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Factors affecting micro and small business distress in Austria

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Abstract: This study analysed the probability of distress of micro and small enterprises in Austria on the basis of financial statement figures, data describing the sector of a company, and the regional and economic situation of the company's location using the resource-based view on a theoretical basis. Results showed that relevant indicators for explaining the distress of micro and small enterprises are the size of the company, key figures from financial statement analysis, the location of the company, affiliation with other companies, and the inflation and unemployment rates of the national economy. The results mostly remain robust even after analysing micro and small enterprises separately.

Keywords: distress; micro and small businesses; resource-based view; network-based view.

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1 Introduction

Despite decades of scientific advancement, developing an independent theory of crisis and insolvency detection that can be linked to recognised financing theories (Exler and Situm, 2019) has been difficult. Overall, the research field of crisis and insolvency detection is still considered to be highly relevant, but relatively few studies in the literature base their empirical results on a theoretical foundation (Appiah et al., 2015). Additionally, in the area of micro and small enterprises, which account for the largest share of companies worldwide, a relatively small number of studies can be found. This is surprising given the higher insolvency rates of micro and small enterprises compared with medium and large enterprises. For example, the Institut für Wirtschaftsforschung (2021) reported that the insolvency rates of small companies in Austria in 2019 are over 1% and those of micro companies are around 0.8%, while medium-sized companies are

around 0.55% and large companies around 0.32%. Figures from Statista for 2019 in Germany show a similar picture. Of all the corporate insolvencies in Germany, 97.3% involve micro and small enterprises. Accordingly, micro and small enterprises are particularly affected by insolvencies, so suitable crisis and insolvency management detection systems are needed for these groups of companies in particular.

In general, bankruptcies are considered contemporary and devastating economic problems that have significant negative effects on business, the economy, and society (Camacho-Miñano et al., 2015). Accordingly, corporate insolvencies are a global problem, and the number of insolvencies in a state is a suitable indicator to measure the robustness of the economy (McKee, 2000). In this economic reality, the potential for insolvencies can be seen as a kind of market imperfection that influences the valuation of companies on a theoretical and empirical level (Altman, 1969). Moreover, it is in the general interest to identify potential insolvencies at an early stage so that countermeasures can be taken.

From a historical perspective, there is insufficient research on micro and small enterprises, as the economic activities of this group of companies have been considered subordinate to those of large companies and multinational corporations (Curran and Blackburn, 2001, p.1). While examining small firms alone, it can be noted that research in this area is relatively well established and has evolved over time, with topics focusing on enterprise, leadership, or financing (Herbane, 2010). Despite this good progress, Kraus et al. (2021) argued that more efforts are needed in the future to facilitate and advance research in small business and entrepreneurship research and adjacent areas.

According to the World Bank, small and medium-sized enterprises (SMEs) play an important role in most of the world's economies. Some 90% of companies belong to this group, and they employ more than 50% of the world's employees. According to current OECD figures, there are on average 31% micro enterprises and 18% small enterprises worldwide. In some countries (e.g., Greece, Italy, Australia, etc.), there is even an over-representation of micro enterprises. These data suggest that 49% of all enterprises worldwide can be classified as SMEs. The significance for Austria is even higher, as 85% can be classified as micro enterprises and 13% as small enterprises. Based on the data presented, the relevance of micro and small enterprises as a research field is therefore evident.

Previous studies on early crisis and insolvency detection have focused primarily on the analysis of annual financial statement figures. Insolvent small businesses have limited cashflow, high debts, and few current assets (Arcari and Grechi, 2021; Beaver, 1966, 1968; Carter and Van Auken, 2006; O'Neill and Duker, 1986). Additionally, their key figures from the analysis of annual financial statements display worse values than the industry average (Edmister, 1972). The analysis of regional and macroeconomic variables was not examined in detail. A theoretical foundation according to the resource-based view (RBV) was not found in the reviewed studies, or was present only to a limited extent. Hence, this is addressed in the present study. On the basis of a literature review, three major research gaps can be identified. First, very few studies have explicitly dealt with the early detection of crises and insolvencies of micro and small enterprises (Altman, 1968; Beaver, 1966, 1968; Edmister, 1972; Gupta et al., 2015, 2018; Jain et al., 2011; O'Neill and Duker, 1986). Second, no study has attempted to explain the probability of crisis and insolvency of micro and small enterprises based on the theoretical basis of the RBV. Third, no study has analysed the influence of company

location and macroeconomic variables on the probability of distress of these groups of companies. The present study answers the following research questions:

- How well can financial statement figures (risk drivers) from previous studies be used to explain the probability of distress of micro and small enterprises?
- How strong is the influence of the sector affiliation of micro and small enterprises on their probability of distress?
- How strong is the influence of regional factors on the probability of micro and small enterprises becoming distressed?
- To what extent is the probability of distress of micro and small enterprises influenced by macroeconomic variables?

This study determines the variables that have an influence on the probability of distress of micro and small enterprises and whether their relationship with the dependent variable (distress) is consistent with RBV expectations. For this annual accounts, data describing the enterprises and their locations, and macroeconomic variables were used. Indicators from previous studies were used to capture the distressed and non-distressed corporate states. The method used is logistic regression, which has been applied in earlier studies (e.g., Bateni and Asghari, 2020; Gyimah et al., 2020; Hol, 2007; Jones, 2017; Kosmidis and Stavropoulos, 2014; Ohlson, 1980; Ooghe et al., 2009) and has the significant added value of being able to calculate direct default and insolvency probabilities (Hayden, 2011, p.13).

The rest of the study is organised as follows. Section 2 presents the general literature review of previously used variables in crisis and insolvency prediction. Section 3, presents a summary of studies on the early detection of crises and insolvencies, which have based their theoretical foundation to a certain extent on the RBV. This is followed by a short presentation on the RBV and the development of hypotheses derived from it. Section 4 provides a description of the variables of the study, the data basis, and the methods used. After the presentation of the detailed results from the statistical analyses, a summary of the important results, the answers to the research questions, and the results from the hypotheses tests are given in Section 6. This section concludes with the potential limitations of the study and directions for future research.

2 Literature review: variables for the development of crisis and insolvency early warning systems

There has been an increasing number of studies on insolvency, distress, and related topics since the 1970s. During this time, attempts have been made to apply modern analytical methods to increase the accuracy of early detection (Situm, 2016). In principle, it can be stated that there are many possible explanations and factors that can cause a corporate crisis and eventual insolvency (Butera and Faff, 2006; Pretorius, 2008). For example, early research efforts increasingly used financial statement figures, and it was found that other variables not derived from the financial statement analysis could also be used to improve the efficiency of early warning models (Du Jardin, 2009; Habib et al., 2018). In order to establish a link between the literature review and the empirical part of this work, a classification of variables (risk drivers) from previous studies is created in line

with Everett and Watson (1998) with regard to systematic and unsystematic, exogenous and endogenous risk drivers.

2.1 Unsystematic and endogenous risk drivers

This category includes variables that describe the enterprise itself or the place or region in which the enterprise is located. In principle, several variables from financial statement analysis can be used to distinguish between solvent and insolvent or distressed and non-distressed companies. Based on Porath (2011, p.32), risk drivers that have proven to be statistically significant on a univariate basis for separating solvent and insolvent companies should preferably be used. Only a few meaningful key figures from financial statement analysis are required to reliably depict or evaluate the financial and economic situation of a company, as correlations result in information redundancies, which can be exploited for the purpose of early detection (Chen and Shimerda, 1981; Laurent, 1979; Pohlman and Hollinger, 1981). For this reason, selected indicators that have been shown in several studies to be suitable early warning indicators are used in this study. More than 400 studies on insolvency and early detection were reviewed. The relevant indicators are listed in the chapter describing the variables.

With regard to SMEs, studies show that profitability, efficiency, and the share of equity or debt capital in particular have a significant influence on the states of financial distress, insolvency, failure, or default (e.g., Camacho-Miñano et al., 2015; Fantazzini and Figini, 2009; Laitinen, 1991; Lin et al., 2012; Yazdanfar and Öhman, 2020). In this context, Modina and Pietrovito (2014) argued that excessive high debt and the resulting high financial charges cause a significant increase in financial risk for SMEs. It was also found for this group of companies that cash flow deteriorates when they approach the state of financial distress, insolvency, or failure (Laitinen, 1994). Camacho-Miñano et al. (2015), Gupta et al. (2015), or Pompe and Bilderbeek (2005) showed for SMEs that the liquidity situation has a significant impact on the state of bankruptcy.

In addition to the key figures of the annual financial statement analysis, variables were also used, which can describe the soft facts of a company. Iazzolino et al. (2013) and Wetter and Wennberg (2009), for example, used human capital as an explanatory variable and showed that it has the potential to enable the early detection of insolvent companies. In other studies technological resources and management skills were examined (Jasra et al., 2011; Madrid-Guijarro et al., 2011; Grunert et al., 2005; Thornhill and Amit, 2003). For example, Carter and Van Auken (2006), Fredland and Morris (1976), and Hall (1994) described that a higher managerial experience in small businesses leads to a reduction in failure or bankruptcy. O'Neill and Duker (1986) extend this view by showing that managers of small businesses should broaden their education or experience so that topics such as financial management or marketing can be professionalised and thus made more efficient. This is consistent with the findings of Hall (1994) and Laitinen and Chong (1999), who cite weaknesses in operational management or incompetence of management as the main reasons for small-and medium-sized firm insolvencies.

These variables are also suitable for improving the classification accuracy of crisis and insolvency early warning systems. Starting from RBV (Williams, 2014a), variables describing the regional environment of a company can be considered relevant in terms of defining access to resources and capacities. This means that a company's location plays a role in analysing how easy or difficult it is to gain access to resources and capacities

(Williams, 2014b) or how strong competition is (Fredland and Morris, 1976). On this basis, the location of the company does have an influence on the probability of default (Platt and Platt, 2008), which is particularly relevant for micro-enterprises (Storey and Wynarczyk, 1996). However, it can be seen that the number of studies that deal with variables that are not derived from the annual financial statement analysis is less when compared to the total number of studies in the research field.

2.2 Unsystematic and exogenous risk drivers

The affiliation of the company to a particular industry determines the extent to which the surrounding accessible inputs can be converted into outputs (Clegg et al., 2017, 53). Based on Koller et al. (2010, pp.60–61), the structure of the industry influences competition and thus the possibility of performance. Hence, differences in industry performance can be attributed to its competitive structure. It can, therefore, be generally assumed that industry affiliation has an influence on the probability of crisis and insolvency of companies (Fredland and Morris, 1976). Jain et al. (2011) showed that while analysing Indian micro-enterprises, there are industries that have a higher risk of default on a loan. Other studies have also demonstrated the influence of sector affiliation on the probability of default (Thornhill and Amit, 2003). Chava and Jarrow (2004) examined the relevance of industry effects in relation to hazard rate estimation and proved that both the coefficients of early detection models are influenced, so that the industry effects have a significant influence on bankruptcy.

Yazdanfar and Öhman (2020) found that an industry does not have a significant influence on SME financial distress in Sweden. This result contrasts with the findings of Camacho-Miñano et al. (2015), who showed that the industry plays a significant role for Spanish SMEs in terms of the probability of bankruptcy. Carter and Van Auken (2006) described that, based on their study results, retail firms are more likely to fail. Butera and Faff (2006) stated that the construction and textile industries are significantly riskier for Italian SMEs. These findings suggest that industry affiliation should be considered as a significant explanatory variable for SMEs to explain financial distress.

