The Potential of Corporate Governance Variables for Small Enterprise Default Prediction Modeling. Statistical Evidence from Italian Manufacturing Firms. Preliminary Findings

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ABSTRACT

Most studies of enterprise default prediction modeling use financial ratios as independent variables, and focus on large and medium sized enterprises.

In this study, we applied logistic regression to a sample of 860 Italian small manufacturing firms, and built a business prediction model based on both financial ratios and corporate governance characteristics as independent variables. We then compared the accuracy rates obtained by this model to those from a second model, based on the same sample of firms, which used only financial ratios as predictive variables. Our findings suggest that including corporate governance variables: i) gives a significant improvement to the small enterprise default prediction accuracy rates; ii) could help banks to reduce their tendency to place unnecessary restrictions on credit.

The main limitations of our research were that no other qualitative variables (such as variables regarding organizational characteristics, or competitive strategies, or managerial characteristics) were included, nor were quantitative variables regarding the relationships between firms and financial institutions.

Key words: *default prediction modeling; rating; corporate governance; small enterprises; logistic regression; financial ratios.*

INTRODUCTION

Much has been written in the literature about corporate default prediction modeling; but, to date, the studies carried out look at medium-sized and large firms, and have been based on economic-financial ratios (Altman 1968; Altman 1993; Altman 2004; Altman, et al., 2005; Berger 2006; Berger, and Frame, 2007; Blum, 1974). Only rarely (Altman, and Sabato 2005; Behr and Güttler, 2007; Ciampi, and Gordini 2009, 2012, 2013a, 2013b; Edminister, 1972; Pompe and Bilderbeek, 2005; Vallini et al. 2009a, 2009b) have small enterprises (SEs) been studied or different prediction variables been adopted.

However, SEs are vitally important in all industrialised countries. They have their own specific characteristics, which are unlike those of large firms; and they thus require specifically developed prediction models (Altman, and Sabato 2005; Behr and Güttler, 2007; Ciampi, and Gordini 2009, 2012, 2013a, 2013b; Edminister, 1972; Pompe and Bilderbeek, 2005; Vallini et al. 2009a, 2009b).

The very marked characteristics of SEs, the lower prediction accuracy rates obtainable from SE account data (since these firms have fewer legal obligations regarding data disclosure, for example) and the fact that they play an important role in the world's economy (Berger, and Frame, 2007; Morrison et al., 2003, Ciampi, and Gordini, 2009, 2013a, 2013b) and especially in the Italian economy (over 80% of all firms are SEs in Italy and employ approx. 70% of the total work force), all these many factors make it essential to construct and test default prediction models that are (1) specific for SEs and (2) include other variables, in addition to economic-financial ones, related to other company traits such as corporate governance.

Effective corporate governance models are vital for both academics and practitioners (i.e. firms, banks, investors). Over the years, many studies have analysed the relationship between corporate governance and company performance (Anderson and Reeb, 2003; Baysinger and Butler, 1985; Baysinger and Hoskisson, 1990; Hillman and Dalziel, 2003; Huse, 2000; Gabrielsson and Huse, 2005). Few studies have concentrated on the relationship between corporate governance characteristics and company default (Abatecola et al., 2012; Abatecola et al., 2013; Chaganti et al., 1985; Daily and Dalton, 1994a, 1994b; Elloumi and Gueyié, 2001; Parker et al., 2002; Wang & Deng, 2006).

In our study, we applied logistic regression to a sample of 860 small Italian firms, and tested the accuracy of a default prediction model based on a combination of economic-financial variables and corporate governance variables (Model 2). We then compared the results with those obtained by a company default prediction model based purely on economic-financial ratios (Model 1).

Our theoretical reference points were 1) studies by D'Aveni and colleagues (D'Aveni, 1989a, 1989b; 1990; D'Aveni and MacMillan, 1990; Daily and Dalton, 1994a, 1994b; Hambrick and D'Aveni, 1988, 1992; Moulton and Thomas, 1993) and 2) the organizational theory literature (McKinley, 1993). We agree with Elloumi and Gueyié (2001), and also with Daily and Dalton (1994a), that "the theoretical linkage between corporate governance and financial distress originates from organizational theory literature".

The next part of the paper reviews the literature on the relationship between corporate governance and company default. Following this, our research methods are illustrated. Then

we analyse the structure of our sample and describe the selection process for the prediction variables. We then propose our research hypotheses, discuss our research results, and present our conclusions.

REVIEW OF THE LITERATURE

Beginning with Altman's seminal 1968 work, many studies (Altman 1968, 1993; Altman et al., 2005a; Beaver 1967, 1968; Blum 1974; Ohlson, 1980) have shown that account data (financial and economic) is useful for company default prediction models. The most frequently adopted statistical methods are multivariate discriminant analysis (Altman, 1968, Beaver 1967, 1968; Blum 1974, Deakin 1972) and logistic regression (Ohlson 1980, Altman, and Saunders 1996). Later studies applied more elaborate methods which could go beyond the limitations of earlier modeling and produce more accurate models, such as neural networks (Ciampi, and Gordini 2013; Lacher et al. 1995; Fletcher, and Gross 1993; Sharda, and Wilson 1996; Tam, and Kiang 1992; Wilson, and Sharda 1994; Zhang et al. 1999) and genetic algorithms (Back et al. 1996, Etemadi et al. 2009).

However, it is true to say that few studies have included variables which are not based on account data, such as corporate governance characteristics, for example.

The first study of the effect of corporate governance variables on company default was carried out in 1985 by Chaganti, Mahajan, and Sharma, who had a sample of 42 firms in the retail sector (21 failed and 21 non-failed). As independent variables regarding corporate governance, they used: board size, proportion of outside directors on board and CEO-duality. Their results find that firms with larger boards were less likely to fail, while CEO-duality and the number of the outside directors were not significant for prediction purposes.

Gilson (1990), with a sample of 111 publicly traded companies showed that company default is significantly related to changes taking place in company boards. Hambrick and D'Aveni (1992), with a sample of 114 firms (57 in default and 57 not) find that a CEO with a "dominant" leadership style goes hand in hand with a greater likelihood of default. Daily and Dalton (1994a) apply logistic regression to a sample of 114 large industrial firms (57 failed and 57 non-failed) from 1972 to 1982. Their results give CEO-duality and proportion of outside directors on board as being significant for company default prediction. Again, Daily and Dalton (1994b) apply logistic regression to a sample of 100 firms (50 failed and 50 not), and find that combining corporate governance variables and financial ratios increases default prediction model accuracy rates (as compared to models with solely financial variables) both 5 years before default (from 61.04% to 70.13%) and 3 years before failure (from 61.90% to 73.81%). The combined variables did not give significant improvements one year before failure.

