SMEs' adoption of environmental efficiency practices

The effects of legislation complexity and external financing

Master thesis

International Business

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Abstract

Global environmental problems have increased the importance of research on the impact of business operations. Where academics were mostly fixated on MNEs in previous research, the current focus has shifted towards the environmental impact of SMEs and towards the factors influencing their environmental practices. Although previous studies have identified several important determinants of SMEs' environmental behavior, there is still an ongoing debate on the effects of environmental legislation and financial support. This thesis addresses these research gaps by exploring the effects of environmental legislation complexity and financial support towards SMEs' adoption of environmental practices. Additionally, we extend previous research by comparing the effect of public funding and private funding. This research makes use of data provided by the Flash Eurobarometer 456, containing more than 10,000 SMEs used in the study, which were dispersed over 28 European countries. The results of our ordinal logistic regression analysis shows that SMEs adopt more environmental practices when experiencing environmental legislation as complex, and when receiving financial support. However, the different type of funding did not give a significant result.

Key words: Small and medium-sized enterprises, absorptive capacity, resource dependency theory, corporate social responsibility, environmental practice adoption, environmental legislation complexity, external funding

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1. Introduction

Global environmental problems have increased the importance of research on the impact of business operations, with a growing number of scholars stating that real environmental improvements are difficult to achieve if the business' decision frameworks stay unchanged (Aragón-Correa et al., 2008). Due to the importance of the issues at hand, the social and theoretical awareness of corporate social responsibility (CSR) has been growing (Stoian & Gilman, 2017; Lee & Jung, 2016). CSR has been defined in a different way by many scholars, where it can be defined as the activities of a firm with the focus on enhancing social good, next to benefiting financially as well (Oduro et al., 2021), in this paper we choose to use to definition put forward by McWilliams et al. (2006, p.1) where CSR is defined as "situations where the firm goes beyond compliance and engages in actions that appear to further some social good, beyond the interests of the firm and that which is required by law." Various research has shown that applying environmental practices does not only improve a company's brand image and reputation (Park & Ghauri, 2015), but that it can also be seen as a competitive advantage which can positively influence sales and profit growth (Adomako et al., 2021; Menguc et al., 2010).

1.1 Problem statement

Even though small and medium-sized enterprises (SMEs) entail over 90% of the worldwide business population (Park & Ghauri, 2015), the literature on environmental strategies has been focused on multinational enterprises (MNEs), which has led to a generalization that the effects MNEs experience are the same for SMEs (Sen & Cowley, 2013). However, SMEs and MNEs do not experience the choice to focus on sustainability practices equally. Where an MNE is considered to have an abundance of resources, an SME's choice to increase their focus on sustainability practices is related to efficiency concerns due to time and (non-) financial resource constraints (Santos, 2011). Other distinct features of an SME in comparison to an MNE are the dependence of relationship quality between various stakeholders and that they are cash-limited, which makes them largely dependent on various financial sources (Perrini et al., 2007). It is therefore that previous research has shown that firm size and relationship with stakeholders have an influence on the choice of implementing environmental practices, whereas the varying degrees of internal and external organizational factors are also deemed

to be important influencers (Darnall et al.,2010; Graafland & Noorderhaven, 2020). Shirokova et al. (2021) explain that firms experience a varying degree of environmental uncertainty, which can be linked to differences in formal institutions. The differences in resource endowment between SMEs and MNEs are an important aspect, where it is said that SMEs are more likely to adapt their processes and decision-making activities to external pressures in comparison to MNEs due to the lack of resources (Park & Ghauri, 2015). Embodying these external pressures, Deephouse et al. (2017) put forward several factors connecting to environmental practices, examples of these are national regulations, public opinion, social movements, stakeholder expectations and competitor CSR engagement. The importance of the strength of these pressures is acknowledged by Kang and He (2018), who state that ignoring these external factors will lead to a decrease in firm's resource commitment towards environmental strategies.

1.2 Research objective

As stated earlier, financial constraints are important for an SME in deciding to implement environmental practices, where earlier research shows lacking SME participation in CSR activities when they are experiencing financial difficulties (Santos, 2011). This statement is supported by Zhang et al. (2019) who find that the availability of external financing interacts with the development of environmental innovations. Together with the resource dependence theory, we will take a more in depth look at how the dependencies of SMEs on external party financing interacts with SMEs' adoption of CSR practices, and whether this relationship is different in regard to receiving public or private funding. Furthermore, after examination of previous research we have found that there is still much to learn about SME environmental practice adoption and how this is affected by external influences (Lynch-Wood et al., 2009; Clement & Hansen, 2003; Soundararajan et al., 2018). To be more precise, we found that current knowledge on SME's environmental practice adoption has little understanding on how financial contributions stimulates the development of environmental practices, in addition to the ongoing debate on the effectiveness of environmental legislation. It is therefore that this research will focus on the effect these factors have on SMEs' environmental practice adoption, resulting in the following research question:

What is the influence of environmental legislation complexity and financial support on SMEs' adoption of environmental practices?

1.3 Theoretical and practical relevance

The relevance of this research is supported on a practical level next to a theoretical contribution. Where SMEs contribute to 90% of the worldwide business population, literature is largely focused on MNEs which, as has been said before, makes that the environmental strategies of these two kinds of businesses have been over generalized (Park & Ghauri, 2015; Sen & Cowley, 2013). This necessity for research on SMEs and its environmental practices is even more stressed due to the fact that even though a single SME is far less polluting than an MNE, the cumulative pollution of the SME sector contributes to 70% of the global pollution (Bakos et al., 2020). Moreover, this research will find its theoretical relevance in filling the gaps found by previous scholars (e.g., Lynch-Wood et al., 2009; Clement & Hansen, 2003; Soundararajan et al. 2018), and try to validate the results found by Clement and Hansen (2003) who investigated the relationship between public financial incentives and CSR in the context of Scandinavian SMEs. Where their analysis showed that public-subsidies play an important role in the environmental transition within SMEs in the Scandinavian region, we hope to validate this relationship within the EU-28 as a larger context while also providing additional knowledge by including the role of private funding to this relationship.

This research is also relevant for governmental policy makers, SME owners and managers, and other institutional stakeholders by providing more information on the drivers and barriers in relation to SME environmental practice adoption. With this information, policy makers get access to knowledge about institutional barriers which they can use to create new policy focused on solving these bottlenecks. Next to this, it will become clear what the effects of the received type of external financial support entail for the SME's environmental practice adaption, which can influence governmental policy makers and SME managers in distributing and accepting certain funds. Furthermore, this research will show SME managers to take the external environment into regard when making strategic decisions on environmental practices, in addition to looking with a focus solely on the firm itself.

1.4 Outline

In the remainder of this research, we will dive deeper in the relationship between institutional pressures, external financial support, and SME's environmental practice adoption. Therefore, the following chapter will provide a detailed theoretical overview, with descriptions of the main concepts and the formulation of our hypotheses. At the end of this chapter a conceptual model will be provided, depicting all relationships to be analyzed. The third chapter will focus on the methodological aspects of this research and will provide the reader with the description of the data used, accompanied with the operationalization of the main variables. Chapter four will regard the analysis of our data, which will be discussed in the fifth chapter. This thesis will be concluded in chapter six, where we will elaborate on the conclusions which can be made in regard to this research. In this chapter we will also address the implications and future research directions following this research.

2. Theoretical framework

This chapter will introduce the theoretical foundation of our research. First, we will discuss prior research on the subject of CSR in SMEs and look at the results they brought forth. Subsequently, we will elaborate on the theory of absorptive capacity and the resource dependence theory, which we will use to formulate our hypotheses. These hypotheses will be displayed in our conceptual model showed at the end of this chapter.

2.1. Overview of prior literature on SMEs and CSR

Where prior research on environmental strategies mostly focuses on MNEs, there has been an increase in the literature in regard to SMEs. This improved knowledge about SMEs is important due to the crucial role they play in our society. The reason for this is the importance of SMEs in local communities, where they account for most of the active business operations, and their influence on these communities due their resources, and negotiation power (Oduro et al., 2021). Furthermore, the numbers stress the impact of SMEs, stating that over 90% of global businesses can be categorized as an SME (Park & Ghauri, 2015), with a 70% contribution to the global pollution (Bakos et al., 2020). It is therefore that the last decade has seen a significant increase in literature regarding the CSR activities of SMEs. While the definition of CSR is difficult to describe fully, a reoccurring definition of this construct is the one stated by McWilliams et al. (2006). These authors describe CSR as "situations where the firm goes beyond compliance and engages in actions that appear to further some social good, beyond the interests of the firm and that which is required by law." (McWilliams et al., 2006, p.1).

Next to economical and societal contribution, Williamson et al. (2006) describe the environment as one of the three pillars where SMEs can contribute to sustainable development. Environmental practices can thus be seen as a related concept to CSR. In this research, we will view SME environmental practices as defined by Hoogendoorn et al. (2014, p. 760-761) as: "activities undertaken by firms aimed at reducing the impact of their operations and their products and services on the environment". Minimizing waste, saving water and energy, and designing sustainable products can be seen as examples of SME environmental activities.