2.3 Systematic and exogenous risk drivers

Early detection models that are constructed using only annual financial statement figures or soft facts cannot achieve a sufficient level of classification accuracy because other factors and variables that also influence the emergence of crises and insolvencies do not behave invariantly over time (Joy and Tollefson, 1975; Betts and Belhoul, 1987; Grice and Dugan, 2001; Haber, 2005). An early detection system developed in a particular year may no longer be reliably applicable in another year when different macroeconomic conditions prevail. Fei et al. (2012) and Hackbarth et al. (2006) showed that if economic cycles are not considered, it causes a significant underestimation of default probabilities, because such cyclical phases cause volatilities in different factors.

Studies that focus on examining the influence of macroeconomic variables on the probability of corporate insolvency are limited in the literature (Chen et al., 2016). According to Anderson (2007, p.147), Bhattacharjee et al. (2009), Couderc et al. (2008, p.249) and Richardson et al. (1998), credit ratings and related default probabilities systematically fluctuate with the business cycle. From a long-term perspective, it is essential to integrate macroeconomic variables into crisis and insolvency early warning

systems (Kane et al., 1996; Keasey and Watson, 1991a, 1991b), because insolvency (failure) cannot be regarded as a financial phenomenon in isolation (Botazzi et al., 2011; Fredland and Morris, 1976).

Yazdanfar and Öhman (2020) showed that macroeconomic conditions have an impact on Swedish SMEs. A similar conclusion is formed by Manazaneque et al. (2015) in their analysis of Spanish SMEs. They argued that business failure prediction models should consider the economic cycle to increase their classification accuracy. In the study by Butera and Faff (2006), different macroeconomic variables (e.g., GDP, rate of unemployment, etc.) showed a significant impact on the probability of default of SMEs in Italy.

3 Theoretical background and hypotheses development

3.1 The consideration of resources as a critical indicator in the context of empirical crisis and an early warning for insolvency

Priem and Butler (2001) indicated in their comprehensive literature review that the RBV provides a helpful perspective in the context of strategy research, which can be applied as a theoretical basis for different problems. The suitability of the RBV as a theoretical basis for the outlined problem is supported in Cook et al. (2011), as they state that it provides a good explanatory basis for explaining SME success and failure. Since the RBV represents an inside-out perspective, it can explain long-term differences between firms based on the presence of firm-specific characteristics (determined by resources) (Peteraf, 1993). This also means that the success of companies essentially depends much more on strategic decisions at the firm-specific level or more on internal factors than on other (non-firm-specific) factors (DiPietro and Sawhney, 1977; Parsa et al., 2005; Spanos et al., 2004). For these reasons, the RBV appears suitable as a theoretical basis for the outlined research field to provide a broad explanatory basis; hence, other theoretical approaches are not used. Such a perspective has rarely been used in empirical studies on the early detection of insolvency and crisis for companies, or only in a very limited or modified form. Beaver (1966, 1968) based his studies on the liquid-asset-flow model, in which he defines the company as a reservoir of liquid funds that is constantly changed by inflows and outflows. If a company no longer possesses liquid assets (resources), it can no longer meet its liabilities and is, in effect, classified as insolvent.

Although this point of view is adopted by other empirical studies (e.g., Blum, 1974; Laitinen and Laitinen, 2000; Ward, 1994), no theoretical basis is established. Overall, studies suggest that insolvent companies have fewer liquid assets when compared to solvent companies and that these are not sufficient to service (due) liabilities. The lack of liquidity and the inability of a company to service mature liabilities when they fall due is, from a legal point of view, an insolvency offence in many countries. Building on Beaver (1966), further studies can be found that have focused specifically on the cash flow analysis of companies (e.g., Aziz et al., 1988; Aziz and Lawson, 1989; Casey and Bartczak, 1985; Chen et al., 2011; Gentry et al., 1985; Gombola et al., 1987; Rodríguez-Masero and López-Manjón, 2020; Welc, 2017), and expand on the point that sufficient liquid funds (resources) must be available in order to remain solvent.

Wilcox (1971) presented a theoretical model for the application of financial statement figures to corporate insolvencies. In his view, access to equity capital and management

skills are essential to avoid insolvency. If a company lacks access to these resources, there is a risk that the business will fail, which can be seen as an approximation to the RBV. A much deeper foundation of the RBV as it applies to insolvencies was established by Thornhill and Amit (2003). From the results, it could be concluded that the RBV appears suitable to explain the failure of companies. Deficiencies in strategic assets correspond to an increase in the probability of insolvency. Particularly, younger companies display a higher risk of insolvency if there is a shortage of valuable assets. Older companies are at risk if they cannot adapt to changes in the competitive environment.

Dawley et al. (2003) analysed the influence of diversification on the probability of insolvency. Partial aspects of the RBV can be found in the theoretical section of this study. It was concluded that larger companies have a higher probability of survival. Additionally, increased levels of organisational slack are helpful in recovering faster from a crisis. A reference to the RBV was used in the studies by Iazzolino et al. (2013), Madrid-Guijarro et al. (2013), and Wetter and Wennberg (2009), who examined the ability of the variables, i.e., human capital, intellectual capital, and social capital, in order to detect corporate insolvencies at an early stage. All three variables relate to knowledge within the company, which can be subsumed under the knowledge-based view (KBV) and, in turn, can be regarded as a derivative of RBV (Eisenhardt and Santos, 2006; Sousa and Hendriks, 2006). The authors concluded that the inclusion of the named variables can improve the predictive power of early insolvency detection systems.

Madrid-Guijarro et al. (2011) took a comprehensive approach regarding the RBV, naming in their theoretical basis both external (with reference to Porter's five forces) and internal factors as being influential on a company's insolvency. In the theoretical part of their work, they examined the internal factors, i.e., human capital, strategic business planning, innovation, technology, and quality, and developed corresponding research hypotheses. They concluded that environmental conditions and some strategic variables are related to the probability of insolvency. Overall, a rather theoretical argument can be observed in a number of studies as to why certain ratios should be capable of distinguishing between solvent and insolvent companies. This finding underscores Pretorius's (2009) statement that previous efforts have tended to focus on predicting insolvencies rather than understanding the predictive path that leads to them.

3.2 Hypothesis development under the resource-based view

Based on Barney and Arikan (2001) and Costa et al. (2013), performance between companies differs due to the heterogeneity of resources. This means that competing companies have different resources, thereby allowing one company to operate more efficiently and thus more profitably than another. However, differences between companies can be explained by differences in efficiency, individual capabilities, and resources, but not by their own market power (Foss et al., 1995; Lenox et al., 2011; Peteraf, 1996). According to this, some companies are more successful in exploiting their capabilities and resources, or are better able to do so when compared to their market competitors, so that certain core competencies can be built up (Armstrong and Shimizu, 2007), which can lead to the establishment of competitive advantage (Castaldo, 2007, p.28; McIvor, 2005, p.44). This in turn enables higher performance (Barney, 2001; Sminia, 2014, p.59). Thus, it is an approach that explains or predicts why certain companies can gain a competitive advantage and achieve superior returns (Deb, 2009,

p.4; Grant, 1996). Based on Peteraf (1993), the RBV's greatest contribution is that this approach can explain the long-term differences between companies that cannot be explained by differences in industry affiliation.

The development of capacities and resources and, as a consequence of core competencies and competitive advantage, is a process that is generally only possible over a certain period of time. Companies that succeed on the basis of the right strategic choices (Esteve-Pérez and Mañez-Castillejo, 2008) generally grow in size. The age of the company and its size should generally have a highly correlative relationship (Jovanovic, 1982). This enables larger companies to innovate more due to the availability of capacities and resources, providing them with a competitive advantage while increasing their chances of continuing to operate successfully in the market (Jovanovic and MacDonald, 1994). These theoretical assumptions have been confirmed in many empirical studies. Companies that are larger (Chava and Jarrow, 2004; Dawley et al., 2003; Fitzpatrick and Ogden, 2011; Theodossiou et al., 1996) and older (Altman, 1968; Altman et al., 2010; Blum, 1974; Esteve-Pérez and Mañez-Castillejo, 2008; Fredland and Morris, 1976; Madrid-Guijarro et al., 2011) generally have a lower probability of default/failure.

According to Ben-Zion and Shalit (1975), a firm's size can be used as a measure of its past performance and as an indicator of its future performance and associated risk. Castanias (1983) argued that the lower risk of larger firms is mainly due to the fact that, as a firm increases in size, there is typically lower risk per dollar invested and per expected earnings and that such firms benefit from easier access to sources of finance. Hambrick and D'Aveni (1988) argued that large companies simply have more financial substance, enabling crises to be bridged for longer and thus increasing the potential to achieve a turnaround before bankruptcy. This is not the case for small companies in particular, and those that lack resources therefore have a higher probability of default (Williams, 2014a). Based on the theoretical foundation and empirical results, the following research hypotheses were developed in this study.

H1: Larger companies have a significantly lower probability of being distressed.

H2: Older companies have a significantly lower probability of being distressed.

In principle, a linear relationship is assumed between the age of the company, the size of the company, and the probability of default. However, there is reason to assume that this is not entirely the case, and instead that a non-linearity exists from a certain age or size of company onwards. Dickinson (2011) claimed that a company's life cycle does not necessarily have to move linearly through different phases and that differences in learning behaviour may occur. Companies of the same age can have different learning curves, and their learning success highly depends on the given feedback system and the willingness to learn from the feedback.

Based on the liability of newness and the liability of aging (Aldrich and Auster, 1986; Freeman et al., 1983), it can be assumed that the probability of insolvency decreases with increasing age. The reason for this is that young companies are in a phase of self-discovery, face an unknown market, and do not yet have a clear orientation (Jovanovic, 1982; Anders and Szczesny, 1998). Companies that survive this initial phase can then develop their potential and establish themselves in the market (Jovanovic and MacDonald, 1994; Thornhill and Amit, 2003; Ucbasaran et al., 2010). As companies age, they become more inflexible and less willing to learn, so their likelihood of insolvency

increases again (Anders and Szczesny, 1998). Yazdanfar and Öhman (2020) argued that this behaviour means firms above a certain size exhibit scale inefficiency, which increases their vulnerability to crises. This was empirically confirmed by Coad (2016), who suggested that performance first increases and then decreases as the company's age increases. Evans (1987) also found a similar non-linear behaviour where a firm's growth decreases with its size. Anders and Szczesny (1998) and Altman et al. (2010) found in their study that there is a non-linear relationship between company size and the probability of insolvency.

The extent to which there is a non-linear relationship in both age and size between micro and small enterprises remains unknown. The present study proposes the following research hypotheses:

H3: There is a significant non-linear relationship between company size and the probability of a company being distressed.

H4: There is a significant non-linear relationship between company age and the probability of a company being distressed.

In addition to the RBV, the network-based view (NBV) has been developed in the literature, which is mentioned as a consistent view but is regarded by some authors as a subform of the RBV, as networks can also be regarded as resources (Andersson et al., 2002; Gulati et al., 2000). In principle, the economy of a company can be regarded as a network of organizations that are connected by different hierarchies. Thus, each company has a certain degree of influence (ability to exert power) over other companies (Thorelli, 1986). This possibility of influence can refer to different levels or forces, following Porter's five forces (Hitt et al., 2005, pp.92–99). Overall, it can be concluded that the higher the power of the various forces, the lower the profitability of the company in question (Clegg et al., 2017, p.55). Gaskill et al. (1993) concluded from their factor analysis that lack of competitiveness in the market is an important reason why companies cannot operate in that market successfully.