Gales and Kesner (1994), with a sample of 254 firms (127 in default and 127 not), show that firms with smaller board sizes are more likely to survive. Mueller and Barker (1997) apply logistic regression on a sample of 66 firms and combine corporate governance variables (top management team size, board size, proportion of outsiders on board, proportion of pre-decline top management team still at firm) with economic and financial variables. They find that CEO-duality and the proportion of outside directors have a positive correlation

to the likelihood that turnaround strategies will succeed. Elloumi and Gueyié (2001) with a sample of 92 Canadian firms (46 failed and 46 not) find that: a) adopting a combination of corporate governance variables and economic-financial ratios increases default prediction model accuracy rates (the percentage of correctly classified firms increases from 70.65% to 72.10%); and that b) the following corporate governance factors are especially significant for the likelihood of failure: the composition of the board of directors, if outside directors are owners, and the average number of directorships in other firms held by the outside directors. Parker et al. (2002) apply survival technique analysis to a sample of 176 firms in a state of crisis, and show that firms with a higher percentage of shares held by managers and directors are more likely to survive, while firms that change their CEO are twice as likely to fail. Lee and Yeh (2004) use binary logistic regression on a sample of 133 Taiwanese listed firms (45 failed and 88 not), and find a positive and significant relation between default likelihood and the following two corporate governance variables: the proportion of directors appointed by the controlling shareholder and the percentage of the shares held by the controlling shareholder that is pledged for bank loans (pledge ratio). Wang and Deng (2006) analyse data relating to a sample of 194 Chinese firms (97 in default and 97 not). They apply logistic regression and show that the following corporate governance variables have a negative correlation with default likelihood: ownership concentration, state ownership, and the proportion of independent directors. Zeitun and Tian (2007) study the impact of ownership structure on performance and default likelihood, with a sample of 59 Jordanian listed companies, and find that state ownership reduces the likelihood of failure.

METHODOLOGY

Multivariate Discriminant Analysis (MDA) was the most frequently adopted statistical method for default prediction modeling based on economic-financials ratios (Altman, 1968; Beaver, 1968; Blum, 1974; Deakin, 1972; Edmister, 1972). To function efficiently, MDA needs two conditions to be respected: 1) the independent variables in the model must be normally distributed; and 2) group dispersion matrixes (variance and covariance matrixes) must be identical in the two groups, that is, in the defaulting and in the non-defaulting firms (Barnes, 1982; Karels, and Prakash, 1987). In consequence of this, doubts were raised regarding the method when the variables adopted relate to economic-financial ratios that are not linear, and normal, and (most importantly) are not completely independent of one another (Karels, and Prakash, 1987; Martin, 1977; Ohlson, 1980). Logistic regression is able to go beyond the limitations of MDA, and seems more suitable for company default prediction modeling where the dependent variable is binary: defaulting/non-defaulting (Altman, and Saunders, 1996; Ohlson, 1980).

In our study, we used logistic regression to construct two default prediction models. The prediction function assumes the following form:

$$Ln [PD (1 - PD)] = a + BX + E$$

where PD is the probability of default; (1-PD) is the probability of non-default; a is the constant; B is the vector of the independent variable coefficients; X is the vector of the

independent variables (in our study the independent variables are a set of economic-financial variables and a set of variables relating to corporate governance characteristics); and E is the error.

DATA SET

Our initial sample was made up of 3,210 small manufacturing firms, from CERVED databases. These databases hold copies of the balance sheets of all Italian companies. We chose to define the default event as the beginning of formal legal proceedings for debt recovery (bankruptcy, forced liquidation etc). This definition is narrower than that generally applied in bank rating models, as these judge default to be the onset of serious financial distress that borrowers cannot solve unaided and through which the loans granted may be lost.

The sample was selected by way of a two-step selection process.

To start with, we took the entire population of Italian firms registered in the CERVED databases which operated in the manufacturing sector, which had become insolvent in 2011, which had filed a regular balance sheet in 2009, and which had a turnover of below 5 million Euro in 2009. There were 1,605 firms in this position. We then selected a sample of manufacturing firms which were non-defaulting at the end of 2011. This sample was selected by stratified random sampling, with the aim to obtain a sample as similar as possible in composition to the failed firms, in regard to two classification criteria: 1) size (divided into 4 size groups[1] shown in Table 1), and geographical location (North, Centre, South). 1,605 firms were thus selected which were solvent at the end of 2011, which had filed a regular balance sheet in 2009, and which had a turnover of below 5 million Euro in the same year[2].

In order to obtain variables relating to corporate governance characteristics, we drew up a first questionnaire, which was given 2 pre-tests with a limited number of firms (30). The pre-test results led us to shorten most of the questions and to change their form. This improved the questionnaire (Gaskill et al., 1993; Lussier 1995). The final questionnaire had 16 questions and was sent, by email or through the post, to the Chairperson of the Board, to the CEO and/or to a board member (reference was 2009), in each of the 3,210 small firms in the sample. Two students from Florence University Faculty of Economics helped us to send the questionnaires, collect the replies, and catalogue the results. Initially, 18.2% (584 firms) answered. To encourage those who did not answer within the specified deadline, a follow-up was sent out. The end-result was that 26.8% of firms replied (860 firms, 375 in default and 485 solvent).

By way of stratified random sampling, the sample of 860 firms was then divided into 2 subsamples: a training sample and a holdout sample. The training sample, made up of 550 firms (230 in default and 320 not), was used for the construction of the prediction models. The holdout sample, made up of 310 firms (145 in default and 165 not), was used to test the

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[1] A firm's size was determined by its 2009 turnover. Size groups were calculated on the distribution quartiles of the defaulting firms.

[2] Studying one entire population (all failed firms) against a sample (solvent firms) has few computational contraindications, except that the logistic evaluation intercept loses its meaning.

prediction accuracy of the models. Table 1 shows the structure of the whole sample (860 firms), together with the gender and average age of the respondents to the questionnaire. There were some differences between the defaulting and the non-defaulting firms: there were relatively more failures in firms of Size Group 4 and in firms operating in the South of Italy.