The acknowledgement of the academic community on the importance of developing a more comprehensive knowledge base on SME's environmental practice adoption has led to a spike in scientific research on the topic (Soundararajan et al., 2018). The meta-analysis by Bakos et al. (2020) provides an additional overview of drivers and barriers to SMEs' sustainability practices found in empirical research. According to this analysis, financial gains, government regulations and availability of resources are most prominent promoters of SME sustainability (e.g., Cuerva et al., 2014; Granly & Welo, 2014; Altinay et al., 2016), whereas behavioral factors within a business, and manager's environmental responsibility were also seen as important drivers of SME environmental behavior (e.g., Tur-Porcar et al., 2018; Ciasullo & Troisi, 2013; Gandhi et al, 2018; Henriques & Catarino, 2015). On the other side, barriers prohibiting SMEs from implementing environmental practices can be internal to the organization as a lack of resources and management commitment, or in its external environment, where a lack of government support or consumer demand has been stated by prior research in the field of SME CSR (e.g., Chassé & Boiral, 2017; Ghadge et al., 2017; McEwen, 2013). The pressure put forward by regulators has been said to be an influencer of SME's environmental practice adoption, however there is still an ongoing debate on the effectiveness of environmental regulation in regard to the SME's environmental behavior (Kassinis, 2012). Furthermore, the importance of financial resources in regard to SMEs' environmental behavior has been stressed by multiple authors (Bodas-Freitas & Corrocher, 2019; Hoogendoorn et al., 2014; Pimenova & Van der Vorst, 2004). However, the view regarding the necessity of financial resources has been disputed by others, stating that SMEs without a strong financial base can be engaged in environmental practices as well (Soundararajan et al., 2018). It is therefore that the subsequent section will focus more in depth on regulatory pressures and financial support, in order to provide additional knowledge regarding the influences they have on SME environmental practice adoption.

2.2. Absorptive capacity and the influence of environmental regulation

In the last years, we have seen an increase in the environmental legislation put forward by regulatory institutions (United Nations, 2019), whereas this legislation can directly address a firm's environmental behavior. Within strong institutions, governmental regulators inspect a firm's compliance on the environmental requirements set, which could lead to penalties and thus forces the SME to comply (Darnall et al., 2010). Menguc et al. (2010) even state that when

the intensity of regulation increases, a firm is inclined to adopt a more proactive environmental strategy to gain legitimacy. Other studies have also found that government regulations are one of the key drivers of SME's environmental initiatives (e.g., Cuerva et al., 2014; Granly & Welo, 2014; Altinay et al., 2016; Hoogendoorn et al., 2014). Pinget et al. (2015) explored various perceived barriers to environmental practices in research containing French SMEs in the manufacturing sector, which concluded that environmental regulation positively affects the probability of SMEs environmental practice adoption. On the other side, governmental regulation can also be viewed as complex and have the opposite effect.

Legislation complexity can be defined as "negative coordination externalities among the different sources of legislation that render it difficult for consumers and firms to understand which is the correct rule to observe" (Di Vita, 2017, p.1058). This lack of understanding can be related to a lower level of the SME's absorptive capacity. Absorptive capacity can be described as "the ability to absorb, recognize, and employ external knowledge" (Aboelmaged & Hashem, p.854, 2019). The imperative work of Cohen and Levinthal (1999) explains the concept in a broader way, where they advocate that the level of absorptive capacity a firm has is reflected by the ability they have to identify imperative knowledge in the environment, and how well they can integrate this knowledge into their organization to use accordingly. Zahra and George (2002) put the notion of absorptive capacity forward as key to creating new organizational competencies, where this is also the case in regard to the creation of new environmental practices (Albort-Morant et al., 2018). This can be connected to the earlier mentioned concept of eco-literacy, where firms aspire to be environmentally active but do not have the abilities to do so (Hoogendoorn et al., 2014). This link can be made, that where certain external knowledge is not gathered or appropriately assimilated into the firm, it will not be able to understand environmental legislation and therefore adopt less environmental practices. Moreover, previous research supports this by reporting that many SMEs do not have adequate knowledge of environmental legislation (Simpson et al., 2004). In connection to this, environmental legislation has also been linked by previous research of being a barrier to environmental practice adoption (Williamson et al., 2006; Bakos et al., 2020). These negative relationships have been found by multiple scholars. In 1999, research done by Petts et al., already discussed the complexity of environmental legislation and its effect on environmental practice adoption. The findings of their research, which states that compliance of environmental legislation becomes more difficult when

complexity increases, are still relevant as is seen by the results of more recent research. Next to this, a qualitative study by Wilson et al. (2011) evaluating environmental legislation's impact and effectiveness, had similar findings. Here it was found that the implementation of environmental practices was not efficient due to a lack of understanding of the complex environmental legislation. In line with results from previous research, we therefore expect that SME's adoption of environmental practices is negatively influenced by the complexity of environmental legislation. This leads up to the following hypothesis:

Hypothesis 1: *There is a negative relationship between the complexity of environmental legislation and SMEs' adoption of environmental practices.*

2.3 Resource dependence theory and the influence of financial support

In addition to environmental legislation complexity, the external support an SME receives is also an important factor to consider when analyzing these firms' adoption of environmental practices. The financial implications of engaging in environmental practices have been cited multiple times as a barrier for SMEs (e.g., Cuerva et al., 2014; Granly & Welo, 2014; Altinay et al., 2016; Roberts et al., 2006; Pacheco et al., 2010). Next to this, Bradford and Fraser (2008) also focus on the knowledge barriers that keep an SME from adopting environmental strategies. Here, the lack of knowledge of environmental legislation and skills, better known as low standards of eco-literacy (Tilly, 2000), are needed to be supplemented by external support. Access to external financial support can provide SMEs the possibility to buy much needed resources, but also help them invest in energy and resource efficient practices (Bodas-Freitas & Corrocher, 2019). However, being dependent on financial support from sources outside the organization can have as a consequence that these beneficiaries want to exert influence on corporate strategy (Hoogendoorn et al., 2014). These influences can come from public institutions who can provide financial funding with the exception that part of the funds be used for environmental practices, or from private investors who relate a better operational efficiency to greater profit margins (Wang & Zhang, 2020; Clark et al., 2018).

Resource dependence theory (RDT), which originates from the article published in 1978 by Pfeffer and Salancik, argues that organizations are dependent on their external environment to guarantee their survival by providing critical resources (Frynas & Yamahaki,

2016). This dependence makes that organizations need to take the demands of these external parties in mind when operating, this is why forming linkages with these parties is described as a key coping mechanism by Pfeffer and Salancik (1978). Dieleman and Widjaja (2019) state that the extent to which organizations engage in boundary spanning activities, is dependent on the preferences of management, but more importantly on the level of environmental uncertainty and resource dependency. Moreover, RDT has been used by multiple scholars on the subject of firm environmental performance (e.g., Zhu et al., 2005; Shang et al., 2010; Sarkis et al., 2011). Where Ramanathan et al. (2014) also refer to the management of these resource dependencies as a way for organizations to strive for sustainable development. In accordance with RDT, it can thus be theorized that financial resource providers can have an effect on the decision-making process of SMEs in regard to their environmental practice adoption.

As has been stated before, financial constraints are critical in the decision-making process towards CSR activities, which can be overcome by acquiring resources from external public or private parties (Santos, 2011; Oguntoye & Quartey, 2020). Empirical findings relating to the study conducted by Aristei and Gallo (2021) on the implementation of resource efficiency actions in European manufacturing firms, provides strong evidence that external financial support has a direct contribution to SME's adaption of environmental practices. Furthermore, Pimenova and Van der Vorst (2004) report that external financial support has a higher result in removing barriers for SMEs in regard to implementing environmental strategies, compared to non-financial support. This is partially supported by Hoogendoorn et al. (2014), who found a strong relationship between external financial support and SME environmental practice adoption in the product and service industries. Based on theoretical considerations and the findings of previous research we have come to the following hypothesis:

Hypothesis 2: *There is a positive relationship between external financial support and SME environmental practice adoption.*

Type of funding and its effect on external financial support

As previous discussed, extant literature has linked external financial support to an increase in SME's environmental practice adoption. However, this financial support can be received through public funds, as through private funds. Wang and Zhang (2020) describe public

financial support as a governmental policy instrument, used to direct capital to firms under certain conditions. Financial support coming from public institutions can be via direct or indirect measures, where direct measures are seen as capital injections and decreasing the tax rates as indirect measures (Lee et al., 2017). These forms of public support are both perceived as important environmental innovation determinants (Cecere & Corrocher, 2020). This statement by Cecere and Corrocher (2020) is supported by additional research. In their article on the effect of state subsidies by the Chinese government, Wang and Zhang (2020) found evidence supporting the claim that firms receiving external financial support originating from the public domain adopt more environmental practices. In regard to private financial support, short-termism is a key concept in explaining the relationship between private financial support and sustainable practices. Short-termism can be described as the maximization and preference of short-term profitability (Robins & McDaniels, 2016). This short-term focus has as a consequence that investors undervalue CSR investments, which have been found to generally reap benefit with a longer time horizon, and therefore pressure management to focus on short-term benefits (Graafland, 2016; Mallin et al., 2013). Waygood (2014) refers to this concept in his article on the UN Sustainable Development Goals as problematic strategy that diminishes incentives for companies to invest in sustainability strategies which have higher up-front costs and a more long-term return on investments. This is corroborated by Mai and Abdul Hamid (2021), who state that CSR investments need a long-term orientation to improve their returns, whereas this long-term orientation is not achievable due to short-termism which has an excessive focus on the short-term returns while disregarding the long-term interests of the firm (Graafland, 2016).

Following the argumentation above, we can see that public funding helps organizations by providing the necessary financial resources to operate but brings an additional pressure with it to invest more of it in sustainable practices, whereas the concept of short-termism makes private investment more involved with short-term financial gains which is generally in contrast with CSR investments. It is therefore that we have formed the following hypothesis:

Hypothesis 3: The positive influence of public funding on SMEs' environmental practice adoption is stronger than the effect of private funding.

2.4. Conceptual model

The hypotheses introduced in this chapter are visualized in the following conceptual model (see Figure 1).