Cooperating with other companies in a network can have a favourable effect on a company's success or profitability (Gulati et al., 2000). Based on Andersson et al. (2002), the probability of a company's survival can be increased by forming networks. A network can create a more stable and safer environment, so that a company's activities are associated with lower risks and, thus, a lower probability of failure (Hite and Hesterly, 2001). Accordingly, if there is weak access to networks, access to resources remains limited, which is reflected in a higher probability of failure (Williams, 2014a). Porter (1991) and Williams (2014b) stated that the location of a company's branch office is relevant to establishing the quality of access to resources, so that the location has an influence on the probability of failure (Platt and Platt, 2008). According to Leiblein (2011), this can be attributed to the fact that each company has different capabilities to control, obtain, and organise resources. The conditions of market factors are important in understanding how well these capabilities can be exploited.

H5: Companies that have a connection with other companies due to shareholding relationships have a significantly lower probability of being distressed compared to companies that do not have such relationships.

H6: Companies that can more readily access resources have a significantly lower probability of being distressed.

Based on the theoretical considerations and the derived research hypotheses, the next section contains descriptions of the variables used in this study. These were selected in such a way that a relationship to the formulated research hypotheses could be established. Additionally, the data used and the methodology applied are presented.

4 Variables, data, and methodology

4.1 Variables of the study

The variables of the study are established on the theoretical basis of the RBV and the findings of previous studies. The structure of the variables used (potential risk drivers) in the study is based on the classification of risks in the financial sector into systematic and unsystematic or endogenous and exogenous (see Table 1). The classification is based on Everett and Watson (1998).

Table 1 Classification of the variables of the study according to different types of risk

	Exogenous	***Endogenous***
Systematic	• Explanatory variables at the macroeconomic level (Macroeconomic variables)	–
Unsystematic	• Control variables at the firm level (Industry variables)	• Control variables at the firm level • Explanatory variables at the firm level • Explanatory variables at the regional level (regional variables)

The variables of the study were categorised according to the individual criteria. The industry variable modelled as a dummy in order to describe the sector affiliation is to be classified as exogenous and unsystematic. All other variables for describing the firm are to be classified as unsystematic and endogenous. This can be argued in line with Peteraf (1993), as when considering the RBV, differences in performance between companies cannot be explained by the industry affiliation.

4.1.1 Dependent variable

Based on the findings of the existing literature, the dependent variable (DIST) was modelled as a dummy variable (0 = not ailing; 1 = ailing) (Grusczyński, 2020, p.86) for logistic regression (Hayden and Porath, 2011, p.2; Löffler and Posch, 2007, p.2). In principle, the concept of 'distress' is not clearly specified or developed in literature (Pozzoli and Paolone, 2017; Situm, 2016). Three indicators were used to define financial and economic distress. Based on these indicators, a company was classified as being 'distressed' if either (a) the company has negative working capital in one financial year (Foster et al., 1998; Poston et al., 1994); (b) the company has negative cash flow in one financial year (Anandarajan et al., 2001; Turetsky and McEwen, 2001); or (c) the company has negative cumulative earnings (Gilbert et al., 1990). Poston et al. (1994) used a similar method of identifying distressed companies.

4.1.2 Control variables at the firm level

As in previous studies, control variables were defined, which describe the companies used in the study according to characteristics or in terms of their relationship to both the dependent and explanatory variables (Tuma, 2009, p.312). First, dummy variables were used to record the industries (IND) (1 = belonging to the industry concerned; 0 = otherwise) that were classified according to the Austrian NACE, as also explained in the description of Table A1 (Situm, 2019). Some studies indicate that there is indeed a significant influence, which leads to a classification of higher-risk and lower-risk industries (e.g., Carter and Van Auken, 2006; Hall and Young, 1991; Hol, 2007; Lennox, 1999; Thornhill and Amit, 2003). On the basis of Cheung and Levy (1998), it can even be assumed that insolvency rates within certain sectors correlate positively. According to Storey and Wynarczyk (1996), the size, age, and sector of the company provide the greatest significance in explaining whether a microenterprise can survive or not. A possible reason for this is that the market success of a company is influenced by the competition in the industry (Grüning and Kühn, 2002, p.122) or the intensity of competition (Maier, 2007, p.95). Therefore, the industry is a good proxy to measure rivalry in the market (Martin, 2012).

Additionally, a dummy variable (LEG_FORM) was introduced to determine whether enterprises are corporate or non-corporate (1 = corporate; 0 = otherwise). Based on Harhoff et al. (1998), corporations have a higher probability of insolvency than non-corporations. For example, Stiglitz and Weiss (1981) showed that owners or shareholders (e.g., in a limited liability company) have limited liability and therefore have an incentive to invest in riskier projects, which increases the risk of failure (Anders and Szczesny, 1998). As a final measure, a dummy variable was recorded (AFFIL) to determine whether each company under investigation is a stand-alone entity or an affiliated company. The aim is to measure whether there are direct or indirect shareholdings between companies. A similar approach was used by Balcaen et al. (2011), where the variable was modelled with 1 if there was a shareholding relationship and with 0 if there was not. Following Dewaelheyns and van Hulle (2006) and Claessens et al. (2003), we conclude that if there is a connection to one or more companies as defined in this paper, the probability of distress decreases. This is because, in a group of connected companies, a well-performing company can support a weaker company, so that the chances of survival increase. The variable AFFIL is related to the fifth research hypothesis.

4.1.3 Explanatory variables at the firm level

The first variable is the size of the firm (SIZE), which is defined by the balance sheet total (Altman et al., 1977; Barniv and Raveh, 1989; Hotchkiss, 1995; Moulton and Thomas, 1993). The second variable is the age of the company (AGE), which is defined in years as the difference between the current observation period and the time of foundation (Chava and Jarrow, 2004; Dakovic et al., 2010; Madrid-Guijarro et al., 2011). The natural logarithm was applied to both quantities to normalise the data (Löffler and Posch, 2007, p.18; Thornhill and Amit, 2003). According to the RBV, a negative correlation can be assumed between a company's age and size and the probability of default. Older and larger companies have a lower probability of default due to their many years of experience as well as their more extensive capacities and resources (Altman,

1968; Altman et al., 2010; Blum, 1974; Fredland and Morris, 1976; Theodossiou et al., 1996). Both variables are related to the first two research hypotheses of this study.

Based on the assumption of a non-linear relationship between the age and size of the enterprise, these two variables were squared and then logarithmised in order to normalise the data. Additionally, a non-linear relationship was supplemented by cubic terms to test the robustness of the results and to determine whether they are more U-shaped or S-shaped (Haans et al., 2016). These variables were also logarithmised in order to normalise the data. Both variables are related to the third and fourth research hypotheses.

The selected key figures (financial statement analysis) are as follows, with the authors cited only by way of example (see Table 2). Their relation to the RBV is that companies with more capacity and resources are in turn better able to grow and operate more profitably (Deb, 2009, p.4; Grant, 1996; Sminia, 2014, p.59). The key figures have been divided into categories based on the results of Chen and Shimerda (1981), Laurent (1979), Min and Lee (2005), and Pohlman and Hollinger (1981). Financial statement ratios include information that can describe corporate risk well (Beaver et al., 1970) and are therefore suitable for separating good from poor-performing ones (Piotroski, 2000; Beaver et al., 2005) or solvent from insolvent companies (Nissim and Penman, 2003; Keasey and Watson, 1991a).

Table 2 Description of the explanatory variables on the firm level

Category	*Code*	*Name*	*References*
Cash flow/ working capital	CF_TD	Cash flow/total debt	Beaver (1966, 1968), Frydman et al. (1985)
	WC_TA	Working capital/total assets	Altman (1968), Arcari and Grechi (2021), Ohlson (1980), Lin et al. (2011)
Profitability	NI_TA	Net income/total assets	Casey (1980), Casey and Bartczak (1985), Frydman et al. (1985), Libby (1975), Ohlson (1980), Zmijewski (1984)
	EBIT_TA	Earnings before interest and taxes/total assets	Altman (1968), Arcari and Grechi (2021), Betts and Belhoul (1987), Gilbert et al. (1990)
	EBT_TA	Earnings before taxes/total assets	Bruse (1978), Pompe and Bilderbeek (2005)
Capital structure	TE_TA	Total equity/total assets	Grunert et al. (2005), Pompe and Bilderbeek (2005)
	TD_TA	Total debt/total assets	Bhattacharjee et al. (2009), Ohlson (1980), Zmijewski (1984)
	RE_TA	Retained earnings/total assets	Altman (1968), Altman et al. (2010), Lin et al. (2011)

4.1.4 Explanatory variables on the regional level (regional variables)

To determine the regional size of the company's branch office, the variable 'regional size' (REG_SIZE) was introduced, which is defined as the natural logarithm of the number of inhabitants in the region (Adjei et al., 2019). A similar variable was applied in the study by Aalbers et al. (2019), which was used as a proxy to determine employment retention. In the present study, regional size serves as a surrogate for measuring the

availability of or access to labour resources as defined in the RBV. The potential of a firm's interaction with the regional labour market is an important aspect of enabling small businesses to operate, and the recruitment potential can be crucial for the survival and/or growth of a business (Down, 2013, p.89).

Similar to the company size, the squared and logarithmic value was also recorded for this regional variable. The reason for this is that companies cannot use the full potential of labour resources in the region, so it is only partially relevant. First, not all employees can be deployed on the basis of their training and experience. Second, there is competition for employees in the regional labour market, and third, there is a net flow of employees who go to work from their own region to other regions and vice versa. Additionally, the region in which a company is located was divided into urban and rural areas (URB_RUR). For this purpose, a dummy variable was used, which was assigned a value of 1 if the company was located in an urban region and a value of 0 if it was located in a rural region. This variable was also used by Williams (2014a). The two variables are related to the sixth research hypothesis.

4.1.5 Explanatory variables at the macroeconomic level (macroeconomic variables)

The first variable represents the annual inflation rate (INFL) in percentage terms, which was collected from public statistics and used in a similar form in other studies (Acosta-González et al., 2019; Butera and Faff, 2006; Tirapat and Nittayagasetwat, 1999). Based on the study by Norton and Smith (1979), it appears that the inflation rate in individual years has a correlating impact on the figures in the annual financial statement, thus influencing the stability and measurement accuracy of the developed crisis and insolvency early warning systems. According to Liu (2009), it can be concluded that higher inflation rates require higher default probabilities. It therefore makes sense to include these as a controlling factor. The second variable in this study is the general development of real GDP (GDP_CHG), measured as the change in real GDP as a percentage of the previous year's GDP. It can be assumed that the probability of insolvency decreases with higher GDP growth (Butera and Faff, 2006; Claessens et al., 2003; Hol, 2007; Liou and Smith, 2007). Aalbers et al. (2019) argued in this context that an increase in GDP growth has a positive impact on employee retention.

The last variable used was the unemployment rate (UNEMPL), measured in percentage terms for the year under review (Acosta-González et al., 2019; Butera and Faff, 2006). Several models were calculated in the analyses to better understand the effect of macroeconomic variables. Following Butera and Faff (2006) and Everett and Watson (1998), we assume that these variables act according to a time-lag. In the study by Hol (2007), this time-lag in relation to the change in GDP could not be determined. The extent to which the selected macroeconomic variables actually have a material impact on the probability of default for micro and small enterprises requires empirical testing.