TABLE 1. THE DATA SET (PERCENTAGES)

	DEFAULTING FIRMS	NON-DEFAULTING FIRMS
Geographical Area		
North	24.2	38.8
Centre	36.4	34.7
South	39.4	26.5
Size (Turnover in Euro)		
Size 1 (below 0.2 million)	31.2	32.9
Size 2 (0.2-0.7 million)	25.4	26.8
Size 3 (0.7-1.8 million)	20.8	20.9
Size 4 (1.8 million-5 million)	22.6	19.4
Gender of Respondents		
Male	86,9	91,3
Female	13,1	8,7
Mean Age of Respondents	56	53
Total	375	485

VARIABLES

In our study, we used one dependent variable (the likelihood of company failure) and two groups of independent variables (economic-financial variables and corporate governance characteristics).

TABLE 2. ECONOMIC-FINANCIAL RATIOS
SELECTED BY MULTICOLLINEARITY AND STEPWISE METHOD

Net Income/Total Assets
Current assets/Current liabilities
Short Term Debts/Total Assets
Working Capital/Total Sales

The dependent variable is a dummy variable, with a value of 1 for defaulting firms and a value of 0 for non-defaulting firms.

TABLE 3. CORPORATE GOVERNANCE VARIABLES USED IN THE LITERATURE (IN ALPHABETIC ORDER)

VARIABLES	DESCRIPTION	CITED BY
Audit Committee	A dummy variable with a value of 1 if the audit committee is totally composed of outsiders[3], 0 otherwise.	Elloumi & Gueyiè (2001)
Board Size	The number of the members of the board of directors at the beginning of the year.	Chaganti et al. (1985); Gales & Kesner (1994); Goodstein et al. (1994); Muller & Baker (1997); Parker et al. (2002); Wang & Deng (2006).
CEO Turnover	A dummy variable with a value of 1 if there was CEO turnover in the last years, 0 otherwise.	Elloumi & Gueyiè (2001); Parker et al. (2002)
CEO-Duality	A dummy variable with a value of 1 if there is CEO-Duality, 0 otherwise.	Daily & Dalton (1994a, 1994b); Elloumi & Gueyiè (2001); Muller & Barker (1997); Simpson & Gleason (1999); Wang & Deng (2006).
Creditor Ownership	The percentage of shares held by Creditors.	Parker et al. (2002).
Director Turnover	A dummy variable with a value of 1 if there was a director turnover in recent years, 0 otherwise.	Parker et al. (2002).
Board Member Education	Average levels of education of board members. It is measured by Likert Scale (1= primary and middle school; 2=high school; 3= university; 4=postgraduate study).	Daily & Dalton (1994a); Finkelstein (1992).
Number of CEOs and Chairpersons	It is the number of CEOs and Chairpersons.	Daily and Dalton (1994a); D'Aveni (1990); Finkelsterin (1992).
Outside Directors	The percentage of board members who are not and have never been employees of the firm, are not related to any employee of the firm, and do not work for a company with significant business relationships with the firm.	Elloumi & Gueyiè (2001); Hambrick & D'Aveni (1992); Chaganti et al. (1985); Daily & Dalton (1994b); Muller & Baker (1997); Simpson & Gleason (1999); Parker et al. (2002); Wang & Deng (2006).
Ownership Concentration 1	The number of owners who hold at least 5% of the shares.	Baysinger et al. (1990, 1991); Boeker (1992); Daily & Dalton (1994); Wang & Deng (2006).
Ownership Concentration 2	A dummy variable with a value of 1 if one owner holds more than 20% of shares, 0 otherwise.	Baysinger et al. (1990, 1991); Boeker (1992); Daily and Dalton (1994a, 1994b); Elloumi & Gueyiè (2001); Parker et al. (2002); Wang & Deng (2006); Xu & Wang (1997)
Percentage Held by Institutions	The percentage of shares held by Institutions.	Baysinger et al. (1990, 1991); Boeker (1992); Daily and Dalton (1994a); Wang & Den (2005).
Percentage Held by Managers and Directors	The percentage of shares held by Directors and Managers.	Baysinger et al. (1990, 1991); Boeker (1992); Daily and Dalton (1994a).

The economic-financial variables were based on the 2009 balance sheet data in the CERVED databases. Initially, we considered 18 economic-financial variables, 6 regarding profitability, 6 regarding leverage, and 6 regarding liquidity (Elloumi and Gueyié 2001;

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[3] Outsiders are persons who are not and have never been employees of the firm, are not related to any employee of the firm, and do not work for a company with significant business relationships with the firm.

D'Aveni 1990; Flagg et al. 1991; Hambrick and D'Aveni 1988; Daily and Dalton 1994a, 1994b; Mallette and Flower, 1992). In order to select only those variables with the highest prediction potential and lowest rates of correlation, we then applied:

a) variance inflation factor (VIF). VIF values of above 5 (Caramanis and Spathis, 2006; Judge et al., 1987; Studenmund, 2006) imply high correlation between variables, while VIF values which are lower than 2 are an indication of a high level of independence (Fernandez, 2007; Judge et al., 1987; Leow and Mues, 2012). In agreement with Pompe and Bilderbeek (2005), we decided to exclude variables with VIF values above 3. We were consequently able to reduce the variables from 18 to 8; and

b) the stepwise method, a well-known procedure for reducing the dimensions of a problem by selecting the most significant variables from a large set of variables (Efroymsom, 1960; Etemadi et al., 2009, Neter et al., 1996; Pampel, 2000). This allowed us to select the 4 variables listed in Table 2.

The corporate governance variables were selected in two stages. We first found the variables that are most frequently used in the literature regarding corporate governance and company failure. Table 3 lists these variables and the Authors that have used them. The relative data was obtained by way of the questionnaire previously described.

To find which variables had the highest prediction potential and the lowest rates of correlation, we used multicollinearity analysis by way of the VIF method. This allowed us to select the 4 variables listed in Table 4.

