.940	0.053 *
LF (legal form)	−1.912	0.6918	−2.764	0.006 ***	−0.234	0.0905	−2.587	0.010 **	−0.885	0.3085	−2.867	0.004 ***
FB (family business)	−0.034	1.0912	−0.031	0.975	−0.088	0.1425	−0.616	0.538	0.083	0.4866	0.170	0.865
Sector	−0.146	0.6608	−0.220	0.826	−0.135	0.0867	−1.556	0.120	0.887	0.2947	3.011	0.003 ***
Country	1.601	1.2336	1.298	0.195	0.029	0.1563	0.187	0.852	1.418	0.5501	2.578	0.010 **
Model quality												
Pseudo R Squared	0.036				0.029				0.060			
MAE (Mean Absolute Error)	7.6841				1.0459				3.3559			

Notes: In quantile regression, the pseudo R Squared does not indicate the model fit (which means that it is not interpreted as the R Squared in OLS regression). This parameter changes with the number of parameters entered to the model and the significance of the model parameters is of prime importance in interpretation of regression results. Simplex Algorithm. Notes: Statistically significant at: *** 0.01, ** 0.05, * 0.1.

5. Conclusions

In this study we investigated the value of enterprise risk management and corporate governance for SMEs in responding to a shock. This issue remains underdeveloped in the existing research (Florio et al. 2022; Heinze and Henschel 2021). Based on extant literature, we take a comprehensive perspective and investigate the sophistication of ERM and strength of corporate governance mechanisms, and their associations to the perceptions of COVID-19 impacts. In this aspect, our study is unique, as it offers an investigation of a real-life situations in terms of ongoing pressure of SMEs to cope with the consequences of the COVID-19 crisis. The results indicate that sophistication of enterprise risk management and strength of corporate governance mechanisms have an impact on SMEs perceptions of COVID-19 impacts. Here, risk management has become a particularly important enabler for developing the governance in small firms and making them more crisis-resilient in the long run (Brustbauer and Peters 2013; Hiebl et al. 2019). Based on the findings it can be concluded that ERM sophistication and strength of corporate governance play a significant role in the success and sustainability of SMEs operating under the pressure of the crisis (Boers and Henschel 2021; Durst and Henschel 2021).

Our study has several implications. First of all, our results could be used by consultants and agencies that support SMEs, to help them better tailor their training to the needs of SMEs (Barbera and Hasso 2013; Collin et al. 2017; Crossan et al. 2018). Our study provides some evidence that a greater degree of ERM sophistication and stronger corporate governance mechanisms are relevant for SMEs' dynamic resilience capabilities. In other words, the SMEs with these features are better prepared to identify, and then respond to the external shocks. Thus, the well-designed professional support in the development of ERM and corporate governance systems in the SMEs, can facilitate further support from key stakeholders. For instance, the lending banks are more confident and willing to support the SMEs that demonstrate a better risk-preparedness (Mayr and Lixl 2019). In this regard, the practical implications of our study cover also the support of SMEs agencies and advisors in promoting the importance of well-designed ERM and corporate governance systems, together with raising the awareness of the benefits within.

Our study is of an exploratory nature, as is the first to address the impacts of ERM sophistication and strength of corporate governance mechanisms in the SMEs, while responding to a shock. However, our findings highlight the interesting gaps for further research. First of all, the results of quantile regression shed some light on the possible differences of the COVID-19 impacts, if the characteristics of the SMEs are considered. In particular, the results we obtained for Model 1 (overall impacts) and for Model 2 (immediate impacts) indicate the possible importance of the SMEs legal form, as the moderating factor. An interesting field for further research could also be more-in-depth analysis of the interdependencies between ERM sophistication and the strength of the corporate governance mechanisms (the interplay between these two constructs), in different country settings. This interplay remains unsearched, also in the context of the potential impact of country-specific environment (such as the macroeconomic perspective or the institutional settings).

Even though this study provides interesting theoretical and empirical insights into the enterprise risk management and corporate governance in SMEs, the findings must be considered with certain limitations. First, this study focused on an unbalanced sample of the SMEs, if we consider the size of the firms (prevalence of small ones for Germany, and medium ones for Poland). To enhance a better representativeness of our findings, further studies can test our model on more homogenous samples (both in the single country dimension, as well as in cross-country comparisons). Furthermore, this research employed self-reported indicators for the constructs of our interest (COVID-19 impact, ERM sophistication and strength of CG mechanisms). Future research can extend our findings by suggesting objective measures for these constructs.