4.2 Data and methodology

This study focused on micro and small companies in Austria as defined by the classification framework of the European Union (2003/361/EC). The balance sheet total was used to determine the size of the enterprise. The following definitions were used:

- Micro firm: ≤ EUR 2 million balance sheet total
- Small firm: ≤ EUR 10 million balance sheet total

The companies' annual accounts figures were obtained from the Creditreform database for the years 2004 up to and including 2015, establishing an analysis period of 12 years. A company was included in the database if all variables of the study were available for review. A total of 15,696 observations (8125 non-distressed and 7571 distressed; 5500 micro firms and 10,196 small firms) were included in the study over this period. The breakdown of the firms by groups and sectors is shown in Table A1. To test the research hypotheses of the study and to answer the research questions, several methods such as discriminant analysis, logistic regression, probit regression, or neural network analysis could be potentially used (Grusczyński, 2020, pp.82–84). The choice in the context of this study was logistic regression. In contrast to linear regression, it can be used to explain the state of binary coded dependent variables — in the case of this study, distressed and non-distressed firms — in a regression over independent variables (Pampel, 2000, p.11; Marques de Sá, 2007, p.322). This method has established itself both in research and in practice in the field of early crisis and insolvency detection and is the most widely used method because it: (a) enables the probability of default to be determined directly; (b) provides results that can be interpreted and understood from a business management perspective (Hayden, 2011); and (c) enables similarly accurate and, in some cases, even higher accuracy levels in the classification of results when compared with more complex methods (like neural network analysis, support vector machines, etc.) (Situm, 2016).

The significant advantage of logistic regression is that it is relatively robust with regard to deviations of the data from the normal distribution when estimating the regression and does not require the covariance matrices of the two groups to be equal (Press and Wilson, 1978; Hayden and Porath, 2011). A significant problem in the development of early detection systems is, first, that sufficient data must be available and, second, that these often include extreme values that have a significant impact on the estimation of the coefficients of logistic regression. Therefore, following Löffler and Posch (2007, pp.15–19), we performed a winsorisation of the data at the 1% level (α-level) (i.e., 99th and 1st percentile) to ensure that an increased model quality can be achieved.

5 Results

5.1 Descriptive statistics

In the first step, selected key figures of descriptive statistics were calculated (see Table 3). Additionally, (univariate) tests on differences were performed to identify the risk drivers that best separate the two groups. Since the data of the individual variables are not normally distributed, it is preferable to consider the nonparametric U-test in order to evaluate differences between the two groups (Burns and Burns, 2008, p.269; Ho, 2014, p.518). It can be observed from the significance that all variables have a separating force. The significance of the t-test also confirms this result. A similar trend emerges when descriptive statistics for micro and small enterprises are analysed separately for the two enterprise groups (the results are not included in tabular form in

this paper). The results showed that almost all variables were statistically significant in these analyses. However, there are two variables where the differences are not significant:

- For small enterprises, according to the *U*-test, there is no statistically significant difference in the AGE variable (*p*-value = 0.202), which is, however, given at the 5% level starting from the *t*-test (*p*-value: 0.013).
- For micro enterprises, the *U*-test shows no statistically significant relationship to the variable REG_SIZE (*p*-value: 0.181), although according to the *t*-test, there is a significant difference at the 5% level (*p*-value: 0.019).

Table 3 Descriptive statistics

Variable	*Group*	*Mean*	*Median*	*σ*	*Sign. (KS-test)*	*Sign. (t-test)*	*Sign. (U-test)*
AGE	0	2.5357	2.6391	1.0104	0.000***	0.000***	0.000***
	1	2.3382	2.4849	1.1774	0.000***		
SIZE	0	14.7930	15.4217	1.4336	0.000***	0.000***	0.000***
	1	14.0170	14.9517	2.1016	0.000***		
WCT_TA	0	0.4231	0.3897	0.2734	0.000***	0.000***	0.000***
	1	–1.3581	–0.2198	6.3035	0.000***		
CF_TD	0	48.2826	0.1910	337.7192	0.000***	0.000***	0.000***
	1	12.1905	0.0143	118.4000	0.000***		
EBIT_TA	0	1.7871	0.0706	12.7571	0.000***	0.000***	0.000***
	1	0.5551	–0.0020	9.2565	0.000***		
EBT_TA	0	0.1192	0.0763	0.1892	0.000***	0.000***	0.000***
	1	–0.2635	–0.0068	1.1151	0.000***		
NI_TA	0	0.0969	0.0615	0.1686	0.000***	0.000***	0.000***
	1	–0.3178	–0.0105	1.3770	0.000***		
TE_TA	0	0.4451	0.4089	0.2757	0.000***	0.000***	0.000***
	1	–1.1267	0.0958	6.7451	0.000***		
TD_TA	0	0.5549	0.5911	0.2757	0.000***	0.000***	0.000***
	1	2.1267	0.9042	6.7451	0.000***		
RE_TA	0	0.3380	0.3002	0.2500	0.000***	0.000***	0.000***
	1	–2.2259	–0.0065	11.6091	0.000***		
REG_SIZE	0	11.1999	11.3414	0.6599	0.000***	0.000***	0.000***
	1	11,1103	11,2948	0,7098	0.000***		

The groups were divided into non-distressed (0) and distressed (1). For each of the variables, the mean, median, and standard deviation (*σ*) for each group were computed. Beside these values, the significance of the test for normality of data based on Kolmogorov-Smirnov is shown. Additionally, the significances from *t*-test and *U*-tests are displayed. Significance: ***1 percent level.

The data show that the theoretical assumptions based on the RBV are essentially correct. Affected companies are younger and smaller, and on average (both mean and median),

they show poorer values in the selected annual financial statement figures. It can also be concluded that such enterprises are located in places with a smaller population.

5.2 Correlation and factor analyses

There is a high correlation between certain variables, which can lead to the problem of collinearity or multicollinearity (Anderson, 2007, p.183). Hence, a correlation and factor analysis were conducted in the following manner (Stolzenberg, 2009). Table A2 in the appendix displays some high correlations (above 0.8 or above 0.9), which can be assumed to indicate collinearity or multicollinearity (Burns and Burns, 2008, p.386; Kahane, 2008, p.122). This means that the variables concerned replicate similar information or that the data contain information redundancy (Chen and Shimerda, 1981; Laurent, 1979; Pohlman and Hollinger, 1981). This can be problematic for the application of logistic regression as the inclusion of multicollinear data affects the estimation of the regression parameters and can lead to poorer classification results (Hosmer and Lemeshow, 2000; Thomas et al., 2002; Hauser and Booth, 2011). Since multicollinearity refers only to annual financial statement figures, beginning with the factor analysis, only those with the highest factor loadings are included in further analyses or calculations. The presumed positive correlation between the age and size of the company is shown to be significant but at a low level ($\rho = +0.226$), indicating that a strong theoretical correlation between the two variables cannot be assumed, as Jovanovic (1982) or Thornhill and Amit (2003) have indicated.

The reasoning behind this can be assumed to be that the strategy of micro and small enterprises is not to pursue a growth strategy at any price. Therefore, although these companies may be older, they do not have to grow in size. It is also evident that with increasing company size comes a significant increase in the company's profitability (based on the key figures EBT_TA [$\rho = +0.309$] and NI_TA [$\rho = +0.320$]), its equity ratio (TE_TA) ($\rho = +0.311$) and retained earnings (RE_TA) ($\rho = +0.362$) can be seen. With regard to the RBV, this can be interpreted as follows: With increasing company size, more resources are available, which are used more efficiently (Foss et al., 1995; Lenox et al., 2011; Peteraf, 1996) to ultimately be more profitable (Deb, 2009, p.4; Grant, 1996).

5.3 Results from regression analyses

Based on the existing knowledge, several logistic regressions were calculated using the sequential method to determine whether the model's quality or efficiency changes through the additional inclusion of further variables, so that the contribution of the variables toward the explanatory power of the models can be determined (Foster et al., 2006, p.60). The data show the regression coefficients and the standard errors. The cut-off value was set at 0.5. The α-error describes the number of companies that are distressed but that are classified as non-distressed. The β-error describes the number of companies that are non-distressed but are classified as distressed (Sobehart et al., 2000). The accuracy indicates what percentage of enterprises were correctly classified overall with regard to their group affiliation (Fawcett, 2006). The effective model performances were measured using area under curve (AUC) and Gini-coefficients as proposed by Grzybowski and Younger (1997) and García et al. (2015).

The results show that by adding further variables to the basic Model I, the model quality could be increased considerably (higher R^2, increase in accuracy, and increase in the Gini coefficient). The most significant leap in quality can be seen between Model I and Model II, which indicates that the addition of annual financial statement figures enables a significant improvement in the early recognition of distress, which supports the argument that annual financial statement figures are well suited to the comprehensive recognition of crisis situations (Ak et al., 2013; Beaver et al., 1970; Milburn, 2008; Mohanram, 2005; Piotroski, 2000; Turetsky and McEwen, 2001). Specifically, results show that weak profitability and lack of liquidity increase the likelihood of distress (Camacho-Miñano et al., 2015; Rujoub et al., 1995).

Regarding the variables on the firm level, the variables SIZE and AFFIL display negative and significant coefficients in all the models. This means that the probability of distress (insolvency) decreases with increasing firm size (Altman et al., 1977; Barniv and Raveh, 1989; Fitzpatrick and Ogden, 2011; Hotchkiss, 1995; Moulton and Thomas, 1993). It is striking that the age of the company only plays a role if a quadratic term is included. The inclusion of the quadratic term also shows significant coefficients for company size (Models V to VIII). As the signs of the coefficients are positive, it is evident that there is a non-linear relationship between the age or size of the enterprise and the probability of distress. This supports the results of Altman et al. (2010), Andres and Szczesny (1998), and Yazdanfar and Öhman (2020). With regard to the variable AFFIL, as in other studies, it can be concluded that the connection by a company with one or more other companies is a form of protective mechanism that causes a negative relationship to distress (Balcaen et al., 2011; Claessens et al., 2003; Dewaelheyns and van Hulle, 2006). The variable LEG_FORM shows only partial significance, and there are inconsistencies in the signs that only partially support the theoretical considerations.

With regard to industry affiliation, essentially only one industry with a negative regression coefficient is seen to be significant in all models (Industry Q). This is a remarkable result as, from a theoretical perspective, the affiliation of a company to a certain industry and the competition it faces have an influence on its performance (Koller et al., 2010, pp.60–61), so that significant coefficients could have been expected for more industries. The two variables for measuring regional influence, i.e., REG_SIZE and URB_RUR, are both statistically significant. From the results of the regression coefficients, it can be concluded that branches in a political district with a larger number of inhabitants have a negative correlation with the probability of distress. Furthermore, due to the positive coefficient of the variable URB_RUR, the probability of distress increases if the company is located in an urban zone, which contrasts with the results of Williams (2014a).

In urban areas, young firms are likely to locate and have a higher probability of distress, so this result can be explained based on this fact (Fredland and Morris, 1976). Overall, it can thus be concluded that the location of the company or the resources associated with it have an influence on the financial and economic situation of the company (Andreano et al., 2018; Platt and Platt, 2008; Storey and Wynarczyk, 1996; Williams, 2014a; Williams, 2014b). Nevertheless, both variables can only marginally improve the discriminatory power or the improvement in model quality, which means that their influence on the probability of distress is of minor importance.