TABLE 4. CORPORATE GOVERNANCE VARIABLE SELECTED BY MULTICOLLINEARITY ANALYSIS

CEO-Duality
Board Size
Outside Directors
Ownership Concentration 2

Table 5 shows the descriptive analysis and the results of the test of the means differences. The non-defaulting firms have on average a higher percentage of outside directors on their boards (74% vs. 62%), less CEO-duality (58% vs. 71%), lower ownership concentration, and smaller boards. The values of the economic-financial variables were in line with expectations: defaulting firms had higher levels of short-term debt, higher incidence of working capital on total sales, lower profitability and a weaker current ratio.

TABLE 5. DESCRIPTIVE ANALYSIS

VARIABLES	MEAN	STANDARD DEVIATION	TEST OF DIFFERENCE IN MEANS
CEO-Duality			
Non-Defaulting Firms	0.580	0.480	0.501 (0.046)*
Defaulting Firms	0.710	0.640	
Total	0.647	0.570	
Outside Directors			
Non-Defaulting Firms	0.740	0.134	-4.438 (0.000)**
Defaulting Firms	0.620	0.173	
Total	0.678	0.156	
Board Size			
Non-Defaulting Firms	10.12	11.32	1.897 (0.000)**
Defaulting Firms	15.12	13.21	
Total	12.59	12.39	
Ownership Concentration 2			
Non-Defaulting Firms	0.410	0.461	0.476 (0.000)**
Defaulting Firms	0.650	0.459	
Total	0.534	0.471	
Net Income/Total Assets			
Non-Defaulting Firms	0.781	1.452	-3.104 (0.000)**
Defaulting Firms	-0.831	1.948	
Total	-0.055	1.732	
Current assets/Current liabilities			
Non-Defaulting Firms	3.149	4.531	-3.109 (0.000)**
Defaulting Firms	1.510	2.134	
Total	2.299	3.179	
Short Term Debts/Total Assets			
Non-Defaulting Firms	0.401	0.435	2.109 (0.012)*
Defaulting Firms	0.701	1.973	
Total	0.557	1.302	
Working Capital/Total Sales			
Non-Defaulting Firms	0.621	0.673	1.653 (0.000)**
Defaulting Firms	0.254	0.361	
Total	0.431	0.497	

* Statistically significant at less than 0,05 level based on one-sided tests. ** Statistically significant at less than 0,01 level based on one-sided tests

HYPOTHESES

On the basis of the considerations expressed above, we expect that combining economic-financial variables with corporate governance variables (Model 2) will improve default prediction accuracy rates, compared to prediction based only on economic-financial variables (Model 1). The first hypothesis is that:

H1: Model 2 gives a higher prediction accuracy rate than Model 1.

The next hypotheses include the relationship between company failure and each of the corporate governance variables. Some researchers (Baysinger & Hoskisson, 1990; Baysinger et al. 1991; Davis et al. 1997; Donaldson & Davis, 1991; Williamson, 1985) find that CEO-duality strengthens leadership styles, and reduces internal discord, and hence helps companies to perform better. A number of other studies show no relationship between CEO-duality and the likelihood of company failure (Chaganti et al. 1985; Wang & Deng 2006). The majority of Authors (Argenti, 1986; Daily and Dalton, 1994a, 1994b; Dalton & Kesner, 1987; Hambrick e D'Aveni 1988, 1992; Lorsch, 1989; Mallette & Fowler, 1992; Rechner & Dalton, 1991; Jensen, 1993; Zhara & Pearce, 1989) do however agree that CEO-duality has a positive correlation to company failure, i.e. a company is more likely to fail if the CEO and the Chairman of the Board is one and the same person. These Authors find that CEO-duality leads to more authoritarian and/or opportunistic behaviour by the CEO/Chair, lower levels of control, over-concentration of decision-taking functions, a tendency by CEOs to maintain the status quo, and consequently inadequate ability by the firm to adapt. Lorsch (1989, p. 185) deems it necessary to separate the roles of CEO and chairperson, saying that "providing a leader separate from CEO could significantly help directors prevent crises, as well as to act swiftly and effectively when one occurs". Mallette and Fowler (1992) find that firms that have separate CEO and Chairman are less likely to "adopt poison pills". On the basis of such empirical evidence, we can hypothesise that:

H2: CEO-duality has a positive correlation to company failure.

The resource dependence perspective (Burt, 1983; Pfeffer & Salancik, 1978; Selznick, 1949) states that having outside directors is a crucial factor for a firm's survival, especially in states of crisis, in that it means that there is greater access to resources and specific competences. There are a number of differing opinions (e.g. Chaganti, Mahajan e Sharma, 1985); but most Authors (Bayinger e Butler; 1985; Daily and Dalton, 1994a, 1994b; Dowell et al. 2011; Elloumi and Gueyiè, 2001; Lorsch, 1989; Mizruchi, 1983; Monks & Minow, 1991; Parker et al, 2002; Pfeffer, 1972; Pfeffer e Salancik; 1978; Zahra & Pearce, 1989) support the view that a board's efficiency depends to a significant degree on outsiders being present. Pfeffer and Salancik (1978), for example, underline the need for there to be a good proportion of outsiders on the board in times of company crisis, as these members can facilitate access to useful resources and information and can improve relationships with the external environment.

On the basis of the above literature, the third hypothesis states that:

H3: The percentage of outside directors has a negative correlation to company failure.

Theorists of the resource dependence say that larger boards have a positive impact on firms because such boards bring more varied resources and competences, and help to build relationships with the external environment (Pearce and Zahra, 1992; Pfeffer, 1972; Zahra & Pearce, 1989). Whereas agency theory supporters say that large boards are more difficult to run, to control and to coordinate, with negative effects in terms of difficulties and conflicts between the different members. The literature that has looked at the relationship between board size and the likelihood of failure (Chaganti et al., 1985; Yermack, 1986) has shown that board size has a positive correlation with the probability of default. Goodstein et al. (1994) find that large boards are less effective when trying to implement turnaround strategies. Hence we can hypothesise that:

H4: A larger board size has a positive correlation with company failure.

Elloumi e Gueyié (2001) and Parker et al. (2002) note that firms with high ownership concentration are better able to get through periods of great difficulty. Xu and Wang (1997) and Wang and Deng (2006) have similar findings. Consequently, our fifth hypothesis states that:

H5: Ownership concentration has a negative correlation with company failure.