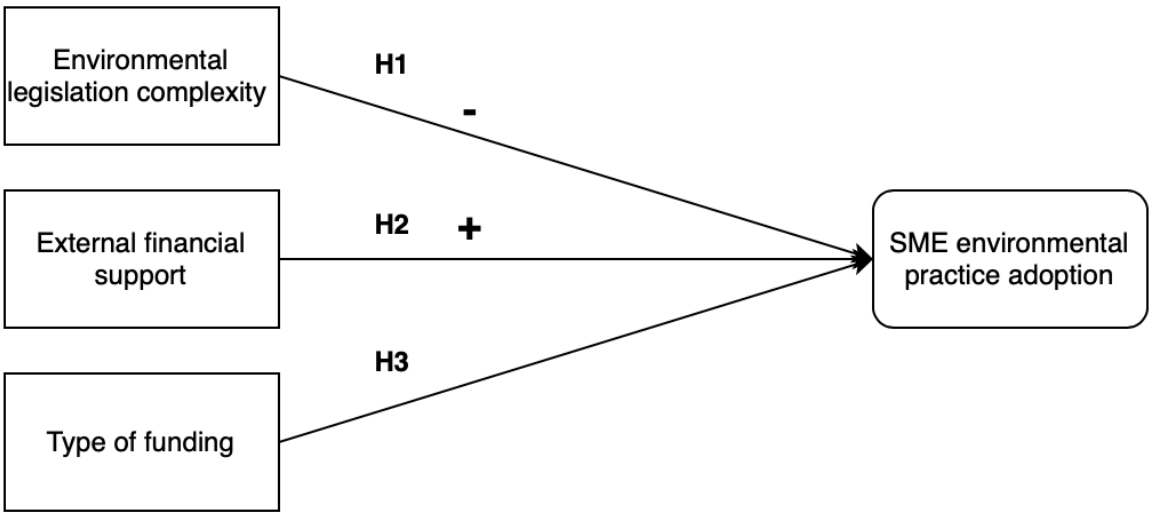

Figure 1

3. Methodology

This chapter will cover the methodological aspects of this research. First, we will elaborate on the data source used, give an overview of the sample within this source, and state the number of items which remain applicable for our statistical analyses after going over the assumptions that need to be met. Subsequently, we will provide an operationalization of our variables and explain how these variables are measured in the data source. After this we will dive deeper into the method of analysis. To conclude, this chapter will give a statement about the ethical considerations in regard to scientific research and critically reflect on the reliability and validity of our research.

3.1 Data source and sample

In order for us to analyze SME's behavior in regard to environmental practice adoption, we rely on the data gathered on behalf of the European Commission (2018) in the Flash Eurobarometer survey on "Small and medium enterprises, resource efficiency, and green markets" (no. 456). The surveys were held through computer-assisted telephone interviews, in the respective language of the respondent. These interviews were conducted by TNS Political & Social, with the surveys coordinated by the European Commission. The research was held between 11-09-2017 and 26-09-2017, with the results published in 2018. The survey includes data from 15,019 randomly selected firms from the 28 member states of the European Union and other countries including Albania, Iceland, the Republic of North Macedonia (for which its previous name FYROM is used in the dataset), Moldova, Montenegro, Norway, Servia, Turkey, and USA. Moreover, the Flash Eurobarometer has gathered data in regard to businesses employing 1 or more individuals active in diverse sectors. These sectors can be divided into four categories, as is done by Hoogendoorn et al. (2014), as the manufacturing (NACE C), Retail (G), Services (H/I/J/K/L/M), and Industry sector (B/D/E/F). The sample of the Flash barometer includes data from SMEs, but from larger companies as well. We therefore make use of the criteria defined by the European Commission Recommendation 361 (2003) to filter the irrelevant items out of the dataset. The criteria set by the European Commission state that a corporation qualifies as an SME if it employs less than 250 people, has an annual turnover ≤ €50 million or an annual balance sheet total of ≤ €43 million. To apply this restriction onto our dataset, we will use the guidelines in

regard of employee size to determine the SMEs in our dataset. In addition to filtering the sample on size, we will also exclude all items regarding companies situated outside the European Union. Due to the focus on external pressures, we will focus on the countries belonging to the EU-28 as of January 1st, 2013. This choice is made in regard to the status of the EU-28 as a political entity, which let us believe that the institutions and the effects of these pressures can be rather similar. Next to this, we have chosen for the composition of the EU-28 which still includes the United Kingdom, because at the time of data gathering (2017) BREXIT did not yet occur. Applying the restrictions of country of origin leaves us with a sample size of 13,117 EU-28 firms, which is narrowed down to 12,081 EU-28 SMEs. The hearth of our research lies in the relationship between the type of external financial funding, and the effect of environmental legislation and external financial support on SMEs' environmental practice adoption. It is therefore that we have to take a more detailed look at the composition of our dataset. If we want to investigate the moderating relationship between type of funding and external financial support, we need a dataset where all SMEs do receive financial external support. However, this will result in a conflicting dataset where we will not be able to analyze the direct effect of external financial support on SME environmental practice adoption. To remedy these routing problems, we will be using two datasets to run our analysis. Our first dataset will exclude all SMEs that do not receive external financial support, this eliminates a great part of our items, but still leaves us with 1,381 SMEs. These 1,381SMEs can be divided into three categories, where 485 SMEs are provided with public financial support, 587 SMEs with private financial support, and 309 with public and private support. Moreover, for the reason that we only look at the individual effect of private and public financial support, we exclude the SMEs that receive both types of financial support, leaving us with a final sample of 1,072 SMEs in our first dataset. The second dataset, which we will primarily use to analyze the direct effect of external financial support on our dependent variable, will consist of SMEs that do receive external financial support and SMEs that do not receive any type of external support. These particular routing specifications leaves us with a dataset containing 10,397 SMEs, where 1,381 SMEs receive external financial support opposed to 9,016 SMEs that do not receive any type of external support.

3.2 Operationalization

In this section, we will dive deeper into the operationalization of our variables. For this, we will explain which items are chosen to construct the variables to be used in our analysis in the subsequent chapter. After the operationalization of our variables is explained, table 1 can be used as a brief summary for readers' convenience, containing all necessary information.

3.2.1 Dependent variable: SMEs' environmental practice adoption

To measure the environmental practice adoption of the SMEs in our dataset, this paper focusses on the firm's resource efficiency actions. Resource efficiency actions are measured as the actions an SME takes to become more resource efficient. This operationalization is based on the article of Aristei and Gallo (2021), who as well worked with the data from the Flash Eurobarometer (no. 456) and used SME's resource efficiency actions to assess a firm's adoption of green processes. Within the questionnaire, SMEs were asked to answer what actions their companies are taking to be more resource efficient. Answer possibilities to this question are: "saving water; saving energy; using predominantly renewable energy; saving materials; minimizing waste; selling scrap material to another company; recycling, by reusing material or waste; design sustainable products; others; none". After answering these questions, the answers are regrouped and categorized as: "not mentioned; many actions; some actions; few actions; non action". We will be using the categorized groups as a measure of environmental practice adoption, where companies using 1-2 resource efficiency actions will be put in the group "few actions", those using 3-4 actions will be classified as "some actions", and "many actions" will entail the companies who use 5-8 resource efficiency actions.

3.2.2 Independent variables

<u>Environmental legislation complexity</u>

To measure the effects of environmental legislation complexity on our outcome variable we consider all legislation which has an influence on resource efficiency actions. The effects of environmental legislation complexity are measured through the question "Did your company encounter any of the following difficulties when trying to set up resource efficiency actions?". Answer possibilities to this question relating to legislation are: "Complexity of administrative

or legal procedures; Difficulty to adapt environmental legislation to your company; Technical requirements of the legislation not being up to date". Previous research does not offer a validated operationalization of the concept 'environmental legislation complexity', therefore we perform a factor analysis where we assess if our selected items together form our construct of environmental legislation complexity. The results of our factor analysis can be found in section 4.1.

External financial support

The operationalization of our independent variable 'external financial support' will be based on the previous use of this construct by Hoogendoorn et al. (2014) with an older version of the Flash Eurobarometer (no. 342). Here, we use the data from two questions out of the Flash Eurobarometer (no. 456) with the first question regarding external support for SME's greening processes: "Which type of support does your company rely on in its efforts to be more resource efficient?", which leads SMEs answering the question with "external support" to the follow-up question: "More precisely, which type of external support is it?". The answer possibilities to this question are: "Public funding such as grants, guarantees or loans; Private funding from a bank, investment company or venture capital fund; Private funding from friends; Advice or other non-financial assistance from public administration; Advice or other non-financial assistance from private consulting and audit companies; Advice or other non-financial assistance from business associations; Other". For the measurement of this variable, we will be using the answer possibilities which have regard to financial external support.

Type of funding

In measuring the type of an SME's external financial support, we make the same distinction as Aristei and Gallo (2021) and distinguish between public financial support and private financial support. In the Flash Eurobarometer (no. 456) the data in regard to financial support is gathered through the question: "Which type of support does your company rely on in its efforts to be more resource efficient?", which leads SMEs answering the question with "external support" to the follow-up question: "More precisely, which type of external support is it?". We will create two categories where public financial support will entail the answer possibility "Public funding such as grants, guarantees or loans", and the private financial

support category will consist of: "Private funding from a bank, investment company or venture capital fund; Private funding from friends".

3.2.3 Control variables

In order to control for omitted variable bias, we will include several industry- and firm-level control variables. In addition to their theoretical merit, the inclusion of these variables is based on previous academic research done on the matter (e.g., Hoogendoorn et al., 2014; Bodas-Freitas & Corrocher, 2019; Aristei & Gallo, 2021).

On the industry-level, we will control for the influences which come from the differing industry sectors. Stoian and Gilman (2017) found that the industry sector has an influence on the use of environmental practices of SMEs, which is also supported by Perrini et al. (2007). Hoogendoorn et al. (2014) depicts this difference in industry sector in more detail, stating that SMEs in resource-intensive sectors (e.g., manufacturing) are more likely to engage in environmental practices than SMEs active in lesser resource-intensive sectors (e.g., services) due to costs of production and the bigger attention they receive by interest groups in regard to higher levels of pollution. Based on Hoogendoorn et al. (2014), we will operationalize this variable as 'sector tangibility' which is defined as 'a sector's use of natural resources as well as its potential to pollute' (p.767). We will use a classification of industry sectors in terms of its tangibility. The first category will be defined as tangible products, which will include sectors with NACE codes C/F/B/D/E (sectors with corresponding NACE codes can be found in Appendix 1). The second category are the tangible service sectors including NACE codes G/H/I. The last category is in regard to the intangible service sectors, which includes NACE codes J/K/L/M. The sectors belonging to the intangible service sectors will be used as the reference category.