Further, as the completion of the survey was voluntary, there is potential for bias if those choosing to respond differ significantly from those who did not respond. Our study's results may be limited to the extent of this bias. All survey responses were anonymous, and all data used in this study, including the demographic data such as organization size (number of employees) and industry sector classification, were self-reported by the survey respondents and cannot be independently verified. Despite these limitations, we believe the responses obtained to provide a unique opportunity to examine how organizational factors such as Enterprise Risk Management and Governance are associated with SMEs resilience to the external shock (which was in our case the COVID-19 impacts).

Notwithstanding the limitations, the presented research is the first to conceptually test a newly developed scale of ERM sophistication and the strength of corporate governance mechanisms adjusted to the specifics of the SMEs. As enterprise risk management continues to grow in prominence in organizations, economies, and research, our study provides a solid groundwork for additional research on enterprise risk management in SMEs, if the SMEs resilience capabilities are being considered. The strength of corporate governance emerges as a relevant supportive factor within.

Author Contributions: Introduction, M.W.-K. and T.H.; Literature Review, M.W.-K. and T.H.; Research design and method, T.H.; Results and discussion, M.W.-K.; Conclusion and further research, T.H. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: Not applicable.

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

Appendix A. Tests of Normality Distribution of Variables

	Germany				Poland			
	Kołmogorov-Smirnov		Shapiro-Wilk		Kołmogorov-Smirnov		Shapiro-Wilk	
	Statistic	Sig.	Statistic	Sig.	Statistic	Sig.	Statistic	Sig.
COVID-19 construct								
C.WORK	0.198	0.000	0.198	0.000	0.803	0.000	0.803	0.000
C.COSTS	0.227	0.000	0.227	0.000	0.854	0.000	0.854	0.000
C.PROD	0.174	0.000	0.174	0.000	0.888	0.000	0.888	0.000
C.SALES	0.145	0.000	0.145	0.000	0.887	0.000	0.887	0.000
C.SUPPLY	0.155	0.000	0.155	0.000	0.920	0.000	0.920	0.000
C.LIQ	0.181	0.000	0.181	0.000	0.885	0.000	0.885	0.000
C.LOANS	0.199	0.000	0.199	0.000	0.866	0.000	0.866	0.000
C.SURV	0.161	0.000	0.161	0.000	0.904	0.000	0.904	0.000
C.Overall	0.073	0.028	0.073	0.028	0.986	0.081	0.986	0.081
C.Imm	0.060	0.200	0.060	0.200	0.991	0.401	0.991	0.401
C.Prol	0.087	0.003	0.087	0.003	0.970	0.001	0.970	0.001
ERM sophistication construct								
ERM.exp	0.256	0.000	0.256	0.000	0.787	0.000	0.787	0.000
ERM.report	0.204	0.000	0.204	0.000	0.864	0.000	0.864	0.000
ERM.ident	0.202	0.000	0.202	0.000	0.880	0.000	0.880	0.000
ERM.list	0.222	0.000	0.222	0.000	0.865	0.000	0.865	0.000
ERM.eval	0.180	0.000	0.180	0.000	0.906	0.000	0.906	0.000
ERM.cust	0.212	0.000	0.212	0.000	0.868	0.000	0.868	0.000
ERM.prev	0.152	0.000	0.152	0.000	0.924	0.000	0.924	0.000
ERM.cont	0.173	0.000	0.173	0.000	0.918	0.000	0.918	0.000
ERM.owners	0.222	0.000	0.222	0.000	0.873	0.000	0.873	0.000
ERM.metrics	0.149	0.000	0.149	0.000	0.917	0.000	0.917	0.000
ERM.Soph	0.079	0.011	0.079	0.011	0.970	0.001	0.970	0.001
ERM.analysis	0.096	0.001	0.096	0.001	0.960	0.000	0.960	0.000
ERM.m&r	0.077	0.016	0.077	0.016	0.973	0.002	0.973	0.002
Strenght of CG mechanisms construct								
CG.succ	0.206	0.000	0.206	0.000	0.806	0.000	0.806	0.000
CG.strat	0.346	0.000	0.346	0.000	0.717	0.000	0.717	0.000
CG.rules	0.406	0.000	0.406	0.000	0.656	0.000	0.656	0.000
CG.com	0.384	0.000	0.384	0.000	0.684	0.000	0.684	0.000
CG.confl	0.359	0.000	0.359	0.000	0.715	0.000	0.715	0.000
CG.r&o	0.349	0.000	0.349	0.000	0.725	0.000	0.725	0.000
CG.dcr	0.425	0.000	0.425	0.000	0.626	0.000	0.626	0.000
CG.size	0.266	0.000	0.266	0.000	0.787	0.000	0.787	0.000
CG_score	0.149	0.000	0.149	0.000	0.919	0.000	0.919	0.000