RESULTS

The aim of our study was to test the accuracy of an SE default prediction model which used both economic-financial ratios and corporate governance variables (Model 2), to compare the results obtained with those supplied when only economic-financial variables are used (Model 1), and to examine the different impact on the likelihood of default of the separate corporate governance variables. The models were built applying logistic regression.

TABLE 6. MODEL 1. STANDARDIZED COEFFICIENTS OF LOGISTIC REGRESSION CALCULATED ON THE TRAINING SAMPLE

Independent Variables	Training Sample
Intercept	-9.467***
Net Income/Total Assets	-7.971*
Current assets/Current liabilities	-5.833***
Short Term Debts/Total Assets	+10.291***
Working Capital/Total Sales	+2.734*

*Significant at 10 percent.. **Significant at 5 percent. ***Significant at 1 percent

Except those relating to board size, for both our models, the coefficients of the variables proved to be significant at 1%, 5% or 10%; and the observed signs were in line with expectations (Tables 6 and 7).

TABLE 7. MODEL 2. STANDARDIZED COEFFICIENTS OF LOGISTIC REGRESSION CALCULATED ON THE TRAINING SAMPLE

Independent Variables	Training Sample
Intercept	-6.561***
Net Income/Total Assets	-3.035*
Current assets/Current liabilities	-6.346***
Short Term Debts/Total Assets	+4.654***
Working Capital/Total Sales	+5.459*
CEO-Duality	+4.520*
Outside Directors	-6.029**
Board Size	+4.510
Ownership Concentration 2	-2.913***

*Significant at 10 percent.. **Significant at 5 percent. ***Significant at 1 percent

Table 8 shows the accuracy rates obtained when testing the two models against the holdout sample.

TABLE 8. TEST ON HOLDOUT SAMPLE OF PREDICTION MODELS (PERCENTAGES)

MODEL	OBSERVED STATE		PREDICTED STATE		CORRECTLY (INCORRECTLY) CLASSIFIED FIRMS
			1	0	
Model 2	Defaulting Firms	1	85.4	14.6	81.2 (18.8)
	Non-Defaulting Firms	0	21.8	78.2	
Model 1	Defaulting Firms	1	81.4	18.6	72.6 (27.4)
	Non-Defaulting Firms	0	33.8	66.2	

The line marked Observed State 1 shows the percentage of correctly classified defaulting firms (85.4% with Model 2, 81.4% with Model 1) and the percentage of incorrectly classified defaulting firms (14.6% vs. 18.6%, Type I errors). The line marked Observed State 0 shows the percentage of correctly classified non-defaulting firms (78.2% with Model 2 and 66.2% with Model 1) and the percentage of wrongly classified non-defaulting firms (21.8% vs. 33.8%, Type II errors). The final column shows the prediction accuracy rates for the two models (81.2% vs. 72.6%).

Model 2 gives an increase of almost 12% when compared to Model 1, with 21% fewer Type I errors and a 35% reduction in Type II errors, thus confirming Hypothesis 1.

The high levels of Type II errors in both models (21.8% and 33.8%) are probably due to the narrow criteria we adopted for the definition of default. Formal insolvency proceedings are usually set into motion when a firm has suffered severe financial distress, and has effectively been in a state of default, for some time.

Regarding the relations found between each of the corporate governance variables and company failure:

a) Hypothesis 2 is confirmed. There is found to be a positive correlation between CEO-duality and company default. This result is especially interesting because CEO-duality is very frequent in SEs;

b) in accordance with Hypothesis 3, the percentage of outside directors is found to have a negative correlation with company default, thus confirming that a board with a sufficient number of outsiders can help to form "a system of checks and balances designed to improve executive monitoring and benefit the firm's owner" (Dalton and D'Aveni, 1989b);

c) board size does not seem to have a significant impact on the likelihood of default, as was also found by Wang and Deng (2006). Hypothesis 4 is therefore not confirmed; and

d) in accordance with Hypothesis 5, ownership concentration is found to be significantly and negatively correlated with company default.

In summary, the sign and the significance of the coefficients regarding the corporate governance variables chosen indicate that (when compared to non-defaulting firms) defaulting firms are more likely to be run by CEOs that are also Chairmen, to have fewer outside directors on their boards, and to have a lower level of ownership concentration.

CONCLUSIONS

We cannot yet determine the full effects of the financial crisis that shook the global economy. One of the causes was the excessive trust placed by rating agencies, and financial intermediaries, in the prediction accuracy of rating models based solely on economic-financial variables. One reaction is the search for more advanced rating methods that can pick up even slight signs of company economic or financial decline and can do so as early as possible. Methods that can predict a firm's vulnerability when faced with potential external events even if these are new and unlike what can be foreseen by simple extrapolation. Methods which will also reduce the typical procyclical effects of traditional credit risk rating models.

Our aim was to see if adopting corporate governance characteristics as predictive variables can increase default prediction modeling accuracy for small firms.

Our results lead us to conclude that:

1. using variables regarding corporate governance characteristics gives higher accuracy rates in default prediction models (like Model 2) than when only economic-financial variables are adopted (Model 1);

2. CEO-duality is significantly and positively correlated with company failure. Therefore the separation of the CEO and the Chairperson (which is rare in SEs) reduces the likelihood of default;

3. ownership concentration and the presence of outsiders on the board are significantly and negatively correlated to company failure in that:

    a) ownership concentration ensures stability and lowers conflict levels between owners; and

    b) increasing the number of outsiders on the board of directors makes a firm healthier, because of the greater availability of resources, competences and ties with the outside world;

4. finally, our results show a significant reduction in incorrect classification errors when corporate governance variables are added. There is a marked reduction in Type II errors (35%), i.e. in the number of firms predicted to fail which do not in actual fact do so.

These results can yield some useful pointers for firms, banks and policy makers.

In order to improve their ability to successfully face the complex challenges of global competition, SE owners should favour:

a) the appointment as CEO or Chairperson of someone other than the owner, preferably from outside the company (whereas both these positions are often held by the majority shareholder); and

b) the appointment to the board of outsiders who can facilitate access to new competences, resources, and relationships with the outside world.

Banks should take into consideration corporate governance variables in the models used to rate client credit worthiness.

Policy makers could regulate corporate governance, for example by stipulating that a number of outsiders must be included in company boards.