In terms of macroeconomic variables, INFL and UNEMPL display a significant influence on the probability of distress, which is consistent with previous studies (Acosta-

González et al., 2019; Butera and Faff, 2006; Liu, 2009; Tirapat and Nittayagasetwat, 1999). Higher inflation rates and higher unemployment rates have a positive relationship with the probability of distress. It can be noted that the influence of the two variables is delayed by two years, supporting the findings of Butera and Faff (2006) and Everett and Watson (1998). When the variable CHG_GDP was included, no significant regression coefficients consistent with theoretical expectations could be determined (even taking a time-lag into account). Hence, this shows that, contrary to the studies by Butera and Faff (2006), Claessens et al. (2003), Hol (2007), and Liou and Smith (2007), this variable has no influence on the probability of distress. The basic assumption that the inclusion of macroeconomic variables improves the early detection power of models (Chen et al. 2016) can only be confirmed to a limited extent for micro and small firms, because the Gini coefficients (Models IV and VIII) improved only marginally. The results of this study support the findings of DiPietro and Sawhney (1977) that the relative importance of external forces in determining business failures has diminished. One possible reason for this could be that micro and small entrepreneurs tend to be more regionally active and are therefore less dependent on overall macroeconomic development.

5.4 Robustness check of the models

To test the robustness of the previous estimates and to enable more detailed statements in connection with distress for both groups of micro and small enterprises, the regressions were replicated in Tables A4 and A5. The results for micro enterprises indicate that the results outlined above contain many similarities. However, two major differences can be observed. First, the age of the enterprise is not as relevant in terms of explaining the probability of distress in micro-enterprises. The coefficients of the non-linear terms (AGE^2) are completely insignificant. Second, the legal form of the microenterprise is not relevant with regard to explaining distress (a significant coefficient can only be found in Model I). In contrast to the results in Table A3, two major differences can also be observed when considering small enterprises. First, by adding the non-linear terms for AGE^2 and $SIZE^2$, the size of the enterprise (Models VII to X inclusive) loses its significance, while the age of the enterprise remains relevant. Second, the size of the region only plays a significant role in certain cases. If the variable REG_SIZE^2 is included, region size loses significance, indicating that there is no non-linear effect between this variable and the probability of distress. Thus, even when considered separately, it can be concluded that financial figures have an early power for detecting distress. Gupta et al. (2015) concluded that the opposite is true for micro-enterprises and thus, it diverges from the results of this study.

6 Summary of the results and conclusions

6.1 Hypotheses testing

The first hypothesis of this study cannot be rejected because the larger a company is, the less likely it is to be distressed (Dawley et al., 2003; Chava and Jarrow, 2004; Fitzpatrick and Ogden, 2011; Theodossiou et al., 1996). Nevertheless, there is a restriction for small companies with regard to this statement, because the inclusion of non-linear terms makes the company size insignificant. The second hypothesis can be rejected on the basis of the

results as the age of the company has largely no material significant influence on the probability of distress. This result contrasts with the previous studies (Altman, 1968; Altman et al., 2010; Esteve-Pérez and Mañez-Castillejo, 2008; Fredland and Morris, 1976).

The third and fourth hypotheses can be regarded as confirmed, although this can only hold true under certain conditions. In the overall model, the non-linear terms for firm age and firm size were considered to be significant in all models. When micro enterprises are considered, this does not apply to the age of the enterprise and, in the case of small enterprises, it no longer applies to the size of the enterprise. The fifth hypothesis can only be partially confirmed, based on the significant and negative regression coefficients of the variable AFFIL. Micro and small enterprises that are linked to one or more enterprises (in a network) have a lower probability of distress. These resources can apparently be applied to be successful at the entrepreneurial level or to generate sufficient profitability (Gulati et al., 2000), thereby reducing the risk or probability of default (Andersson et al., 2002; Hite and Hesterly, 2001). Although the variable AFFIL was considered statistically significant for small enterprises in all models, it was not relevant for micro enterprises in four models. This may be influenced by the fact that in the data basis used, affiliation is more frequent for small enterprises (77.04 %) than for micro enterprises (56.71 %), so that the latter can only achieve a reduction in the probability of distress through affiliation if certain other variables are disregarded or if other variables have an impact on the enterprise.

The sixth hypothesis can also be partially confirmed, as the variables REG_SIZE and URB_RUR showed statistically significant coefficients in almost all regressions. This confirms that the location of the company's branch office is relevant for companies in terms of establishing networks and gaining access to resources, which is consistent with previous studies (Huggins and Thompson, 2015; Williams, 2014a, 2014b). The variable REG_SIZE appears to be a proxy for measuring access to resources in the market. Although very low but nevertheless significant coefficients, the contribution of the variable can also confirmed for micro-enterprises, which conditionally supports the statements of Storey and Wynarczyk (1996) that location is highly relevant, especially regarding the size of the enterprise. With regard to the unexpected presentation of the regression coefficient for the variable URB_RUR, reference is made to the previous discussion.

6.2 Answers to the research questions and a summary of the main results

The first research question aimed to identify the risk drivers from the analysis of annual financial statements. According to the results, these are WC_TA, CF_TD, EBT_TA, and TD_TA, which confirms the results of the previously cited studies. Considering the R^2, it can be seen that when the ratios are added to the control variables at the firm level, there is a significant increase in the explanatory power of the calculated regressions. These results also remain robust when micro and small enterprises are considered separately. Therefore, the variables mentioned above are the most significant in terms of explaining why firms get into a situation of distress.

The second question attempted to determine the extent to which industry affiliation has an influence on the probability of distress. Based on the model estimates, it can be observed that industry affiliation is essentially of little relevance for explaining distress with regard to micro and small enterprises. Almost no sector showed significant

coefficients. This finding contrasts with earlier studies in which sector affiliation had an influence on the probability of crisis or insolvency (Chava and Jarrow, 2004; Jain et al., 2011; Thornhill and Amit, 2003), but supports the findings of Yazdanfar and Öhman (2020), which also showed no influence of the industry.

The third question was to determine the extent to which regional factors influence the probability of distress. The variables REG_SIZE and URB_RUR show statistically significant coefficients, leading to the conclusions that (a) if a company is located in a larger political district; and (b) if it is located in a rural area, the probability of distress decreases. The latter finding diverges from earlier studies (Williams, 2014a), but undermines the results of Fredland and Morris (1976). A non-linear effect of the variable REG_SIZE could only be proven for micro enterprises in this study. Irrespective of the significance of the named variables, it must be noted that their contribution to explaining the differences between distressed and non-distressed enterprises is somewhat marginal while comparing the relevant parameters between the models both with and without the regional variables.

The last question was linked to the assessment of the influence of macroeconomic variables on the probability of distress. The variables, i.e., INFL and UNEMPL showed statistically significant values, confirming the study results of Acosta-González et al. (2019), Butera and Faff (2006), Tirapat and Nittayagasetwat (1999), or Liu (2009) and showing that higher values for these variables increase the probability of distress. The variable, i.e., CHG_GDP showed insignificant coefficients in all calculation experiments and therefore has no influence on determining the probability of distress, leading to a divergence of this study from the results of Butera and Faff (2006), Claessens et al. (2003), Hol (2007), and Liou and Smith (2007). It is also observed that the variables INFL and UNEMPL have a time-lag effect on the probability of distress, which supports the results of Butera and Faff (2006) and Everett and Watson (1998). Both variables have an effect on the dependent variable, with a lag of two years. Similar to the variables describing the establishment of the enterprise, however, their explanatory power is of secondary importance when considering the R^2 values of the models when the variables are added (DiPietro and Sawhney, 1977).

6.3 Discussion of the results

Considering selected variables, this study used the RBV as a theoretical basis to determine whether it could be used to explain the state distress of micro and small enterprises in Austria. Studies conducted in this area are insufficient, and the present study provides new findings regarding research for micro and small enterprises.

The findings support the assumptions of the RBV in several ways, confirming the view that the RBV is a useful theoretical perspective in strategy research (Barney, 2001; Priem and Butler, 2001) and thus can be applied in the context of research on early crisis and insolvency detection. For example, the size of the firm itself and region size indicate the importance of resources for a firm to successfully compete in the market (Adjei et al., 2019; Down, 2013, p.89; Platt and Platt, 2008). The latter variable has not been tested in its present form in previous studies, so it provided new insights. First, the definition of the variable seems appropriate to capture the resource potential of a region (Porter, 1991; Leiblein, 2011; Williams, 2014b); and second, the results are consistent with the predictions of the RBV (and in this context, also with network-based views) that the size

of the region has a favourable effect on the economic situation of a firm (Aalbers et al., 2019).

A similar finding was made for the variable AFFIL; although in the context of this study, this is particularly more relevant for small companies than for micro-enterprises. It can thus be deduced that the integration of a company into a group of companies can be seen as a protective resource that reduces the probability of distress (Andersson et al., 2012; Claessens et al., 2003; Dewaelheyns and van Hulle, 2006).

A non-linear effect in company size could essentially only be found for micro companies, not for small companies. The first statement supports the results of Altman et al. (2010) or Yazdanfar and Öhman (2020), although their results refer to SMEs in general. Similarly, a non-linear effect could be found for firm age, which, however, is only significant for small firms. Based on Dickinson (2011), this could be interpreted as companies go through different life cycles over time, which can be non-linear, and as the dependent variable distress was defined via performance indicators, Coad's (2016) reasoning can be used as an explanation that the performance of companies decreases with age, which by definition has a vice versa effect on increasing the condition distress. Thus, these results are also not found in previous studies.

Another contribution of this study is that a non-linear effect was found for the variable REG_SIZE for microenterprises, meaning that a region that is too large leads to an increase in the probability of distress. It seems that microenterprises, due to their small size, are not able to fully exploit the potential of larger regions and the networks they provide (Huggins and Thompson, 2015; Williams, 2014a). It must also be remembered that the likelihood of distress increases in urban regions. Following Thorelli (1986), we interpret that in large regions, the influence of competitors on one's company is high, resulting in negative effects on performance.

The importance of annual financial statement figures for describing and explaining the economic distress of a company appears to be undisputed. Their explanatory contribution was found to be the strongest. Inflation and the unemployment rate showed significant influences with a time-lag, which are, however, of subordinate importance overall for micro and small enterprises. The results thus clearly support the idea of the RBV that companies can manage their financial and economic situations from their own resources and that the success of a company depends on its management capacities.

6.4 Limitations of the study and recommendations for future research

In general, the estimates show robust results in the various estimated models, leading to the assumption that the results can be considered representative for micro and small enterprises. Additionally, the number of 15,696 observations over a period of 12 years can be described as large and thus meaningful when compared to many other studies. Nevertheless, it is certainly desirable to analyse more observations to improve the estimation quality of the models (Silva et al., 2002) and increase the possibility of making more accurate statements as a result. In the case of the available database, it was unfortunately not possible to include more cases in the study. Nevertheless, due to the high Gini coefficients (for Models II to VIII, the values are above 0.8, which can be described as excellent (Anderson, 2007, p. 205), it can be stated that the estimates display reliable model quality.

The landscape of micro and small enterprises in Austria has similarities with that of other countries in Europe (e.g., Germany, Italy, or Switzerland), and therefore the results of this study appear to be transferable to such economies as well. Nevertheless, it would be interesting in this context to test this hypothesis on the basis of empirical data. Furthermore, it is of interest to put the RBV to the test as a theoretical basis in further studies and to experiment with further variables that form a bridge between the theoretical approach and empirical observations. Following existing opinions and based on the available research results, the sole consideration of RBV is only partially sufficient to explain the state of financial distress among micro and small enterprises. Therefore, it should be combined with other theoretical bases, such as NBV. In this context, other variables should also be considered, which may be better proxies for measuring the influence of networks on the probability of financial distress.

A further limitation of this study is that, despite winsorisation, the data were not normally distributed, which could possibly affect the estimation of the coefficients in logistic regression (Hopwood et al., 1988; Silva et al., 2002). As already mentioned in the context of this study, the logistic regression method is relatively robust against a violation of the normal distribution (Press and Wilson, 1978; Hayden and Porath, 2011). Hence, the chosen method was appropriate and provided estimation results of sufficient quality (Pohar et al., 2004).