On the firm-level, we will be controlling for firm age (in years) and firm size. Firm age can be seen as an influencing factor on environmental responsiveness. Where in comparison to established firms, younger firms have to deal with the liability of newness and are less resource endowed (Neubaum et al., 2004). Furthermore, we will be controlling for firm size. In accordance with Aristei and Gallo (2021), we will control for firm size by using binary indicators for *micro* (with 1-9 employees), *small* (10-49 employees) and *Medium* (50-249 employees). We will be using micro firms as a reference category.

Category	Variable	Source	Validation
Dependent variable	Environmental practice adoption	FL456* (2018)	Aristei & Gallo (2021)
Independent variables	Environmental legislation	FL456 (2018)	N/A
	External financial support	FL456 (2018)	Hoogendoorn et al. (2014)
	Type of funding	FL456 (2018)	Aristei & Gallo (2021)
Control variables	Sector tangibility	FL456 (2018)	Hoogendoorn et al. (2014)
	Firm age	FL456 (2018)	Hoogendoorn et al. (2014)
	Firm size	FL456 (2018)	Aristei & Gallo (2021),

Table 3.1 Variable descriptions, data sources, and validation

*Flash Eurobarometer 456

3.3 Method of analysis

In order to choose a method of analysis, we need to check the nature of our dependent and independent variables. According to Hair et al. (2018), when the nature of the dependent variable is categorical two options are applicable. The first option is a discriminant analysis, whereas the second option is the logistic regression. After looking at the prerequisites, we find the use of a logistic regression method more suitable for our analysis due to the non-metric characteristics of our independent variables. Because our dependent variable has four ranked categories, the use of an ordinal logistic regression model has a better fit to our data than a normal logistic regression (Liu & Koirala, 2012). Additionally, we will perform a factor analysis before running the ordinal logistic regression. This is done to form our construct of the independent variable 'environmental legislation complexity', which we then use in the ordinal logistic regression. We will be conducting these analyses in IBM SPSS Statistics 27.

3.4 Research ethics

Keeping an eye on ethical considerations is very important in the scientific community. It is, therefore, that before and during this research the ethical considerations based on the guidelines of the Ethics Assessment Committee (EACLM) of the Radboud University are upheld. This code is based on five important principles regarding (1) Honest; (2) Scrupulousness; (3) Transparency; (4) Independence; (5) Responsibility (KNAW; NFU; NWO; TO2-federatie; Vereniging Hogescholen; VSNU, 2018).

The data used in this research has its origin from a survey conducted by TNS Political & Social, with coordination by the European Commission. The interviews were held through computer-assisted telephone interviews, in the respective language of the respondent. Administering the interviews in the native language of the respondents decreases the problem of misinterpretation of the data. The participants in the research conducted by TNS were informed of the research's goal and that it was conducted on behalf of the European Commission. The participating firms were not forced to stay in the research and could leave at any time, where they also had the possibility to not answer questions if they did not want to. Moreover, the data gathered from this research is accessible for all participating firms on the website of the Flash Eurobarometer.

The data gathered by the TNS, leading to the Flash Eurobarometer (no. 456) which is used in this research, will be used with utmost caution. The data will only be used for the purpose of this research, where full transparency will be provided to all interested parties.

3.5 Validity and reliability

We have paid attention to the validity and reliability throughout the entire research process. In order to ensure the validity of our data, we based the majority of our variables on previous research, employing the same operationalization. For our variables, we mainly used the operationalizations previously used by Aristei and Gallo (2021), and Hoogendoorn et al. (2014), with the exception of our independent variable 'Environmental legislation complexity'. Furthermore, the validity of a research can be endangered by not meeting the assumptions in regard to the chosen statistical analysis. It is therefore, that we checked all assumptions prior to performing the analysis. In regard to the variable 'environmental legislation complexity', we did not use a validated operationalization but created the construct by the use of a factor

analysis. As described by Field (2013), the reliability of a construct can be observed by the level of Crohnbach's Alpha. When the Crohnbach's Alpha-level of a scale is <0.60 it is insufficient, meaning it is not very reliable. Whenever Cronbach's Alpha is >0.80, the reliability of a measurement scale is high. The reliability of our construct is sufficient with a Crohnbach's alpha-level >0.60 (α = 0.62), however, the lower level of reliability should be kept in mind whilst interpreting the results. Moreover, we have ensured the reliability of our research by running most of our variables in two different datasets with a varying sample size, which did not result in significant differences.

4. Analysis

This chapter will contain the analysis of our data, leading up to the acceptance or rejection of our hypotheses formulated in the second chapter. We will look into the descriptive statistics of our data which will give us more general knowledge about the collected data. Before running our logistic regression, we will run a factor analysis in regard to our independent variable 'legislation complexity' and perform a missing value analysis. Here, we will discuss the missing value analysis and descriptive statistics of our first sample (N=1,068), where the analyses relating to the second sample (N=10,287) can be found in Appendix 2. This chapter will conclude with accepting or rejecting the formulated hypotheses. The next chapters will focus on discussing these results, before forming conclusions based on these results.

4.1 Factor analysis

Factor analysis is an interdependence technique whose primary purpose is to define underlying structure among the variables in the analysis (Hair et al., 2018). Factor analysis is generally used in two occasions, for the reduction of data and, the manner for which we will be using it, data summarization. The insights provided by our factor analysis can be incorporated into our logistic regression in the subsequent section.

Before conducting a factor analysis, the specific variables need to be selected and the sample size needs to be considered. Hair et al. (2018) states that a correlation value can be calculated among all types of variables, although metric variables are seen as the preferred option. However, our data consists of non-metric variables, and it is therefore that we will be using dummy variables to represent the categories of our data. For this we have identified three key variables: "Q7.1 Complexity of administrative or legal procedures; Q7.2 Difficulty to

adapt environmental legislation to your company; Q7.3 Technical requirements of the legislation not being up to date". The choice to only incorporate three variables in our factor analysis does go against the minimum inclusion of five variables, as is proposed by Hair et al. (2018). However, because of the underlying theoretical considerations of the variables and their expected linkage towards our construct 'environmental legislation complexity', we continue with the analysis. Furthermore, the sample size considerations are met, where we exceed the minimum sample size of fifty observations with 1068 observations. For the last assumption, we need the variables to be normally distributed because this can affect the correlations between the variables. In order to meet this last assumption, we have evaluated the skewness and kurtosis levels and found no irregularities as all numbers are between the -2 and 2 thresholds, therefore we do not have to adjust the variables. In order to validate that factor analysis is a suitable technique to use, we conducted Bartlett's test of sphericity as well as KMO test. Bartlett's test should be significant at α=0.05 and KMO test value should be $\geq$0.5 (Hair et al., 2018). The results coming from these tests indicate that factor analysis is an appropriate technique to use with KMO= 0.64 and Bartlett's test $p < 0.05$, which confirms our believe that an underlying structure is present in the selected variables. To determine the number of factors, we looked at the eigenvalues which only reported a score above 1 for the first component (1.66), which helps us to conclude that these items score on the same construct and can therefore be used to build our variable 'Environmental Legislation Complexity' which will be used in the remainder of our research. An additional measure to evaluate if the underlying structure is well-defined can be done by looking at the factor loadings. As can be seen in Appendix 3, all our variables exceed the 0.70 threshold which is considered to indicate a well-defined structure (Hair et al., 2018). However, we see that our included items only account for 55.33% of the total variance explained, leaving 44.67% of the variation within this construct unexplained. This has as a result that we need to interpret the results surrounding our newly constructed variable with caution. Finally, in order to validate the outcome of our factor analysis, we performed the same procedure with our second sample (N=10287). This resulted in roughly the same results (KMO= 0.63, $p < 0.05$), providing us the validation for the use of this construct.

4.2 Missing value analysis sample 1

Before we can elaborate more on the descriptive statistics of our final sample, we will perform a missing value analysis. This analysis will be performed because missing data can have of consequence that the sample size available for our analysis will be reduced by excluding the items, or an imputation method will be needed (Hair et al., 2018). A first look at our data set shows that we do have missing values on our independent variable 'environmental legislation complexity' and on our control variable 'firm age'. According to Hair et al. (2018) we should first look at the extent of missing data before we continue with further diagnoses. A more detailed look at our control variable 'firm age' shows that there are only 4 missing items on this variable, because this number is way below the 10-percentage threshold where it can generally be ignored, we use list-wise deletion to exclude these items from our analysis. Our independent variable 'legislation complexity', however, reports 276 missing items (25.8%) which is substantial enough to warrant further action. Because list-wise deletion of these items would result in a substantially reduced sample size, we find the usage of an imputation method more appropriate. Although there are several types of imputation methods available, we will be using the procedure of multiple imputation. In this procedure, we will generate multiple datasets where in each dataset the imputed data will differ, this will be done to provide both unbiased parameter estimates and correct estimates of the standard errors in the aggregate (Field, 2013). This procedure will be done according to three steps, where in the first step the imputed datasets are created, before the model is estimated, where at last the results coming from the multiple imputed datasets are combined. The program will look at the data which is available to fill in the missing data and create a complete dataset. For this, it will make a probability calculation on what the missing values could have been before replacing this data with the imputed values (Sterne et al., 2009). Before we were able to start the imputation procedure, we needed to examen if the missing items were missing at random (MAR) or completely at random (MCAR). An examination of the missing value patterns revealed that there were no patterns to be found (Appendix 4), which gives us reason to conclude that the missing values are MCAR (Hair et al., 2018). Following this, we performed the multiple imputation procedure. This procedure let to the creation of five different datasets, which were ultimately pooled. Due to the fact that the missing values were originating from our independent variable 'Environmental Legislation Complexity' which is not

measured at a scale level, we used the mode of the pooled imputed data to replace the missing values.