The study has two main limitations. Firstly, it looks at firms in only one country. Further studies should aim to include cross-country analysis, in order to see if the corporate governance characteristics which are useful for prediction purposes vary from one country to another, and/or if the social-cultural environment and relationships with the territory and with local institutions change the prediction potential of the variables. Secondly, the continuing significant presence of classification errors (both Type I and Type II) points to the need to increase the categories of the independent variables used so as to include the greatest number of characteristics possible, especially qualitative characteristics relating to company organizational structure and models and competitive strategies.

REFERENCES

Abatecola, G., Farina, V., and Gordini, N. (2013). "Systematizing the Empirical Research on Corporate Distress. What Board Features Affect Survival?," *Proceedings of the 73rd Annual Meeting of the Academy of Management: Capitalism in Question*, 9-13 August, Lake Buena Vista, Orlando, Florida.

Abatecola, G., Farina V., and Gordini, N. (2012). "Boards of Directors in Troubled Waters! Enhancing the Survival Chances of Distressed Firms, in Carretta A., and Mattarocci G. (Eds.), *Financial System in Troubled Waters: Information, Strategies and Governance to Enhance Performances in Risky Times*, Routledge, London, UK, pp. 9-18.

Anderson, C.R., and Reeb, M.D. (2003). "Founding-Family Ownership and Firm Performance: Evidence from the S&P500," *The Journal of Finance*, LVIII(3), pp.1301–1328.

Altman, E. I. (1968). "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy," *The Journal of Finance*, 23(4), 589-609.

Altman, E. I. (1993). *Corporate Financial Distress and Bankruptcy* (2nd ed.). New York, NY: Wiley.

Altman, E. I. (2004). *Corporate Credit Scoring Insolvency Risk Models in a Benign Credit and Basel II Environment*. New York, NY: New York University Working Paper.

Altman, E. I., and Sabato, G. (2005b). "Effects of the New Basel Capital Accord on Bank Capital Requirements for SMEs," *Journal of Financial Services Research*, 28(1-3), 15-42.

Altman, E. I., and Saunders, A. (1996). "Credit Risk Measurement: Development over the Last 20 years," Working Paper Series, New York, NY: New York University Working Paper, 1-38.

Altman, E. I., Brady, B., Resti, A. and Sironi, A. (2005a). "The Link between Default and Recovery Rates: Theory, Empirical Evidence, and Implications," *The Journal of Business*, 78(6), 2203-2227.

Argenti, J. (1986a), "Predicting Corporate Failure," *Accountancy*, pp. 157-8.

Back, B., Laitinen, T. and Sere, K. (1996). "Neural Networks and Genetic Algorithms for Bankruptcy Predictions," *Expert System With Applications*, 11(4), 407–413.

Barnes, P. (1982). "Methodological Implications of Non-Normality Distributed Financial Ratios," *Journal of Business Finance and Accounting*, 9(1), 51-62.

Baysinger, B.D. and Hoskisson, R.E. (1990), "The Composition of Boards of Directors and Strategic Control," *Academy of Management Review*, 15, pp. 72-87.

Baysinger, B.D., and Butler, H.N. (1985), "Corporate Governance and the Board of Directors: Performance Effects of Change in Board Composition," *Journal of Law, Economics and Organization*, 1, pp. 101-24.

Baysinger, B.D., Kosnik, R.D., and Turk, T.A. (1991). "Effects of Board and Ownership Structure on Corporate R&D Strategy," *Academy of Management Journal*, 34, pp. 205-214

Beaver, W. (1967). "Financial Ratios Predictors of Failure," *Journal of Accounting Research*, Supplement to Volume 4, 71-111.

Beaver, W. (1968). "Alternative Accounting Measures as Predictors of Failure," *The Accounting Review*, 43(1), 113-122.

Berger, A. N. (2006). "Potential Competitive Effects of Basel II on Banks in SME Credit Markets in the United States," *Journal of Financial Services Research*, 29(1), pp. 5-36.

Behr, P., and Güttler, A. (2007). "Credit Risk Assessment and Relationship Lending: An Empirical Analysis of German Small and Medium-Sized Enterprises," *Journal of Small Business Management* 45(2), pp. 194–213

Berger, A. N., and Frame W.S. (2007). "Small Business Credit Scoring and Credit Availability," *Journal of Small Business Management,* 45(1), pp. 5-22.

Blum, M. P. (1974). "Failing Company Discriminant Analysis," *Journal of Accounting Research*, 12(1), pp. 1-25.

Boeker, W. (1992). "Power and Managerial Dismissal: Scapegoating at the top," *Administrative Science Quarterly,* 37, pp. 400-421.

Burt, R. S. (1983). *Corporate Profits and Cooptation*, Academic Press, New York.

Caramanis, C. & Spathis, C. (2006). "Auditee and Audit Firm Characteristics as Determinants of Audit Qualifications: Evidence from the Athens Stock Exchange", *Managerial Auditing Journal, 21*(9), 905-920.

Chaganti, R.S., Mahajan, V., and Sharma. S (1985). "Corporate Board Size, Composition, and Corporate Failures in Retailing Industry." Journal of Management Studies, 22(4), 400–17.

Ciampi, F., and Gordini, N. (2009). "Default Prediction Modeling for Small Enterprises: Evidence from Small Manufacturing Firms in Northern and Central Italy," *Oxford Journals*, 8(1), 13-29;

Ciampi, F., and Gordini, N. (2013a), Small Enterprise Default Prediction Modeling through Artificial Neural Networks: An Empirical Analysis of Italian Small Enterprises, *Journal of Small Business Management*, Vol.51, 1, pp.23-45;

Ciampi F., Gordini, N. (2013b). "Relazione Impresa-Territorio e Modelli Predittivi del Default d'impresa. Primi Risultati di Una Analisi Statistica sulle Piccole Imprese Italiane", *Sinergie*, 90, pp. 51-76, DOI 10.7433/s90.2013.05;

Ciampi F., Gordini N. (2012). "Managerial Characteristics and Default Prediction Modeling for Small Firms: Evidence from Small Italian Firms," *Proceedings of XXXV AIDEA Annual Conference - Management Senza Confini. Gli Studi di Management Tradizione e Paradigmi Emergenti*, 4-5 Ottobre, Salerno, Italia;

D'Aveni, R. A. (1990). "Top Managerial Prestige and Organizational Bankruptcy," *Organization Science*, 1, pp. 121-142.