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Appendix

Table A1 Sample description

Year	*Parameter*	*Industry*																	*Total*
		A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*	*M*	*N*	*P*	*Q*	*R*	*S*	
2004	Non-dist. (0)	0	0	6	0	0	4	16	0	1	1	4	2	6	0	0	0	0	0	**40**
	Distress (1)	0	1	12	1	0	10	17	4	1	0	3	3	10	7	0	1	0	2	**72**
	Micro (0)	0	0	3	0	0	0	2	0	1	1	2	1	4	0	0	0	0	0	**14**
	Micro (1)	0	0	2	0	0	4	10	2	0	0	1	1	6	5	0	0	0	1	**32**
	Small (0)	0	0	3	0	0	4	14	0	0	0	2	1	2	0	0	0	0	0	**26**
	Small (1)	0	1	10	1	0	6	7	2	1	0	2	2	4	2	0	1	0	1	**40**
2005	Non-dist. (0)	0	0	14	1	0	9	36	6	4	6	8	5	19	18	0	0	0	4	**130**
	Distress (1)	1	0	23	2	1	17	50	5	11	20	11	24	49	30	0	2	2	3	**251**
	Micro (0)	0	0	4	0	0	3	12	4	2	6	7	2	16	12	0	0	0	3	**71**
	Micro (1)	0	0	9	0	0	11	31	3	10	13	5	13	35	22	0	2	0	2	**156**
	Small (0)	0	0	10	1	0	6	24	2	2	0	1	3	3	6	0	0	0	1	**59**
	Small (1)	1	0	14	2	1	6	19	2	1	7	6	11	14	8	0	0	2	1	**95**
2006	Non-dist. (0)	0	0	100	1	0	56	210	29	12	38	39	29	110	49	3	12	4	7	**699**
	Distress (1)	3	3	110	10	9	66	269	52	46	61	58	87	163	124	6	12	11	16	**1,106**
	Micro (0)	0	0	19	0	0	10	42	8	5	21	22	11	58	23	1	4	2	3	**229**
	Micro (1)	1	1	22	3	1	29	93	15	24	33	34	39	110	81	4	2	5	8	**505**
	Small (0)	0	0	81	1	0	46	168	21	7	17	17	18	52	26	2	8	2	4	**470**
	Small (1)	2	2	88	7	8	37	176	37	22	28	24	48	53	43	2	10	6	8	**601**

Table A1 Sample description (continued)

Year	*Parameter*	*Industry*																		*Total*
		A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*	*M*	*N*	*P*	*Q*	*R*	*S*	
2007	Non-dist. (0)	2	1	102	5	5	77	245	31	11	47	48	27	102	61	3	11	6	6	**790**
	Distress (1)	1	1	97	5	5	50	226	40	44	46	47	71	118	74	4	10	9	11	**859**
	Micro (0)	1	0	16	1	1	19	51	3	2	14	24	9	59	31	1	3	1	2	**238**
	Micro (1)	1	0	18	1	2	16	68	7	23	29	24	25	72	44	3	1	7	6	**347**
	Small (0)	1	1	86	4	4	58	194	28	9	33	24	18	43	30	2	8	5	4	**552**
	Small (1)	0	1	79	4	3	34	158	33	21	17	23	46	46	30	1	9	2	5	**512**
2008	Non-dist. (0)	2	0	115	8	6	71	287	34	20	60	55	25	134	71	3	14	8	5	**918**
	Distress (1)	1	1	89	7	8	49	190	46	34	45	53	53	97	62	4	6	8	6	**759**
	Micro (0)	1	0	18	4	1	16	58	3	6	23	27	8	74	33	1	3	2	2	**280**
	Micro (1)	0	1	16	2	2	16	62	8	16	29	34	27	58	39	3	3	4	2	**322**
	Small (0)	1	0	97	4	5	55	229	31	14	37	28	17	60	38	2	11	6	3	**638**
	Small (1)	1	0	73	5	6	33	128	38	18	16	19	26	39	23	1	3	4	4	**437**
2009	Non-dist. (0)	1	0	110	10	6	72	258	34	13	59	44	27	110	84	2	16	7	9	**862**
	Distress (1)	1	3	77	4	7	41	157	39	30	33	46	46	91	56	4	8	4	6	**653**
	Micro (0)	0	0	16	4	1	18	49	6	3	23	26	12	57	43	0	3	2	4	**267**
	Micro (1)	0	1	14	0	3	21	38	6	13	19	22	22	57	40	3	4	2	3	**268**
	Small (0)	1	0	94	6	5	54	209	28	10	36	18	15	53	41	2	13	5	5	**595**
	Small (1)	1	2	63	4	4	20	119	33	17	14	24	24	34	16	1	4	2	3	**385**

Table A1 Sample description (continued)

		Industry																		
Year	*Parameter*	*A*	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*	*M*	*N*	*P*	*Q*	*R*	*S*	*Total*
2010	Non-dist. (0)	0	1	127	10	10	70	250	47	27	72	67	38	112	94	5	10	7	6	**953**
	Distress (1)	0	2	101	4	6	48	185	38	20	31	31	27	74	62	1	12	1	10	**653**
	Micro (0)	0	0	35	0	3	16	79	15	3	14	13	5	29	28	0	0	1	4	**245**
	Micro (1)	0	1	42	0	4	25	73	13	8	9	8	9	24	28	1	0	0	6	**251**
	Small (0)	0	1	92	10	7	54	171	32	24	58	54	33	83	66	5	10	6	2	**708**
	Small (1)	0	1	59	4	2	23	112	25	12	22	23	18	50	34	0	12	1	4	**402**
2011	Non-dist. (0)	0	0	39	4	2	26	104	19	10	29	17	3	33	39	4	10	2	1	**342**
	Distress (1)	0	0	24	1	2	6	49	18	10	18	5	4	5	11	0	3	2	2	**160**
	Micro (0)	0	0	5	0	0	1	12	2	0	4	8	1	7	8	1	2	0	0	**51**
	Micro (1)	0	0	4	0	0	2	5	1	2	8	0	1	1	4	0	1	0	0	**29**
	Small (0)	0	0	34	4	2	25	92	17	10	35	9	2	26	31	3	8	2	1	**301**
	Small (1)	0	0	20	1	2	4	44	17	8	10	5	3	4	7	0	2	2	2	**131**
2012	Non-dist. (0)	1	3	130	5	6	75	311	55	21	77	63	29	123	96	5	20	10	8	**1,038**
	Distress (1)	1	2	98	3	6	39	167	35	36	46	53	70	81	79	2	8	5	7	**738**
	Micro (0)	0	1	7	0	1	13	50	10	7	31	42	14	59	43	3	3	2	1	**287**
	Micro (1)	0	0	23	1	0	12	49	6	16	27	27	31	59	52	0	2	3	3	**311**
	Small (0)	1	2	123	5	5	62	261	45	14	46	21	15	64	53	2	17	8	7	**751**
	Small (1)	1	2	75	2	6	27	118	29	20	19	26	39	22	27	2	6	2	4	**427**

Table A1 Sample description (continued)

Year	Parameter	Industry																		
		A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*	*M*	*N*	*P*	*Q*	*R*	*S*	*Total*
2013	Non-dist. (0)	0	1	133	6	7	70	288	53	20	72	58	19	103	70	8	19	9	6	**942**
	Distress (1)	1	5	124	6	7	57	218	46	34	51	83	86	113	119	5	13	9	11	**988**
	Micro (0)	0	0	8	1	1	15	46	6	4	25	39	12	49	28	2	2	3	1	**242**
	Micro (1)	0	1	27	2	2	20	63	13	10	30	51	34	69	71	4	5	4	6	**412**
	Small (0)	0	1	125	5	6	55	242	47	16	47	19	7	54	42	6	17	6	5	**700**
	Small (1)	1	4	97	4	5	37	155	33	24	21	32	52	44	48	1	8	5	5	**576**
2014	Non-dist. (0)	2	1	119	7	4	62	233	50	14	46	42	19	79	80	4	16	9	5	**792**
	Distress (1)	1	7	83	8	3	47	134	34	24	37	77	82	105	107	5	8	8	6	**776**
	Micro (0)	0	0	8	1	0	13	40	11	2	20	29	7	40	32	0	3	1	2	**209**
	Micro (1)	0	1	22	4	1	16	40	11	11	25	49	36	65	68	3	3	4	2	**361**
	Small (0)	2	1	111	6	4	49	193	39	12	26	13	12	39	48	4	13	8	3	**583**
	Small (1)	1	6	61	4	2	31	94	23	13	12	28	46	40	39	2	5	4	4	**415**
2015	Non-dist. (0)	1	1	69	6	2	36	163	32	16	56	40	44	49	77	4	15	5	3	**619**
	Distress (1)	0	0	68	4	4	31	150	32	13	35	27	42	62	59	8	7	7	7	**556**
	Micro (0)	1	0	19	0	2	9	49	8	4	8	9	17	6	19	0	2	1	2	**156**
	Micro (1)	0	0	32	0	1	13	71	15	5	11	7	19	17	18	1	0	3	4	**217**
	Small (0)	0	1	50	6	0	27	114	24	12	48	31	27	43	58	4	13	4	1	**463**
	Small (1)	0	0	36	4	3	18	79	17	8	24	20	23	45	41	7	7	4	3	**339**

Table A1 Sample description (continued)

Year	*Parameter*	*Industry*																		
		A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*	*M*	*N*	*P*	*Q*	*R*	*S*	*Total*
Total	Non-dist. (0)	**9**	**8**	**1,064**	**63**	**48**	**628**	**2,401**	**390**	**169**	**563**	**485**	**267**	**980**	**739**	**41**	**143**	**67**	**60**	**8,125**
	Distress (1)	**10**	**25**	**906**	**55**	**58**	**461**	**1,812**	**389**	**303**	**423**	**494**	**595**	**968**	**790**	**39**	**90**	**66**	**87**	**7,571**
	Micro (0)	**3**	**1**	**158**	**11**	**10**	**133**	**490**	**76**	**39**	**190**	**248**	**99**	**458**	**300**	**9**	**25**	**15**	**24**	**2,289**
	Micro (1)	**2**	**6**	**231**	**13**	**16**	**185**	**603**	**100**	**138**	**233**	**262**	**257**	**573**	**472**	**22**	**23**	**32**	**43**	**3,211**
	Small (0)	**6**	**7**	**906**	**52**	**38**	**495**	**1911**	**314**	**130**	**373**	**237**	**168**	**522**	**439**	**32**	**118**	**52**	**36**	**5,836**
	Small (1)	**8**	**19**	**675**	**42**	**42**	**276**	**1209**	**289**	**165**	**190**	**232**	**338**	**395**	**318**	**17**	**67**	**34**	**44**	**4,360**

The industry classes were based on the Austrian NACE 2008 code and contain: A = Agriculture, forestry and fishing; B = Mining and quarrying; C = Manufacturing; D = Electricity, gas, steam, and air condition supply; E = water supply, sewerage, waste management and remediation activities; F = Construction; G = Wholesale and retail trade and repair of motor vehicles and motorcycles, H = Transporting and storage; I = Accommodation and food service activities; J = Information and communication; L = Real estate activities; M = Professional, scientific, and technical activities, N = Administrative and support service activities; P = Education; Q = Human health and social work activities; R = Arts, entertainment, and recreation, and S = Other services activities. The table contains the number of non-distressed (0) and distressed (1) companies per year and industry.