4.3 Descriptive statistics of sample 1

After our treatment of the missing values, our final sample will consist of 1,068 SMEs. which are distributed over the countries present in the EU-28. Within this group, Belgium accounts for the most SMEs in our dataset (6.6%) and Romania contributes the least (0.3%), where a more detailed division of the SMEs per country can be found in Appendix 5.1. Before taking a closer look at the frequencies of our variables, we will check the skewness and kurtosis levels to examine any unusual patterns. In doing so, we found that the control variable 'SME age' was the only variable exhibiting skewness or kurtosis levels higher than the critical value of 3, with a kurtosis level of 5.991. After examination of the frequency table of this variable, we found that only 10 items (0.9%) fall into the category of firms aged 2 years and younger. To remedy this problem, we have merged the categories which has as a result that our control variable 'SME age' now has two categories with firms aged 8 years and younger or firms older than 8 years. We have taken this step of merging three categories into one because only merging the categories of firms younger than 2 years old and firms between 3-5 years old still resulted in a kurtosis level above the critical value. After recoding, the variable age now consists of two categories and has an adequate kurtosis level of 1.785. Moving on to the examination of the frequency tables. The 1,068 SMEs in our dataset were not equally distributed over the tangible products, tangible service, and intangible service sector as can be seen in Appendix 5.2. The tangible products and service sector take more than 80% of our dataset, however the difference, we deem the intangible service sector still valid and thus keep it as a separate category to avoid interpretation problems. In regard to the size of the SMEs in our dataset, the statistics show that 311 of our companies have less than 9 employees (micro firms), where 443 companies employ 10 up to 49 employees (small firms), with the remainder 314 SMEs employing 50 to 249 people (medium-sized firms). Moreover, our dataset shows that all of our SMEs do take efficiency actions, with 52.1% taking many actions, 30.2% taking some actions, and 17.7% of the SMEs in our dataset taking few resource-efficiency actions. A more detailed overview of our final sample's descriptive statistics can be found in table 4.1.

Variable	Mean	Median	Mode	SD	Skew.	Kurt.	Min.	Max
Resource efficiency actions	1.660	1.00	1.00	0.762	0.668	-0.981	1	3
Environmental legislation complexity	0.761	1.00	1.00	0.427	-1.227	-0.495	0	1
Type of funding	0.449	0.00	0.00	0.498	0.204	-1.962	0	1
SME size	2.000	2.00	2.00	0.765	-0.005	-1.292	1	3
SME age	1.152	1.00	1.00	0.359	1.945	1.785	1	2
Sector tangibility	1.685	2.00	1.00	0.699	0.522	-0.853	1	3

Table 4.1 Descriptive statistics from final sample N=1068; Missing=0

4.4 Ordinal logistic regression assumptions

When performing an ordinal regression analysis, we first have to check whether all necessary assumptions are met before we continue the analysis. In regard to the sample size Hosmer and Lemeshow (2000) advise the researcher to employ an overall sample size of at least 400 cases. In addition, the sample size per group of the dependent variable has to be at least 10 for each estimated parameter (Hair et al., 2018). Because our dependent variable 'resource efficiency actions' has three categories, where 14 parameters are estimated per model, the minimum number of cases per category should therefore be at least 140 cases. The smallest group of the dependent variable relates to our first sample and has 189 cases (few actions), which means that this first requirement is met. Furthermore, the assumptions in regard to the multivariate method need to be checked. Before we are able to perform our ordinal logistic regression, we need to check four underlying assumptions: (1) the presence of an ordinal-level dependent variable, (2) the presence of at least one independent variable of a continuous, categorical, or ordinal nature, (3) the absence of multicollinearity, and (4) the presence of proportional odds (Brant, 1990; O'Connell, 2006; Ananth & Kleinbaum, 1997). We check the first two assumptions by reviewing our dataset, which gives us the basis to say that these assumptions are met. To make a statement about the absence of multicollinearity we need to perform an additional analysis, whereas the assumption of proportional odds can only be tested after we have completed the logistic analysis (Brant, 1990).

Multicollinearity is defined by Field et al. (2013, p.2) as 'the extent to which a variable can be explained by other variables in the analysis'. A higher degree of multicollinearity can complicate the interpretation of the analysis because it is more difficult to determine the effect of a separate variable. To evaluate if there is indeed a high degree of multicollinearity we examine the collinearity statistics, including the tolerance and the variance inflation factor (VIF). First, we looked at the correlations between the independent and control variables, which are displayed in the bivariate correlation matrix as can be seen in table 4.2 and 4.3. Here, the Spearman's correlations are displayed instead of the Pearson's correlations due to the nominal and ranked nature of our variables (Field, 2013). As can be seen in the correlation matrix, there are no correlations that go beyond the critical value of 0.80, which indicates the absence of multicollinearity in our sample. Another measure to detect multicollinearity is by examining the tolerance and VIF factors. The tolerance level embodies the amount of variability of the selected independent variable not explained by the other independent variables, whereas the VIF is actually the inverse of the tolerance level (Field, 2013). If we want to meet the assumption of absence of multicollinearity, we want the tolerance level to be as close to 1 and the VIF to be below 10 (Field, 2013). Looking at our collinearity statistics, we see that the tolerance values are close to 1 and that all the VIF values are below 2. According to our observed Spearman's rho coefficients, accompanied by the tolerance and VIF values, we can state that the assumption of absence of multicollinearity is met as well for both our datasets.

4.5 Ordinal logistic regression analysis

In order to test the hypotheses of this research, several ordinal logistic regressions are run. The results of these regressions can be found in table 4.4. Multiple ordinal regressions are conducted, where every model considers a different set of variables. Models 1 and 2 are run using the dataset containing 1,068 items, where models 3 and 4 consider the dataset containing 10,287 items. To be able to observe the additional explanatory power of our model, we will first run the analysis only containing the control variables (Model 1 and 3), before adding the subsequent predictor variables (Model 2 and 4). In this paragraph, we will test the hypotheses through the use of the results displayed in table 4.4. Model 2 serves to identify the effects of environmental legislation complexity and the type of funding. The value of our independent variables can be acknowledged by evaluating the explanatory power of

Model 2 against Model 1, where the inclusion of environmental legislation complexity and type of funding resulted in a higher explanatory power (Nagelkerke's R^2 of 0.042 as opposed to 0.019). Thereby proving the value of environmental legislation complexity in predicting SMEs' environmental practice adoption. Furthermore, Model 2's statistically significant Chi-Square statistic ($p \leq 0.001$) indicates that this model gives a significantly better prediction of SMEs' adoption of environmental practices than when this would merely be predicted based on the occurrence of the outcome categories, indicating that the model is appropriate. Suprisingly, Model 2 shows the existence of a significantly positive relationship between complexity of environmental legislation and SME's adoption of environmental practices ($b = -0.588$, $p \leq 0.001$). Therefore, SME's who experience environmental legislation as complex will adopt more environmental efficiency practices, thereby rejecting hypothesis 1. The effect of our second independent variable can be found in Model 4. Model 3 and Model 4 both have a greater sample size compared to the data used in the analysis of Model 1 and 2, which gives us the opportunity to test the explanatory power for a second time. Similarly, as Model 2, Model 4 reports a higher explanatory power than Model 3 which only includes the control variables (Nagelkerke's R^2 of 0.048 as opposed to 0.230). Furthermore, the statistically significant Chi-Square statistic ($p \leq 0.001$) gives further confirmation that the model including the predictor variables is significantly better in predicting SMEs' environmental practice adoption. As a means of further validation, just as Model 2, a significantly positive relationship between environmental legislation complexity and SMEs' adoption of efficiency actions can be found in Model 5 ($b = -1.578$; $p \leq 0.001$). This can be used as a validation of rejecting hypothesis 1. The relationship between financial external support and SMEs' environmental practice adoption can also be found in Model 4. Here, the model shows the existence of a significantly positive effect ($b = 0.910$; $p \leq 0.001$). Therefore, SMEs who receive external financial support adopt more environmental efficiency action as opposed to those not receiving any kind of external support. Consequently, hypothesis 2 is supported. Finally, we will again evaluate the information regarding Model 2, which includes the more specific variable 'Type of funding' as opposed to the more general financial support variable. Hypothesis 3 proposes that the relationship between SMEs' adoption of environmental efficiency practices is stronger for firms who receive public funding than for those receiving private funding. Surprisingly, Model 2 shows a slightly negative effect of public funding

Variables	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1. Environmental legislation complexity								
2. Type of funding	0.091							
3. Age	0.023	-0.046						
4. Size: micro	0.050	-0.186	0.189					
5. Size: small	-0.014	-0.004	0.010	-0.540				
6. Size: medium	-0.034	0.190	-0.198	-0.414	-0.543			
7. Tangibility: tangible products	0.031	0.077	-0.079	-0.159	0.042	0.113		
8. Tangibility: tangible services	-0.003	-0.127	0.085	0.103	-0.004	-0.099	-0.761	
9. Tangibility: intangible services	-0.041	0.071	-0.008	0.083	-0.056	-0.022	-0.359	-0.332

Table 4 1 Bivariate correlation matrix ; N=1068

Variables	1	2	3	4	5	6	7	8
1. Environmental legislation complexity								
2. Financial support	0.140							
3. Age	-0.056	-0.043						
4. Size: micro	-0.081	-0.129	0.177					
5. Size: small	0.038	0.043	-0.072	-0.666				
6. Size: medium	0.056	0.109	-0.135	-0.448	-0.368			
7. Tangibility: tangible products	0.073	0.047	-0.050	-0.131	0.038	-0.131		
8. Tangibility: tangible services	0.000	-0.013	0.033	0.072	0.001	-0.091	-0.700	
9. Tangibility: intangible services	-0.094	-0.044	0.022	0.076	-0.049	-0.035	-0.385	-0.390

Table 4.2 Bivariate correlation matrix ; N=10287

opposed to private funding. However, this relationship is found to be insignificant (b= -0.232; $p > 0.05$), which gives us the power to reject hypothesis 3.