D'Aveni, R. A. (1989). "The Aftermath of Organizational Decline: A Longitudinal Study of the Strategic and Managerial Characteristics of Declining Firms," *Academy of Management Journal*, 32(3), 577-605.

Daily, C. M., and Dalton, D. R. (1994a). "Bankruptcy and Corporate Governance: The Impact of Board Composition and Structure," *Academy of Management Journal*, 37, 1603-1617.

Daily, C. M., and Dalton, D. R. (1994b). "Corporate Governance and the Bankrupt Firm: An empirical Assessment," Strategic Management Journal, vol. 15, pp. 643-654.

Dalton, D. R. and Kesner, I.F. (1987). "Composition and CEO Duality in Boards of Directors: An International Perspective," *Journal of International Business Studies*, 28, pp. 33-42.

Davis, J.H., Schoorman, F.D. and Donaldson, I. (1997). "Toward a Stewardship Theory of Management," *Academy of Management Review,* 22(1), pp. 20–47.

Deakin, E.B. (1972). "A Discriminant Analysis of Predictors of Business Failure," *Journal of Accounting Research*, 10(1), pp. 167-180.

Donaldson, L., and Davis, J. (1991). "Stewardship Theory or Agency Theory: CEO Governance and Shareholder Returns," *Australian Journal of Management* ,16(1), p. 49.

Dowel, Glen W.S., Shackell, M.B., and Stuart, N.V. (2011). "Boards, CEOs, and Surviving a Financial Crisis: Evidence from the Internet Shakeout," *Strategic Management Journal*, 32, pp. 1025-1045.

Edmister, R.O. (1972). "An Empirical Test of Financial Ratio Analysis for Small Business Failure Prediction," *Journal of Financial and Quantitative Analysis*, 7(2), pp. 1477-1493.

Efroymson, M.A. (1960). Multiple Regression Analysis, in Ralston, A., and Wilf, H.S. (eds.), *Mathematical methods for digital computers.* New York, NY: Wiley.

Elloumi, F., and Gueyie, J.P. (2001). "Financial Distress and Corporate Governance: An Empirical Analysis*," Corporate Governance: The International Journal of Business in Society* 1(1), pp. 15–23.

Etemadi, H., Rostamy, A.A.A., and Dehkordi, H.F. (2009). "A Genetic Programming Model for Bankruptcy Prediction: Empirical Evidence from Iran," *Expert System with Applications*, 36, pp. 3199-3207.

Etheridge, H.L., Sriram, R.S., and Hsu, H.Y.K. (2000), "A Comparison of Selected Artificial Neural Networks that Help Auditors Evaluate Client Financial Viability," *Decision Science*, Vol. 31(2), pp. 531-50.

Fernandez, G. C. J. (2007). "Effects of Multicollinearity in all Possible Mixed Model Selection," *Pharamasug Conference, Statistics And Pharmacokinetics*. Colorado: Denver.

Finklestein, S. (1992). "Power in Top Management Teams: Dimensions, Measurement, and Validation," *Academy of Management Journal*, 35, pp. 505-538.

Flagg, J. C , G. A. Giroux and C. E. Wiggins (1991). "Predicting Corporate Bankruptcy Using Failing Firms," *Review of Financial Economics*, 1, pp. 67-7.

Fletcher, D., and Gross, E. (1993). "Forecasting with Neural Networks: An Application Using Bankruptcy Data," *Information and Management*, 24(3), 159-167.

Gabrielsson, J., and Huse, M. (2005), ""Outside'' Directors in SME Boards: A Call for Theoretical Reflections," *Corporate Board: Role, Duties & Composition*, 1(1), pp.28–38.

Gales, L.M., and Kesner, I.F. (1994), "An Analysis of Board of Director Size and Composition in Bankrupt Organizations," Journal of Business Research, Vol. 30(3), pp. 271-92.

Gaskill, L., Howard , A.R., Van Auken, E., and Manning, R.A. (1993). "A Factor Analytic Study of the Perceived Causes of Small Business Failure," *Journal of Small Business Management,* 31(4), pp. 18-31.

Gilson, S.C. (1990), "Bankruptcy, Boards, Banks, and Blockholders," *Journal of Financial Economics*, 27, pp.355-387.

Goodstein, J., Gautam, K., and Boeker, W. (1994). "The Effects of Board Size and Diversity on Strategic Change," *Strategic Management Journal*, 15(3), pp. 241–50.

Hambrick, D. C., and D'Aveni, R.A. (1992). "Top Team Deterioration as Part of the Downward Spiral of Large Corporate Bankruptcies," Management Science, 38, pp. 1445-1466.

Hambrick, D.C. and D'Aveni, R.A. (1988). "Large Corporate Failures as Downward Spirals," Administrative Science Quarterly, 33, pp. 1-23.

Hillman, A.J., and Dalziel, T. (2003). "Boards of Directors and Firm Performance: Integrating Agency and Resource Dependence Perspectives," *Academy of Management Review*, 28(3), pp. 383–396.

Huse, M. (2000). "Boards of Directors in SMEs: A Review and Research Agenda," *Entrepreneurship and Regional Development*, 12(4), pp. 271–290.

Jensen, M.C. (1993), "The Modern Industrial Revolution, Exit, and the Failure of Internal Control Systems," *Journal of Finance,* 48(3), pp. 831–80.

Judge, G.G., Hill, R.C., Griffiths, W.E., Lutkepohl, H., and Lee, T. (1987). *Theory and Practice of Econometrics* (2nd ed.). New York, NY: Wiley.

Karels, G. V., and Prakash, A.J. (1987). "Multivariate Normality and Forecasting of Business Bankruptcy," *Journal of Business finance & Accounting*, 14(4), 573-593.

Lacher, R. C., P.K. Coats, S.C. Sharma, and L.F. Fant (1995). "A Neural Network Tool for Classifying the Financial Health of a Firm," *European Journal of Operation Research*, 85(1), 53-65.

Lee, T.S., and Yeh, Y.H. (2004). "Corporate Governance and Financial Distress: Evidence from Taiwan," *Corporate Governance: An International Review,* 12(3), pp. 378–88.

Leow, M., and Mues, C. (2012). "Predicting Loss Given Default (LGD) for Residential Mortgage Loans: A Two-Stage Model and Empirical Evidence for UK Bank Data," *International Journal of Forecasting, 28*, pp. 183-195.