Table A2 Correlation and factor analysis

	Rotated component matrix				*Correlation matrix*										
Variables	*Factor 1*	*Factor 2*	*Factor 3*	*Factor 4*	*AGE*	*SIZE*	*WC_TA*	*CF_TD*	*EBIT_TA*	*EBT_TA*	*NI_TA*	*TE_TA*	*TD_TA*	*RE_TA*	*REG_SIZE*
AGE				0.730	1	0.226**	–0.009	0.010	0.008	0.087**	0.079**	–0.010	0.010	–0.002	0.073**
SIZE		0.334		0.534	0.226**	1	0.297**	–0.030**	0.001	0.309**	0.320**	0.311**	–0.311**	0.362**	0.065**
WC_TA	0.961				–0.009	0.297**	1	0.014	0.058**	0.454**	0.495**	0.981**	–0.981**	0.821**	0.004
CF_TD			0.898		0.010	–0.030**	0.014	1	0.609**	0.041**	0.041**	0.014	–0.014	0.009	0.011
EBIT_TA			0.889		0.008	0.001	0.058**	0.609**	1	0.139**	0.129**	0.061**	–0.061**	0.056**	0.004
EBT_TA		0.909			0.087**	0.309**	0.454**	0.041**	0.139**	1	0.917**	0.467**	–0.467**	0.488**	0.032**
NI_TA	0.350	0.891			0.079**	0.320**	0.495**	0.041**	0.129**	0.917**	1	0.518**	–0.518**	0.547**	0.023**
TE_TA	0.968				–0.010	0.311**	0.981**	0.014	0.061**	0.467**	0.518**	1	–1.000**	0.847**	–0.001
TD_TA	–0.968				0.010	–0.311**	–0.981**	–0.014	–0.061**	–0.467**	–0.518**	–1.000**	1	–0.847**	0.001
RE_TA	0.861				–0.002	0.362**	0.821**	0.009	0.056**	0.488**	0.547**	0.847**	–0.847**	1	0.012
REG_SIZE				0,621	0.073**	0.065**	0.004	0.011	0.004	0.032**	0.023**	–0.001	0.001	0.012	1

The table shows the results of factor analysis and bivariate correlation analysis when combined for all observations together. In the factor analysis, four factors could be extracted using Varimax rotation as this method allows the clearest separation of factors. Absolute values smaller than 0.33 were suppressed following Ho (2014, p.249), so that their values do not appear in the rotated component matrix. The four factors can explain 78.678% of the total variance (Burns and Burns, 2008, pp.449–459; Foster et al., 2006, p.75; Ho, 2014, p.255; Raykov and Marcoulides, 2008, p.226). Significance: *5 percent level; **1 percent level.

Table A3 Results from logistic regression analyses for micro and small firms

	Model I		*Model II*		*Model III*		*Model IV*		*Model V*		*Model VI*		*Model VII*		*Model VIII*	
Variable	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*
AGE	–0.094***	0.016	0.000	0.023	0.006	0.023	–0.004	0.024	–0.436***	0.052	–0.145*	0.076	–0.148*	0.076	–0.159**	0.077
AGE²									0.078***	0.011	0.039**	0.016	0.041**	0.016	0.042**	0.016
SIZE	–0.217***	0.010	–0.644***	0.020	–0.643***	0.020	–0.649***	0.020	–1.535***	0.153	–5.531***	0.293	–5.595***	0.294	–5.706***	0.298
SIZE²									0.050***	0.006	0.180***	0.011	0.182***	0.011	0.186***	0.011
IND_A	–0.116	0.498	–1.018	0.685	–1.001	0.692	–1.093	0.722	–0.037	0.498	–0.834	0.701	–0.844	0.708	–0.946	0.736
IND_B	1.080**	0.444	0.040	0.617	0.108	0.618	0.048	0.612	1.114**	0.445	–0.011	0.608	0.092	0.610	0.010	0.606
IND_C	–0.277	0.180	–0.238	0.253	–0.164	0.255	–0.142	0.258	–0.276	0.181	–0.279	0.260	–0.190	0.262	–0.169	0.266
IND_D	–0.353	0.257	–0.440	0.392	–0.377	0.392	–0.336	0.398	–0.302	0.258	–0.462	0.400	–0.413	0.402	–0.370	0.408
IND_E	0.055	0.265	0.086	0.363	0.149	0.363	0.225	0.367	0.078	0.265	0.012	0.371	0.100	0.372	0.168	0.377
IND_F	–0.537***	0.185	–0.467*	0.260	–0.397	0.261	–0.392	0.265	–0.512***	0.186	–0.446*	0.267	–0.373	0.269	–0.370	0.273
IND_G	–0.463***	0.177	–0.313	0.249	–0.263	0.250	–0.252	0.253	–0.439**	0.178	–0.318	0.255	–0.267	0.257	–0.260	0.261
IND_H	–0.131	0.189	–0.240	0.265	–0.178	0.266	–0.151	0.269	–0.108	0.189	–0.229	0.271	–0.158	0.273	–0.137	0.277
IND_I	0.301	0.200	–0.137	0.289	–0.116	0.289	–0.106	0.293	0.341*	0.201	–0.109	0.297	–0.099	0.299	–0.096	0.303
IND_J	–0.599***	0.186	–0.569**	0.264	–0.538**	0.265	–0.532**	0.268	–0.497***	0.187	–0.390	0.271	–0.356	0.273	–0.348	0.277
IND_K	–0.358*	0.186	0.126	0.263	0.139	0.264	0.144	0.267	–0.272	0.187	0.318	0.270	0.316	0.272	0.330	0.276
IND_L	0.590***	0.189	–0.128	0.271	–0.111	0.272	–0.140	0.276	0.676***	0.190	0.021	0.279	0.032	0.281	0.008	0.285
IND_M	–0.477***	0.180	–0.065	0.254	–0.058	0.255	–0.047	0.259	–0.405**	0.181	0.011	0.261	–0.001	0.263	0.013	0.267
IND_N	–0.437**	0.182	–0.262	0.258	–0.238	0.258	–0.243	0.262	–0.404**	0.183	–0.209	0.265	–0.199	0.266	–0.204	0.270
IND_P	–0.426	0.290	0.028	0.400	0.031	0.399	–0.026	0.406	–0.334	0.291	0.221	0.410	0.190	0.412	0.129	0.419
IND_Q	–0.604***	0.221	–0.741**	0.310	–0.682**	0.312	–0.658**	0.316	–0.523**	0.222	–0.742**	0.318	–0.694**	0.320	–0.659**	0.325
IND_R	–0.300	0.250	–0.285	0.348	–0.270	0.349	–0.310	0.356	–0.273	0.252	–0.291	0.357	–0.302	0.359	–0.344	0.365
LEG_FORM	–0.195***	0.062	0.140	0.088	0.125	0.088	0.133	0.089	–0.139**	0.062	0.237***	0.090	0.218**	0.091	0.228**	0.091
AFFIL	–0.435***	0.037	–0.161***	0.055	–0.154***	0.055	–0.188***	0.056	–0.456***	0.038	–0.229***	0.056	–0.222***	0.056	–0.259***	0.057

Table A3 Results from logistic regression analyses for micro and small firms (continued)

	Model I		*Model II*		*Model III*		*Model IV*		*Model V*		*Model VI*		*Model VII*		*Model VIII*	
Variable	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*
WC_TA			–5.079***	0.098	–5.090***	0.098	–5.142***	0.100			–5.304***	0.105	–5.327***	0.106	–5.387***	0.107
CF_TD			–0.001***	0.000	–0.001***	0.000	–0.001***	0.000			–0.001***	0.000	–0.001***	0.000	–0.001***	0.000
EBT_TA			–4.350***	0.156	–4.354***	0.156	–4.462***	0.159			–4.391***	0.162	–4.395***	0.162	–4.510***	0.165
TD_TA			0.147*	0.078	0.147*	0.078	0.153*	0.080			0.368***	0.100	0.360***	0.101	0.382***	0.102
REG_SIZE					–0.131***	0.036	–0.161***	0.037					–2.607***	0.891	–2.064**	0.912
REG_SIZE²													0.112***	0.040	0.085**	0.041
URB_RUR					0.126**	0.058	0.131**	0.059					0.153**	0.060	0.166***	0.061
INFL_LAG2							34.893***	4.144							35.834***	4.213
UNEMPL_LAG2							67.591***	5.859							69.896***	5.981
CONST.	4.122***	0.234	10.440***	0.386	11.748***	0.551	6.796***	0.682	12.815***	1.030	42.804***	1.985	58.209***	5.312	50.655***	5.451
Chi-Square	53.549		453.069		444.162		365.910		12.047		910.428		854.948		764.831	
Sign. Chi-Square	0.000***		0.000***		0.000***		0.000***		0.149		0.000***		0.000***		0.000***	
R^2 (Nagelkerke)	0.098		0.667		0.668		0.674		0.109		0.681		0.683		0.689	
α-error (in %)	51.30		16.48		16.48		16.29		54.68		14.24		14.40		14.48	
β-error (in %)	28.39		10.57		10.50		10.71		24.55		9.93		9.90		10.03	
Accuracy (in %)	60.56		86.58		86.61		86.60		60.91		87.99		87.93		87.82	
AUC	0.646***	0.004	0.924***	0.002	0.925***	0.002	0.927***	0.002	0.648***	0.004	0.931***	0.002	0.931***	0.002	0.933***	0.002
Gini-coefficient	0.292		0.849		0.849		0.854		0.295		0.861		0.862		0.866	

Significance: *10 percent level; **5 percent level; ***1 percent level.