4.6 Control variables results

After checking the hypotheses, we additionally examine the influence of the control variables which were included in the analysis. The possible influence of the control variables, in combination with the independent variables, can be found in Model 2 and Model 4. Model 2 shows if any control variable has a significant effect following the inclusion of the independent variable 'Environmental legislation complexity' and 'Type of funding'. Here, we see that only the control variable firm size has a significantly positive effect regarding the medium-sized SMEs (b= 0.559; $p \leq 0.001$), opposed to small and micro-SMEs. When evaluating the control variable effects regarding Model 4, which contains the larger sample size, we see multiple significant results. In addition to the significantly positive effect of medium-sized SMEs (b= 0.530; $p \leq 0.001$), we see a slightly weaker positive effect of smaller-sized SMEs (b= 0.232; $p \leq 0.001$). Furthermore, sector tangibility can also be seen as an important influencer of SME environmental practice adoption. Examination of the data shows that firms operating in the tangible product sector adopt the most environmental efficiency actions (b= 0.542; $p \leq 0.001$), followed by the tangible service sector (b= 0.321; $p \leq 0.001$). The control variables regarding SME age are found to be insignificant in each model.

4.7 Assumption of proportional odds

The fourth assumption we need to check for our ordinal logistic regression is the presence of proportional odds. This assumption evaluates if the effects of any of the explanatory variables are consistent across the different thresholds (Brant, 1990). Because the outcome variable in our models is ordinal, the regression divides this variable into two different thresholds for Model 1-3 (i.e., some actions or above, many actions), and into three thresholds for model 4 and 5 (i.e., few actions or above, some actions or above, many actions). In SPSS, this assumption is evaluated via the test of parallel lines, which looks whether the regression coefficients are the same or if they vary across different regression models. When the test of parallel lines results in a non-significant outcome, it suggests that the effects of the

independent variables does not vary across categories of the dependent variable, ultimately giving us the power to conclude that the assumption of proportional odds is met.

We obtain varying results regarding the test of parallel lines. The Chi-Square values of the alternative models regarding Model 1 to 3 are all found to be non-significant, thereby confirming that the assumption of proportional odds has been met for these models. However, the Chi-Square values belonging to the alternative models of Models 4 and 5 were both highly significant, resulting in the rejection of the assumption. Failure to meet this assumption is not particularly surprising, since the test of parallel lines has been linked to rejecting the assumption of proportional odds in the case of larger sample sizes or continuous predictor variables (Brant, 1990; O'Connell, 2006). Considering the sample size relating to Models 4 and 5, we will run an additional analysis to determine if the assumption of proportional odds is met. For this, we will perform Brant's (1990) Wald test by conducting three separate binary logistic regressions, one for each threshold (Appendix 6). This additional analysis gives us the opportunity to examine the odds ratios for each independent variable across the different thresholds and determine if we have met the assumption of proportional odds. The examination of the odds resulting from the binary logistic regression show varying results for Model 3 and Model 4. In regard to model 3, we do not see any significant changes for the odds ratios between thresholds, where all odds are roughly the same with no changes in the directions of the coefficients. However, Model 4 shows a different situation when the independent variables environmental legislation complexity and external support are added. Here, the odds ratios for all variables stay roughly the same across two of the three thresholds, with exception for threshold 1 (few actions and more). Here, the odds ratios for 'Environmental legislation complexity' and 'External support' reach an extremely high number. Even though Model 3, and in a greater part Model 4, show proportional odds, we do not fully meet the assumption. However, Harrell (2020) describes that not meeting this assumption usually does not prevent the model from providing a reasonable assessment of the effects our independent variables have on SMEs' environmental practice adoption. It is therefore that we still continue with the interpretation of our data, however, we do need to interpret the results with caution.

	Model 1		Model 2		Model 3		Model 4	
	Coeff.	**SE**	**Coeff.**	**SE**	**Coeff.**	**SE**	**Coeff.**	**SE**
EnvLegCompl: No complexity			-0.561***	0.137			-1.578***	(0.040)
EnvLegCompl: Complexity [a]								
External support: Financial support							0.910***	(0.058)
External support: No support [a]								
Type of funding: Public funding			-0.232	(0.123)				
Type of funding: Private funding [a]								
Controls								
SME age: > 8 years	0.031	(0.166)	0.037	(0.167)	0.190***	(0.061)	0.102	(0.062)
SME age: < 8 years [a]					N/A		N/A	
SME age: 5-8 years	N/A		N/A		-0.136	(0.082)	-0.164	(0.084)
SME age: 0-5 years [a]	N/A		N/A					
SME size: Medium	0.575***	(0.160)	0.559***	(0.165)	0.648***	(0.050)	0.530***	(0.052)
SME size: Small	0.211	(0.141)	0.205	(0.143)	0.319***	(0.041)	0.232***	(0.042)
SME size: Micro [a]								
Sector tangibility: Tangible products	0.278	(0.180)	0.274	(0.181)	0.069***	(0.051)	0.542***	(0.052)
Sector tangibility: Tangible services	0.301	(0.181)	0.331	(0.183)	0.431***	(0.051)	0.321***	(0.052)
Sector tangibility: Intangible services [a]								
N		1068		1068		10287		10287
Pseudo (Nagelkerke) R2		0.019		0.042		0.048		0.230
Chi-Square		17.939**		40.054***		468.054***		2487.158***

Table 4.4 Ordinal logistic regression

Parameter estimates (including significance values) and standard errors (between parentheses) are displayed.
Non-included models in which interaction effects can be found are displayed between parentheses.
Ordinal dependent variable Environmental efficiency actions: (1) No actions; (2) Few actions; (3) Some actions; (4) Many actions.
Significance values: *** $p \leq 0.001$; ** $p \leq 0.01$; * $p \leq 0.05$;

[a] Reference category.

5. Discussion

The analysis brought forth some interesting results regarding the influence of environmental legislation complexity and external financial support. This chapter will be focused on discussing and interpretating the meaning of these results in the light of previous research on SMEs' environmental practice adoption.

5.1 The influence of environmental legislation complexity

Contrary to what had been hypothesized, it appears that when SMEs experience environmental legislation as complex, they will adopt more environmental efficiency practices. A potential explanation for this positive relationship is that the complexity of the matter will force SMEs to divert more attention to it in order to learn from it, inevitably resulting in a positive influence on the adoption of environmental practices. This argumentation is in line with how complexity theorists treat organization as complex adaptive systems, where they state that organizations will achieve a proper measure of fit or create a degree of autonomy regarding the imposed subject of complexity (Boisot & Child, 1999). This is in line with Nguyen et al. (2014), who state that complex systems can change its way of behavior by evaluating and learning from changes in the environment, causing the organization to evolve. This relates to the article published by Jenkins (2009), who refers to adaptability as a key capability of SMEs in regard to CSR practices. Here, it is argued that the higher degree of flexibility gives the SME the ability to respond quickly to changes in the environment, resulting in better CSR approaches. It can thus be, that experiencing environmental legislation as complex, urges the organization to respond and learn, ultimately leading to more environmental practice adoption than when it would have already understood the legislation.

5.2 the influence of external financial support

The hypotheses regarding the influence of financial support, shows that SMEs who receive external financial support will adopt more environmental efficiency practices opposed to those who do not receive any kind of support. The outcome of this hypothesis supports the results from earlier published research, where financial support has been shown to be an underlying factor of SMEs' environmental practice adoption (Santos, 2011; Oguntoye &

Quartey, 2020; Aristei & Gallo, 2021; Hoogendoorn et al., 2014). Moreover, this outcome does also show how important additional resources are in regard to SMEs, reaffirming the position that the scarcity of resources can be seen as a prohibitor of SME CSR practices (Chassé & Boiral, 2017; Santos, 2011; Perrini et al., 2007).

5.3 The influence of public and private funding

Surprisingly, the hypothesis stating that public funding, in contrast to private funding, would have a significant positive effect on the adoption of efficiency practices by SMEs was found to be non-significant. This outcome can be used to debate the relevancy of the concept 'short-termism', which is related by several authors to negatively influence private investments in CSR practices (Graafland, 2016; Mallin et al., 2013; Waygood, 2014). This concept states that private investors want to gain a return on investment as soon as possible, whereas CSR investments were shown to start generating return in the long run. However, it can be that private investors start seeing investments in environmental practices as a way to gain legitimacy instead of a way to earn fast returns. This aligns with the observation made by Velte et al., 2020), that the last decade introduced social-responsible investors to the capital market. These sustainable investors, as described by Barroso Casado et al. (2015), are not interested in short-termism but are characterized by investing over a period of time in a single firm, with an interest in its long-term prospects. The investments made by the sustainable investors provide them an increased influence on the SMEs' CSR strategies, where they can pressure senior management to adopt more environmental practices (Velte, 2021). This new perspective on the nature of private investors changes the point of view that private funding can have a significant impact on SMEs' environmental practices equal to that of public funding, which makes the implications of sustainable investors an interesting topic for future research.

6. Conclusion

We will begin this chapter by reflecting on the objective of this research, before providing an answer to the research question. Thereafter, we will discuss the main theoretical and practical implications of this research. Finally, we discuss important limitations of this research, and offer suggestions for future research.