Appendix B. Results of K-Means Clustering

Panel A. ERM sophistication construct

Variable	Germany				Poland			
	Low (N = 66)		High (N = 149)		Low (N = 249)		High (N = 277)	
	Mean	St.D.	Mean	St.D.	Mean	St.D.	Mean	St.D.
ERM.exp	1.67	1.19	2.50	1.65	1.72	0.87	3.13	1.57
ERM.report	1.55	0.88	4.01	1.92	2.22	1.09	4.34	1.37
ERM.ident	2.41	1.61	5.45	1.15	3.38	1.54	5.22	1.03
ERM.list	3.15	1.84	5.70	1.02	2.77	1.27	4.86	1.11
ERM.eval	2.95	1.54	5.23	1.42	3.85	1.54	5.30	1.01
ERM.cust	2.15	1.68	3.24	1.88	3.72	1.72	5.01	1.30
ERM.prev	2.88	1.74	4.88	1.59	3.81	1.45	5.23	1.00
ERM.cont	2.77	1.42	5.32	1.31	3.51	1.47	5.16	1.00
ERM.owners	2.56	1.61	5.25	1.57	3.73	1.47	5.14	1.09
ERM.metrics	2.06	1.19	4.91	1.47	3.22	1.26	4.86	1.05

Panel B. Strength of corporate governance mechanisms

Variable	Germany				Poland			
	Weak (N = 59)		Strong (N = 156)		Weak (N = 251)		Strong (N = 275)	
	Mean	St.D.	Mean	St.D.	Mean	St.D.	Mean	St.D.
CG.succ	1.75	0.76	2.16	0.73	1.63	0.71	1.93	0.78
CG.strat	1.92	0.92	2.44	0.78	1.52	0.78	2.78	1.12
CG.rules	2.08	0.75	2.81	0.41	2.38	0.64	2.81	0.43
CG.com	1.97	0.72	2.72	0.48	2.23	0.64	2.80	0.45
CG.confl	1.92	0.70	2.65	0.57	2.24	0.66	2.86	0.38
CG.r&o	1.64	0.55	2.76	0.44	2.08	0.68	2.77	0.46
CG.dcr	1.85	0.61	2.91	0.29	2.04	0.67	2.72	0.52
CG.size	1.56	0.68	2.40	0.68	1.78	0.68	2.55	0.65

Appendix C. Correlation Matrix for Variables in Qualile Regression Models (Spearman Coefficients)

Parameter		C.Overall	C.Immed	C.Prolong
ERM_score	Coef.	0.055	0.126 **	−0.035
	Sig.	0.145	0.001	0.349
CG_score	Coef.	0.022	0.087 *	−0.072
	Sig.	0.563	0.018	0.056
Size	Coef.	−0.121 **	−0.024	−0.205 **
	Sig.	0.001	0.519	0.000
Age	Coef.	−0.135 **	−0.047	−0.218 **
	Sig.	0.000	0.197	0.000
LF (legal form)	Coef.	−0.185 **	−0.099 **	−0.265 **
	Sig.	0.000	0.007	0.000
FB (family business)	Coef.	−0.024	−0.048	0.035
	Sig.	0.523	0.189	0.361
Sector	Coef.	0.083 *	−0.010	0.159 **
	Sig.	0.028	0.779	0.000
Country	Coef.	0.120 **	0.067	0.181 **
	Sig.	0.002	0.068	0.000

Notes: ** statistically significant at 1%; * statistically significant at 5%.

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