Table A4 Results from logistic regression analyses for micro firms

	Model I		*Model II*		*Model III*		*Model IV*		*Model V*		*Model VI*		*Model VII*		*Model VIII*	
Variable	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*
AGE	–0.168***	0.026	–0.045	0.035	–0.044	0.035	–0.078**	0.037	–0.279***	0.082	–0.128	0.113	–0.108	0.114	–0.103	0.116
AGE²									0.019	0.020	0.015	0.027	0.011	0.027	–0.001	0.028
SIZE	–0.333***	0.020	–0.727***	0.037	–0.735***	0.037	–0.740***	0.038	–5.067***	0.421	–9.570***	0.685	–9.591***	0.688	–10.030***	0.701
SIZE2									0.194***	0.017	0.357***	0.027	0.358***	0.028	0.375***	0.028
IND_A	–0.820	0.961	–1.029	1.126	–1.095	1.122	–1.439	1.161	–0.685	0.965	–0.743	1.177	–0.830	1.172	–1.204	1.222
IND_B	1.965*	1.125	0.714	1.216	0.815	1.214	0.816	1.203	1.505	1.125	0.255	1.250	0.368	1.250	0.322	1.235
IND_C	0.116	0.286	–0.177	0.383	–0.064	0.384	–0.104	0.391	0.029	0.293	–0.202	0.397	–0.117	0.399	–0.181	0.404
IND_D	–0.401	0.500	–0.836	0.728	–0.745	0.721	–0.711	0.741	–0.440	0.508	–0.904	0.751	–0.785	0.747	–0.765	0.770
IND_E	0.172	0.495	0.053	0.707	0.203	0.708	0.180	0.712	0.110	0.497	0.114	0.716	0.251	0.719	0.183	0.721
IND_F	–0.099	0.290	–0.371	0.389	–0.268	0.390	–0.300	0.397	–0.095	0.297	–0.275	0.402	–0.210	0.404	–0.249	0.409
IND_G	–0.198	0.272	–0.522	0.363	–0.459	0.363	–0.524	0.371	–0.201	0.280	–0.436	0.377	–0.395	0.378	–0.487	0.383
IND_H	0.044	0.309	–0.149	0.415	–0.038	0.416	–0.110	0.424	0.026	0.314	–0.106	0.427	–0.020	0.429	–0.105	0.437
IND_I	0.694**	0.325	0.100	0.438	0.148	0.437	0.092	0.445	0.646*	0.332	0.071	0.453	0.103	0.453	0.021	0.459
IND_J	–0.171	0.284	–0.591	0.381	–0.572	0.381	–0.616	0.388	–0.151	0.291	–0.450	0.394	–0.450	0.395	–0.519	0.401
IND_K	–0.377	0.281	0.125	0.374	0.151	0.374	0.085	0.381	–0.376	0.288	0.325	0.388	0.314	0.390	0.223	0.395
IND_L	0.805***	0.292	0.229	0.391	0.227	0.392	0.121	0.399	0.720**	0.299	0.274	0.408	0.239	0.409	0.103	0.414
IND_M	–0.355	0.273	–0.127	0.362	–0.128	0.362	–0.188	0.370	–0.359	0.281	–0.028	0.377	–0.069	0.378	–0.154	0.383
IND_N	–0.234	0.276	–0.231	0.368	–0.197	0.368	–0.250	0.376	–0.287	0.284	–0.148	0.382	–0.154	0.384	–0.224	0.389
IND_P	0.304	0.488	0.797	0.629	0.775	0.624	0.662	0.634	0.362	0.492	1.110*	0.644	1.063*	0.639	0.943	0.647
IND_Q	–0.406	0.399	–0.740	0.547	–0.692	0.548	–0.742	0.556	–0.494	0.404	–0.888	0.554	–0.949*	0.555	–1.036*	0.557
IND_R	0.324	0.427	0.307	0.606	0.355	0.601	0.134	0.618	0.100	0.434	0.363	0.618	0.334	0.617	0.119	0.637
LEG_FORM	–0.267**	0.130	0.189	0.182	0.161	0.183	0.118	0.186	–0.194	0.131	0.293	0.190	0.251	0.190	0.203	0.193
AFFIL	–0.410***	0.059	–0.097	0.083	–0.094	0.084	–0.145*	0.085	–0.413***	0.060	–0.135	0.086	–0.135	0.086	–0.196**	0.088

Table A4 Results from logistic regression analyses for micro firms (continued)

	Model I		*Model II*		*Model III*		*Model IV*		*Model V*		*Model VI*		*Model VII*		*Model VIII*	
Variable	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*
WC_TA			–3.000***	0.131	–3.039***	0.132	–3.043***	0.134			–3.206***	0.137	–3.257***	0.138	–3.277***	0.140
CF_TD			–0.001***	0.000	–0.001***	0.000	–0.001***	0.000			–0.001***	0.000	–0.001***	0.000	–0.001***	0.000
EBT_TA			–3.420***	0.193	–3.408***	0.193	–3.506***	0.197			–3.497***	0.201	–3.484***	0.201	–3.611***	0.206
TD_TA			0.775***	0.152	0.750***	0.153	0.778***	0.154			0.862***	0.157	0.824***	0.158	0.853***	0.159
REG_SIZE					–0.189***	0.056	–0.217***	0.057					–3.074**	1.309	–2.856**	1.329
REG_SIZE²													0.131**	0.060	0.120**	0.061
URB_RUR					0.250**	0.108	0.263**	0.109					0.224**	0.113	0.244**	0.115
INFL_LAG2							43.638***	7.538							48.827***	7.774
UNEMPL_LAG2							78.510***	10.091							85.742***	10.470
CONST.	5.450***	0.386	10.093***	0.599	12.081***	0.882	6.296***	1.118	33.937***	2.596	64.079***	4.259	81.994***	8.388	76.968***	8.542
Chi-Square	50.275		68.119		47.902		37.811		37.780		117.202		91.908		73.451	
Sign. Chi-Square	0.000***		0.000***		0.000***		0.000***		0.000***		0.000***		0.000***		0.000***	
*R*2 (Nagelkerke)	0.131		0.647		0.649		0.658		0.169		0.673		0.675		0.685	
α-error (in %)	24.79		15.10		14.98		14.64		29.27		12.96		13.17		12.77	
β-error (in %)	56.31		16.47		16.60		16.82		49.76		15.42		15.20		15.12	
Accuracy (in %)	62.09		84.33		84.35		84.45		62.20		86.02		85.98		86.25	
AUC	0.675***	0.007	0.918***	0.004	0.919***	0.004	0.922***	0.003	0.681***	0,007	0.928***	0,003	0.928***	0,003	0.932***	0,003
Gini-coefficient	0.349		0.837		0.838		0.845		0.361		0.855		0.857		0.864	

Significance: *10 percent level; **5 percent level; ***1 percent level.

Table A5 Results from logistic regression analyses for small firms

	Model I		*Model II*		*Model III*		*Model IV*		*Model V*		*Model VI*		*Model VII*		*Model VIII*	
Variable	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*
AGE	–0.054**	0.021	0.024	0.033	0.034	0.033	0.032	0.033	–0.562***	0.072	–0.176	0.110	–0.189*	0.110	–0.200*	0.111
AGE^2									0.108***	0.015	0.042***	0.022	0.047**	0.022	0.049**	0.023
SIZE	–0.375***	0.051	–0.440***	0.083	–0.430***	0.083	–0.453***	0.083	8.802*	3.646	4.084	5.779	4.223	5.785	3.845	5.848
$SIZE^2$									–0.299*	0.118	–0.147	0.187	–0.151	0.188	–0.140	0.190
IND_A	0.060	0.590	–0.740	0.960	–0.668	0.977	–0.640	1.003	0.121	0.591	–0.730	0.961	–0.686	0.977	–0.636	1.005
IND_B	0.824*	0.499	–0.305	0.769	–0.227	0.772	–0.271	0.771	0.875*	0.500	–0.298	0.767	–0.208	0.770	–0.257	0.769
IND_C	–0.447*	0.233	–0.123	0.353	–0.032	0.356	0.033	0.360	–0.400*	0.233	–0.122	0.354	–0.031	0.358	0.037	0.362
IND_D	–0.417	0.310	–0.170	0.506	–0.099	0.508	–0.014	0.513	–0.321	0.310	–0.161	0.507	–0.107	0.510	–0.005	0.515
IND_E	–0.015	0.320	0.154	0.472	0.236	0.474	0.360	0.479	0.073	0.321	0.164	0.473	0.256	0.475	0.379	0.481
IND_F	–0.757***	0.240	–0.277	0.362	–0.199	0.364	–0.159	0.369	–0.718***	0.240	–0.281	0.363	–0.208	0.366	–0.163	0.371
IND_G	–0.612***	0.230	–0.079	0.349	–0.022	0.351	0.027	0.355	–0.555**	0.230	–0.075	0.350	–0.023	0.353	0.032	0.357
IND_H	–0.256	0.242	–0.134	0.365	–0.067	0.367	0.004	0.371	–0.204	0.242	–0.136	0.366	–0.071	0.369	0.002	0.373
IND_I	0.085	0.256	–0.127	0.402	–0.109	0.404	–0.067	0.409	0.170	0.257	–0.114	0.403	–0.105	0.406	–0.055	0.411
IND_J	–0.839***	0.244	–0.096	0.372	–0.063	0.374	–0.022	0.378	–0.750***	0.245	–0.083	0.373	–0.052	0.375	–0.008	0.380
IND_K	–0.175	0.246	0.391	0.376	0.402	0.378	0.468	0.383	–0.105	0.246	0.403	0.377	0.401	0.380	0.477	0.385
IND_L	0.530**	0.246	0.005	0.384	0.049	0.386	0.076	0.391	0.616**	0.247	0.019	0.385	0.055	0.388	0.089	0.393
IND_M	–0.475**	0.237	0.210	0.361	0.222	0.363	0.292	0.367	–0.393*	0.238	0.223	0.362	0.223	0.365	0.303	0.369
IND_N	–0.559**	0.239	–0.096	0.365	–0.078	0.366	–0.065	0.370	–0.500**	0.239	–0.090	0.366	–0.079	0.368	–0.061	0.372
IND_P	–0.849**	0.380	–0.061	0.562	–0.079	0.563	–0.121	0.571	–0.719*	0.379	–0.021	0.562	–0.057	0.566	–0.083	0.572
IND_Q	–0.731***	0.275	–0.606	0.417	–0.545	0.420	–0.452	0.424	–0.618**	0.275	–0.577	0.418	–0.520	0.421	–0.419	0.426
IND_R	–0.590*	0.318	–0.380	0.459	–0.376	0.461	–0.358	0.468	–0.547*	0.320	–0.373	0.460	–0.382	0.463	–0.351	0.471
LEG_FORM	–0.180**	0.071	0.217**	0.108	0.205*	0.108	0.230**	0.109	–0.127*	0.072	0.246**	0.110	0.236*	0.110	0.264**	0.111
AFFIL	–0.451***	0.048	–0.276***	0.076	–0.265***	0.076	–0.302***	0.077	–0.451***	0.049	–0.279***	0.076	–0.268***	0.076	–0.305***	0.077

Table A5 Results from logistic regression analyses for small firms (continued)

	Model I		Model II		Model III		Model IV		Model V		Model VI		Model VII		Model VIII	
Variable	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*	*Coefficient*	*Std.-error*
WC_TA			–7.287***	0.168	–7.309***	0.169	–7.419***	0.172			–7.272***	0.168	–7.294***	0.169	–7.404***	0.172
CF_TD			–0.001***	0.000	–0.001***	0.000	–0.001***	0.000			–0.001***	0.000	–0.001***	0.000	–0.001***	0.000
EBT_TA			–5.079***	0.258	–5.103***	0.258	–5.206***	0.262			–5.046***	0.258	–5.066***	0.259	–5.167***	0.262
TD_TA			0.273**	0.133	0.280**	0.133	0.307**	0.134			0.284**	0.133	0.289**	0.133	0.318**	0.135
REG_SIZE					–0.108**	0.050	–0.143***	0.050					–1.321	1.274	–0.552	1.296
REG_SIZE²													0.055	0.058	0.019	0.059
URB_RUR					0.181**	0.074	0.185**	0.075					0.179**	0.076	0.194**	0.077
INFL_LAG2							37.725***	5.362							38.024***	5.369
UNEMPL_LAG2							72.258***	7.685							72.024***	7.711
CONST.	6.643***	0.823	7.234***	1.343	8.075***	1.435	2.993*	1.534	–63.412**	28.046	–27.393	44.523	–20.863	45.006	–27.601	45.514
Chi-Square	8.587		1.613.416		1.632.934		1.398.574		9.110		1.563.013		1.580.228		1.397.212	
Sign. Chi-Square	0.378		0.000***		0.000***		0.000***		0.333		0.000***		0.000***		0.000***	
R^2 (Nagelkerke)	0.052		0.705		0.706		0.712		0.059		0.706		0.706		0.713	
α-error (in %)	71.61		13.58		13.44		13.53		69.45		13.62		13.56		13.46	
β-error (in %)	15.42		7.97		7.83		7.52		15.87		7.98		7.98		7.69	
Accuracy (in %)	60.55		89.63		89.77		89.91		61.22		89.60		89.63		89.84	
AUC	0.612***	0.006	0.940***	0.003	0.941***	0.003	0.942***	0.003	0.619***	0.006	0.940***	0.003	0.941***	0.003	0.942***	0.003
Gini-coefficient	0.225		0.881		0.881		0.885		0.239		0.881		0.881		0.885	

Significance: *10 percent level; **5 percent level; ***1 percent level.