6.1 conclusion

The global environmental problems relating to climate change have fueled research on the topic of CSR, where it has been concluded that if we want to enact change, we need to modify the decision frameworks within our businesses (Aragón-Correa et al., 2008). The growing impact SMEs can have on this problem is becoming largely recognized, with numerous scholars researching a variety of factors relating to SMEs' environmental practice adoption (Soundararajan et al., 2018; Bakos et al., 2020). In regard to this, the effects of legislation and financial support have been put forward as important influencers of SME CSR behavior (Bodas-Freitas & Corrocher, 2019; Hoogendoorn et al., 2014; Soundararajan et al., 2018). However, a consensus relating to the impact of these factors have not always been found. It was therefore that the aim of this research was to develop a better understanding of wat drives the SME in adopting environmental practices, by looking at the effects of environmental legislation and external financing. With regard to these influences, the following research question was addressed:

What is the influence of environmental legislation complexity and financial support on SMEs' adoption of environmental practices?

External financial support demonstrates to have a significant influence on the adoption of environmental practices in regard to SMEs. Surprisingly, the effect of environmental legislation complexity shows to be the opposite as what has been hypothesized, where complex regulation wields a positive influence. This shows that the flexibility of SMEs is an important influencer in regard to its CSR practices, where the adaptive competencies help the organization to learn and evolve. Furthermore, we discussed the existence of a different effect in regard to the contributor of the financial resources SMEs would receive, arguing that

the type of funding would have a different effect on SMEs' environmental practice adoption. In regard to this, we did not find a significant result, showing that receiving external financing from public institutions or private investors does not make a big difference when SMEs want to adopt environmental practices.

6.2 Theoretical and practical implications

The academic focus into the subject of SMEs' environmental practice adoption, has been growing fast over the last decade. Where the environmental impact of SMEs is becoming more and more recognized, forming a consensus that additional knowledge into the subject of their responsible behavior is necessary to form a complete picture of CSR in general. Our research contributes to this literature by examining the influence of regulatory complexity and financial support, with an additional in-depth examination of the influence of the specific type of financial support. Furthermore, the quantitative nature of our research contributes to the predominantly qualitative body of research by using a large-scale sample of European SMEs.

Furthermore, the findings of this research provide an answer towards the question put forward by Kassinis (2012) regarding the effectiveness of environmental regulation on the subject of SMEs' environmental behavior, by showing a significant relationship with legislation complexity. Moreover, the use of environmental legislation complexity as a determinant of SMEs' environmental practice adoption contributes to the scarcely existing knowledge on this subject. The findings of this thesis can also be useful for SME managers, who are increasingly expected to have their firm operate in an environmentally friendly way, while also generating a profit. This research can help these managers understand how the external factors environmental regulation and financial support influence the behavior of their company and act adequately to these pressures. The outcome regarding the insignificant result of the type of funding is especially interesting for SME managers, where it shows them that partnering with public or private investors does not affect the environmental practice adoption of their organization. Moreover, this thesis provides policy makers with relevant insights on how the complexity of environmental regulation affects the environmental practice adoption of SMEs, ensuring that the complexity is not negatively affecting the adoption of environmental practices even though it is mentioned to be seen as a barrier. At last, the outcome showing that there is no significant difference between private

and public funding can motivate public institutions to revisit their funding policy in regard to environmental practices, in order to become a more significant stimulator of CSR practices.

6.3 Limitations and future research

There are several limitations within this research, which could offer potential directions for future research. The first limitation has regard to the possible social desirability bias that is present inside the collected data in the Flash Eurobarometer 456. Because the method of data gathering made use of self-reported measures, the participants could answer the questions regarding their environmental practice adoption in any way they would like. Although this is perceived as common practice (e.g., Hoogendoorn et al., 2014; Darnall et al., 2010), we need to acknowledge the fact that the data used could have a form of bias in it. Future research could take this in regard and make use of independent measures of environmental practice adoption. Secondly, this research only made use of variables codified into dummy variables. This way of analyzing data makes that we can only measure the data in a dichotomous way and see if a respondent does possess a particular characteristic (Hair et al., 2018). Because of this, a lot of information is lost. Future research can address this shortcoming by using other types of measurement, which can capture the variables on a more varying degree. Furthermore, another limitation in regard to our data is the operationalization of our independent variable 'Environmental legislation complexity', which only explains 55.33% of the total variance, leaving 44.67% of the variation within this construct unexplained. Future research could therefore focus on defining a more complete construct of this variable, as it is an interesting research topic to pursue where, to our knowledge, only Di Vita (2017) attempts to provide a full definition. A fourth limitation of this research has regard to the assumption of proportional odds. Where our first dataset does meet this assumption, the second dataset does not. By this, we cannot have full confidence in the interpretation of our results. Future research can make use of other statistical analyses like the partial proportional odds (PPO) model, which is a method that allows the simultaneous use of covariates which do meet the assumption of proportional odds and those who do not meet this assumption (Sasidharan & Menéndez, 2014). Finally, our third hypothesis showed that there is no significant difference between the relationship of private and public funding towards SMEs' environmental practice adoption. A possible explanation for this could be the rise of the sustainable investor. An interesting topic for future research is to provide

more in-depth knowledge as to how this new type of investor effects the adoption of CSR practices. This research topic is said to be underdeveloped, where the investors' role in the creation of sustainable organizations is not yet addressed (de Lange, 2019).

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Appendix

Appendix 1: Sectors with corresponding NACE codes

NACE CODE	Sector
B	Mining and quarrying
C	Manufacturing
D	Electricity, gas, steam, and air conditioning
E	Water supply, sewerage, and waste management
F	Construction
G	Wholesale and retail
H	Transportation and storage
I	Accommodation and food service
J	Information and communication services
K	Financial and insurance activities
L	Real estate activities
M	Professional, scientific, and technical activities

Appendix 2: Missing value analysis & descriptive statistics Sample 2

2.1 Missing value analysis – Big sample group

To evaluate the missing values in our second sample, we will be using the same procedure as we have followed during the analysis of our first sample. Therefore, we start by looking at the missing values on our dependent variable. Contrary to our first sample, we do find missing values on our dependent variable (66 cases; 0.6%), which we delete to avoid misinterpretations in our relationships with the independent variables. A further look at the frequencies show that missing values are also present in our independent and control variables. Our independent variable 'External financial support' and our control variable 'Age' both have missing values which do not exceed 5% of the cases, making them candidates for list-wise deletion. However, our independent variable 'Environmental legislation complexity' has 32.8% of missing cases, deleting these cases in a list-wise matter would substantially reduce the sample size. Because of this constraint, we will use multiple imputation to replace the missing date. The procedure of this method will be done similar to the imputation method

used for our first dataset, where we used multiple imputation as well for our independent variable 'Environmental legislation complexity'. The only exception we make between the procedures, is that we are now only able to create one different dataset where the missing values are estimated. This exception is made due to the lack of processing power, which made it impossible to create five different datasets with this greater sample size.

Before starting the imputation procedure, we need to examine if any non-random patterns exist in the missing data, thus establishing if the missing items are MAR or MCAR. After examination of the missing values patterns, we can conclude that no patterns exist in the missing data, deeming the data MCAR. After evaluating the missing data patterns, we delete the missing values on the variables 'External financial support' and 'Age' in a list-wise matter before the remaining missing values are imputed. The multiple imputation method generated a pooled dataset, where the mode of the pooled imputed data was used to replace the missing values of our independent variable 'Environmental legislation complexity'.

2.2 Descriptive statistics of the final sample – Big sample group

The sample size of our second dataset will consist of 10,287 SMEs, which are distributed rather equally over the countries present in the EU-28, where not one country contributes more than 5% to the entire sample as can be seen in table A2.1. To examine if there are any unusual patterns present in our data, we examine the skewness and kurtosis levels. In doing so, we found that only the variable 'SME age' exhibited a kurtosis level above the critical value of 3 (3.387). Through a closer examination of the frequencies, we saw that the category '2 years or younger' only housed 0.7% of the items. To remedy this unusual kurtosis level, we merged the categories '2 years and younger' and '3-5 years' to form the category '0-5 years'. This change resulted in a kurtosis level below the critical value of 3, as can be seen in the A2.1 below. Furthermore, just as with our first dataset, we see that an unequal distribution exists within our variable 'sector tangibility'. Even though the last category 'intangible service sector' only covers 17.7% of the entire population, we still deem the category valid and keep it in our analysis. The same problem has regard to our variable 'external support', where the category 'no external support' is significantly larger than our second category 'external financial support'. However, both categories have more than sufficient items to be seen as valid, therefore we will leave this variable as it is. More details on the frequency divisions between our variables can be found in tables A2.2-A2.5

Variable	Mean	Median	Mode	SD	Skew.	Kurt.	Min.	Max
Resource efficiency actions	2.20	2.00	1.00	1.05	0.331	-1.120	1	4
Environmental legislation complexity	0.582	1.00	1.00	0.493	-0.332	-1.890	0	1
External support	1.134	1.00	1.00	0.341	2.151	2.627	1	2
SME size	2.250	2.00	3.00	0.764	-0.454	-1.163	1	3
SME age	1.280	1.00	1.00	0.632	2.017	2.512	1	3
Sector tangibility	1.768	2.00	2.00	0.729	0.389	-1.051	1	3

Table A2.1 Descriptive statistics final sample; N=10287; Missing=0

Country	Frequency	Percentage	Cumulative %
France	360	3.5	3.5
Belgium	370	3.6	7.1
The Netherlands	354	3.4	10.5
Germany	338	3.3	13.8
Italy	383	3.7	17.5
Luxembourg	155	1.5	19.1
Denmark	346	3.4	22.1
Ireland	331	3.2	25.6
United Kingdom	283	2.8	28.4
Greece	437	4.2	32.6
Spain	372	3.6	36.2
Portugal	430	4.2	40.4
Finland	378	3.7	44.1
Sweden	364	3.5	47.6
Austria	358	3.5	51.1
Cyprus	170	1.7	52.8
Czech Republic	395	3.8	56.6
Estonia	451	4.4	61.0
Hungary	423	4.1	65.1
Latvia	440	4.3	69.4
Lithuania	438	4.3	73.6
Malta	168	1.6	75.3
Poland	435	4.2	79.5
Slovakia	410	4.0	83.5
Slovenia	403	3.9	87.4
Bulgaria	420	4.1	91.5
Romania	461	4.5	96.0
Croatia	414	4.0	100