Lorsch, J. W. (1989). "Pawns or Potentates: The Reality of America's Corporate Boards," *Harvard Business School Press, Boston, MA*.

Lussier, R. N. (1995). "A Non Financial Business Success Versus Failure Prediction Model for Young Firms," *Journal of Small Business Management*, 33(1), pp. 8-20.

Mallette, P., and Fowler, K.L. (1992). "Effects of Board Composition and Stock Ownership on the Adoption of Poison Pills," *Academy of Management Journal*, 35, pp. 1010-1035.

Martin, D. (1977). "Early Warning of Bank Failure: A Logit Regression Approach," *Journal of Banking and Finance,* 1(3), pp. 249-276.

McKinley, W. (1993). "Organizational Decline and Adaptation: Theoretical Controversies," *Organization Science*, 4, pp. 1-9.

Mizruchi, M. S. (1983). "Who Controls Whom? An Examination of the Relation Between Management and Boards of Directors in Large American Corporations," *Academy of Management Review*, 8, pp. 426-435.

Monks, R. A. G. and Minow, N. (1991). "Power and Accountability," *Harper Business,* New York.

Morrison, A., Breen, J. and Ali, S. (2003). "Small Business Growth: Intention, Ability, and Opportunity," *Journal of Small Business Management* 41(4), pp. 417–425.

Moulton, W. N., & Thomas, H. (1993). "Bankruptcy as a Deliberate Strategy: Theoretical Considerations and Empirical Evidence," *Strategic Management Journal*, 14, pp. 125-135.

Mueller, D., and Barker, V. (1997). "Upper Echelons and Board Characteristics of Turnaround and Non-Turnaround Declining Firms," *Journal of Business Research* 39, pp. 119.

Neter, J., Kutner, M. H., Nachtsheim, C. J., and Wasserman, W. (1996). Applied linear statistical models. Chicago, IL: Irwin.

Ohlson, James A. (1980). "Financial Ratios and the Probabilistic Prediction of Bankruptcy," *Journal of Accounting Research*, 18(1), pp. 109-131.

Pampel, F. C. (2000). *Logistic regression—A premier*. Thousand Oaks, CA: Sage.

Parker, S., Gary, F.P. and Turestky, H.F.. (2002). "Corporate Governance and Corporate Failure: A Survival Analysis," *Corporate Governance: The International Journal of Business in Society,* 2(4), pp. 4–12.

Pearce, J. A., and Zahra, S. A. (1991). The Relative Power of CEOs and Boards of Directors: Associations with Corporate Performance," *Strategic Management Journal*, 12, pp. 135-153.

Pfeffer, J. (1972). "Size, Composition, and Function of Hospital Boards of Directors: A Study of Organization-Environment Linkage," *Administrative Science Quarterly,* 17, pp. 218–28.

Pfeffer, J. and Salancik, G.R. (1978). "The External Control of Organizations: A Resource Dependence Perspective," *Harper & Row, New York.*

Pompe, P.M., and Bilderbeek, J. (2005). "The Prediction of Bankruptcy of Small-and Medium-Sized Industrial Firms," *Journal of Business Venturing*, 20, pp. 847-868.

Rechner, P. L. and Dalton, D.R. (1991). "CEO Duality and Organizational Performance: A Longitudinal Analysis," Strategic Management Journal, 12(2), pp. 155-160.

Selznick, P. (1949). "TVA and the Grass Roots: A Study in the Sociology of Formal Organization," *Harper & Row, New York.*

Sharda, Ramesh, and Rick L. Wilson (1996). "Neural Network Experiments in Business-Failure Forecasting: Predictive Performance Measurement Issues," *International Journal of Computational Intelligence and Organizations*, 1(2), pp. 107-117.

Simpson, W.G., and Gleason, A.E. (1999). "Board Structure, Ownership, and Financial Distress in Banking Firms," *International Review of Economics and Finance* 8, pp. 281–92.

Studenmund, A.H. (2006). *Using Econometrics, A Practical Guide* (fifth edition). New York, NY: Addison-Wesley.

Tam, Kar Y., and Melody Y. Kiang (1992). "Predicting Bank Failure: A Neural Network Approach", *Decision Science,* 23, pp. 926-947.

Vallini, C., Ciampi, F., Gordini, N., and Benvenuti, M. (2009a). "Are Credit Scoring Models Able to Predict Small Enterprise Default? Statistical Evidence from Italian Firms," *International Journal of Business & Economics*, 8(1),pp. 3-18.

Vallini C., Ciampi F., Gordini N. (2009b). Using Artificial Neural Networks Analysis for Small Enterprises Default Prediction Modeling: Statistical Evidence from Italian Firms, in *Proceedings of the 2009 Oxford Business & Economics Conference*, Oxford, UK;

Wang, Z.J., and Deng, X.L. (2006), "Corporate Governance and Financial Distress. Evidence from Chinese Listed Companies," *The Chinese Economy*, 39(5), pp. 5-27.

Watts, R.L., and Zimmerman, J.L. (1986), "Positive Accounting Theory," *Prentice-Hall Inc.*

Williamson, O. E. (1985). "The Economic Institutions of Capitalism: Firms, Markets, and Relational Contracting," *Macmillan, New York*

Wilson, Rick L., and Ramesh Sharda (1994). "Bankruptcy Prediction Using Neural Networks," *Decision Support System*, 11(5), pp. 545-557.

Xu, X.N., and Wang, Y. (1997). "Ownership Structure, Corporate Governance, and Firm's Performance," *Working paper, World Bank.*

Yermack, D. (1996). "Higher Market Valuation of Companies with a Small Board of Directors," Journal of Financial Economics 40, pp. 185–211.

Zahra, S. A. and Pearce, J.A. (1989). "Boards of Directors and Corporate Financial Performance: A Review and Integrative Model," *Journal of Management*, 15, pp. 291-334.

Zeitun, R., and Tian, G. (2007), "Does Ownership Affect a Firm's Performance and Default Risk in Jordan?" *Corporate Governance, International Journal of Corporate Finance in Business Society*, 7(1), pp. 66 – 82.

Zhang, G.P., Hu, MY., Patuwo, E.B. and Indro, D.C. (1999). "Artificial Neural Networks in Bankruptcy Prediction: General Framework and Cross-Validation Analysis," *European Journal of Operational Research*, 116(1), pp. 16