Table A2.2 Frequency distribution SMEs per country

Sector	Frequency	Percentage	Cumulative %
Tangible products	4207	40.9	40.9
Tangible service	4264	41.5	82.3
Intangible service	1816	17.7	100

Table A2.3 Frequency distribution SMEs per sector

Size	Frequency	percentage	Cumulative %
1-9 employees (Micro)	4603	44.7	44.7
10-49 employees (Small)	3641	35.4	80.1
50-249 employees (Medium)	2043	19.9	100

Table A2.4 Frequency distribution SMEs per size

Age	Frequency	Percentage	Cumulative %
8 years or older	8374	81.4	81.4
5 to 8 years	906	8.8	90.2
0-5 years	1007	9.8	100

Table A2.5 Frequency distribution SMEs per age

Appendix 3: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.636
Bartlett's Test of Sphericity	Approx. Chi-Square	315.582
	df	3
	sig	<0.001

Table 3.1 KMO and Bartlett's Test (N= 1068)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.633
Bartlett's Test of Sphericity	Approx. Chi-Square	2852.446
	df	3
	sig	0.000

Table 3.2 KMO and Bartlett's Test (N= 10287)

Appendix 4: Missing value analysis

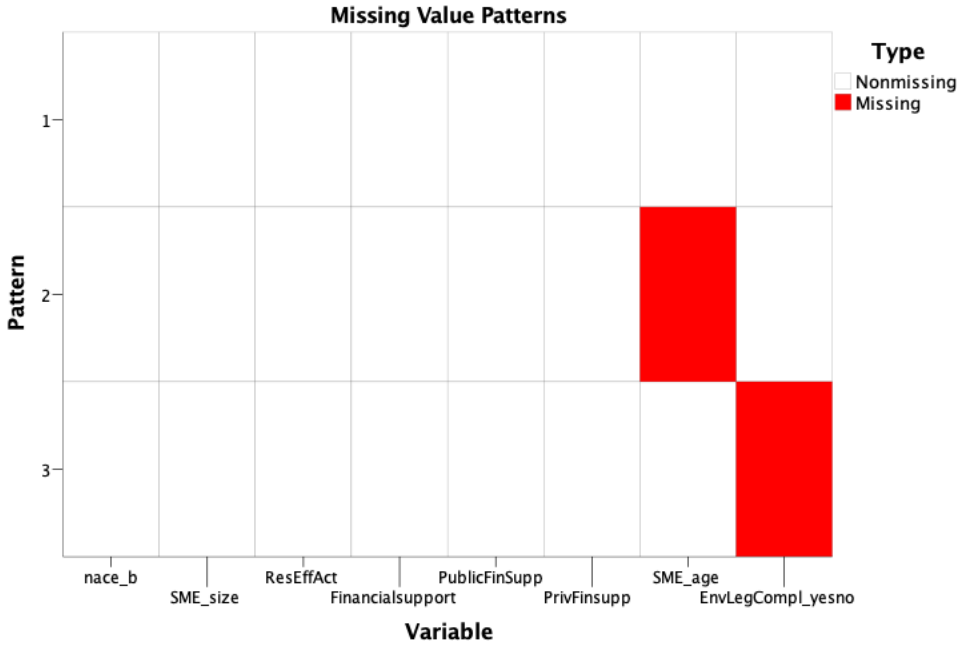

Figure A4.1 Missing value patterns (1)

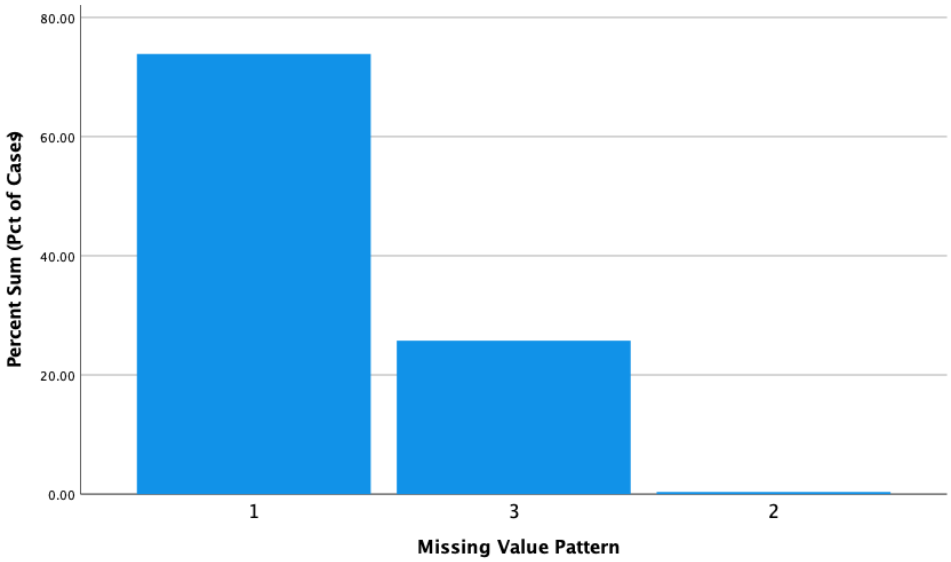

Figure A4.2 Missing value patterns (2)

Appendix 5 Frequency statistics sample 1 (N= 1068)

Country	Frequency	Percentage	Cumulative %
France	56	5.2	5.2
Belgium	71	6.6	11.9
The Netherlands	68	6.4	18.3
Germany	61	5.7	24.0
Italy	27	2.5	26.5
Luxembourg	11	1.0	27.5
Denmark	45	4.2	31.7
Ireland	47	4.4	36.1
United Kingdom	28	2.6	38.8
Greece	20	1.9	40.6
Spain	62	5.8	46.4
Portugal	43	4.0	50.5
Finland	40	3.7	54.2
Sweden	40	3.7	58.0
Austria	60	5.6	63.6
Cyprus	10	0.9	64.5
Czech Republic	43	4.0	68.5
Estonia	16	1.5	70.0
Hungary	50	4.7	74.7
Latvia	27	2.5	77.2
Lithuania	28	2.6	79.9
Malta	34	3.2	83.1
Poland	41	3.8	86.9
Slovakia	20	1.9	88.8
Slovenia	45	4.2	93.0
Bulgaria	41	3.8	96.8
Romania	3	0.3	97.1
Croatia	31	2.9	100

Table A5.1 *Division of SMEs per country*

Sector	Frequency	Percentage	Cumulative %
Tangible products	482	45.1	45.1
Tangible service	441	41.3	86.4
Intangible service	145	13.6	100

Table A5.2 *Division of SMEs per sector*

Size	Frequency	percentage	Cumulative %
1-9 employees (Micro)	311	29.1	29.1
10-49 employees (Small)	443	41.5	70.6
50-249 employees (Medium)	314	29.4	100

Table A5.3 *Division of SMEs per employee size*

Age	Frequency	Percentage	Cumulative %
8 years or older	906	84.8	84.8
0 to 8 years	162	15.2	100

Table A5.4 *Division of SMEs per age*

Appendix 6: Proportional odds testing model

Model 1	Coefficients				Odds ratios			
	Ordinal	Binary			Ordinal	Binary		
		Few +	Some+	Many		Few +	Some+	Many
Independent variables								
ELC: No complexity								
ELC: Complexity[a]								
External support: Financial support								
External support: No support[a]								
Controls								
SME age: > 8 years	0.190	0.207	0.225	0.132	1.209	1.230	1.252	1.141
SME age: 5 to 8 years	-0.136	-0.118	-0.140	-0.139	0.873	0.888	0.870	0.870
SME age: 0 to 5 years [a]								
SME size: medium	0.648	0.779	0.547	0.703	1.912	2.178	1.728	2.020
SME size: small	0.319	0.426	0.289	0.322	1.374	1.530	1.334	1.380
SME size: micro[a]								
Sector tangibility: Tangible products	0.069	0.863	0.592	0.700	1.071	2.371	1.807	2.013
Sector tangibility: Tangible services	0.431	0.447	0.368	0.492	1.539	1.564	1.445	1.635
Sector tangibility: Intangible services[a]								
Chi-Square		284.009***	292.502***	344.129***				
Hosmer & Lemeshow test		23.024**	7.886	14.349				

Table A7.1 Proportional odds model regarding Model 3

Model 2	Coefficients				Odds ratios			
	Ordinal	Binary			Ordinal	Binary		
		Few +	Some+	Many		Few +	Some+	Many
Independent variables								
ELC: No complexity	-1.578	20.326	1.472	0.990	0.206	672220775	4.357	2.691
ELC: Complexity[a]								
External support: Financial support	0.910	18.726	1.006	0.773	2.484	135765599	2.735	2.166
External support: No support[a]								
Controls								
SME age: > 8 years	0.102	0.046	0.153	0.071	1.107	1.047	1.166	1.074
SME age: 5 to 8 years	-0.164	-0.193	-0.185	-0.168	0.849	0.825	0.831	0.845
SME age: 0 to 5 years [a]								
SME size: medium	0.530	0.607	0.402	0.577	1.699	1.835	1.496	1.781
SME size: small	0.232	0.293	0.188	0.234	1.261	1.340	1.207	1.264
SME size: micro[a]								
Sector tangibility: Tangible products	0.542	0.659	0.443	0.586	1.719	1.932	1.557	1.796
Sector tangibility: Tangible services	0.321	0.233	0.246	0.405	1.379	1.262	1.279	1.499
Sector tangibility: Intangible services[a]								
Chi-Square		3240.240***	1749.567***	1031.91***				
Hosmer & Lemeshow test		1.0534	12.490	16.659*				

Table A7.1 Proportional odds model regarding Model 4