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An analysis of non-financial factors associated with financial distress

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This article examines factors associated with financial distress among 1006 Spanish manufacturings (SMEs), distinguishing high and low technology industries. Financial distress is analysed using industrial organizational theory through the Porter's five competitive forces model (external factors) and the resource based view through strategic variables (internal factors), such as training, planning, innovation, technologynology and quality. Two different sources of information were used in the study: Qualitative information related to environmental conditions and strategic variables was gathered through a questionnaire addressed to the firm manager. Quantitative information to identify whether the firm was in financial distress was gathered from the balance sheets and earning statements of the firms. Evidence from this study shows that environmental conditions and some strategic variables are associated with financial distress. The results found that young SMEs with low technologynology and in a highly competitive environment had a higher probability of financial distress. High bargaining power of buyers and high degree of rivalry among existing competitors were positively associated with financial distress. Financial distress in high-technology industries was not affected by external factors. However, firms with a quality certification have better quality control procedures that ultimately improve financial performance of firms in the technologynology industries.

Keywords: financial distress; international; financial management

1. Introduction

Studies indicate that financial distress is common in small firms often leading to bankruptcy, and is costly and disruptive (Carter and Van Auken 2006). Previous studies attributed financial distress to a number of factors that include, for example, economic turbulence, change in demand, high debt, restrictive monetary policy, high interest rates, inadequate capital structure and poor financial management (Pompe and Bilderbeek 2005; Denis and Denis 1995; Sheppard and Chowdhury 2005; Segarra and Callejón 2002). Financial distress and bankruptcy are disruptive and costly, and especially relevant due to the impact on workers, shareholders, customers, suppliers, communities and the financial entities (Carter and Van Auken 2006). The New York Times reported, for example, that declining sales and tight credit markets have led to a record increase in Spanish unemployment and

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business bankruptcy (Burnett 2009). Few studies have focussed on factors leading to bankruptcy. This study provides insight into factors that are associated with financial distress prior to bankruptcy.

This article examines non-financial factors associated with financial distress from the perspectives of industrial organization theory and resource based view theory. Industrial organization theory contends that a firm's environment has a greater impact on business distress than firm specific factors (Bowman and Helfat 2001). Resource-based theory emphasizes that internal characteristics affect the firm's ability to develop distinct resources and capabilities that are needed to successfully compete (Collis and Montgomery 1995). Non-financial characteristics used in this study include the competitive environment using Porter's (1979, 1980) five competitive forces model (buyer and supplier powers, threat of substitutes, threat of new firm entry, and high intensity of rivalry) and the company's strategic position using factors such as human capital, innovation, technology, planning and quality.

The research questions in this article are: Do factors associate with the company's competitive environment and related to company's strategy explain organizational distress? Do the variables related to financial distress vary by high technologynology versus low technologynology industry? Therefore, this article is consistent with Loong and Hughes (2007), who stated that studies examining firm distress would be incomplete without considering both industry and firm characteristics.

This study examines these questions through an empirical study of 1006 Spanish manufacturing small and medium sized enterprises (SMEs) with more than 10 employees. Qualitative information related to environmental conditions and strategic variables were gathered through a questionnaire. Quantitative information to identify whether the firm was in financial distress was gathered from the firms' financial statements.

The study makes two contributions to the literature. First, the research analyses the role of non-financial factors on financial distress from the perspectives of industrial organization theory and resource based view theory. Little empirical evidence about the relationship between non-financial factors and firm distress is available, especially from these theoretical perspectives. Most studies of financial distress use quantitative measures. Using non-financial factors will enhance our understanding of financial distress and improve the predictive capacity of financial distress models (Grünert, Norden and Weber 2005). The richness of our dataset allows analysing (1) whether the firm is able to develop distinct resources to avoid the financial distress, and (2) how rivalry within a firm's operating environment affects firm performance. Second, the study examines differences in the relationships when segmenting the sample by high and low technologynology industries. Several SME studies have shown the need to consider the technologynological level of the industry (Acs and Audretsch 1990; Poutziouris et al. 2000). Jovanovic (1982) reported that firm success or failure can be associated with activities such as fixed asset composition and labour force specialization. Hemmasi and Graf (1990) also established that industries with low-value-added products have less control over profit margins while firms in high-value-added industries have better control over performance. Calvo (2006) reported that performance of Spanish firms was associated with level of technologynology within the industry.

The remainder of the article is organized as follows: The next section provides insights about the theoretical framework and the development of hypotheses.

The third section describes the methodology used in the data analysis. Subsequently, results of the analysis are presented. The last section concludes the article.

2. *Background and hypotheses*

2.1. *External factors*

Industrial organization theory assumes that a firm's environment has a greater impact on factors associated with business distress than firm specific factors because the structural characteristics of industries are the primary determinants of performance (Bowman and Helfat 2001; Porter 1980). Mellahi and Wilkinson (2004) stated that distress results from external factors over which management has little or no control, and that more research is needed to better understand the relationship between external factors and failure. This is particularly valid for SMEs since they must adapt to market changes over which they have no influence (Storey and Sykes 1996).

Previous research indicated a link between environmental conditions and firm performance. Everett and Watson (1998) found that environmental factors directly influenced firm distress and failure. Brixy and Grotz (2007) found that the competitive environment contributed to business distress. Audretsch, Houweling, and Thurik (2000) established that business distress is shaped by the firm's operating environment and is lower with greater competition. Carter and Van Auken (2006) found that weak market conditions increased financial distress because of declining revenues. Challenging and highly competitive operating environments lead to a more complex environment and greater difficulties in achieving success.

Porter (1980) believed that five forces determine industry performance and, ultimately, survival. These five competitive forces are the (1) threat of entry of new competitors (new entrants); (2) threat of substitutes; (3) bargaining power of buyers; (4) bargaining power of suppliers; and (5) degree of rivalry between existing competitors. This model, which involves a relationship between competitors, suppliers and buyers, captures the economic forces shaping rivalry in an industry (Narayanan and Fahey 2005). Each competitive force will influence a firm's strategy and the likelihood of failure. The more powerful the five forces, the lower the possibility to achieve profits is in that industry.

Other things being equal, higher levels of all of Porter's 5-forces imply upward pressures on costs (in the case of supplier power) or downward pressures on price (all others) leading to lower profitability. In this sense, high levels of bargaining *power of suppliers* may provoke price increases or declines in the quality of the purchased goods or services. This would lead to a decline in profitability if firms are not able to recover costs by increasing prices (Porter 1979). However, high levels of *buyer power* may also prevent firms from charging higher prices (Song, Calantone, and DiBenedetto 2002). Many *new competitors* will be attracted by industry profitability, leading to lower industry profitability (Porter 1980). The *threat of substitute product* is important when these products can satisfy the same demand at a lower price and superior quality, limiting profits in stable economic cycles (Porter 1980).

Though profitability is strictly concerned with the return on capital invested, it is usefully thought of a price minus costs. In this way, lower profitability is associated with small margins leading to greater vulnerability to financial distress.

Higher levels of Porter's five factors would be expected to be directly associated with financial distress because of greater stress within the firms operating environment.

Hypothesis 1a: The threat of entry of new competitors is positively associated with financial distress.

Hypothesis 1b: The threat of substitute product is positively associated with financial distress.

Hypothesis 1c: High bargaining power of buyers is positively associated with financial distress.

Hypothesis 1d: High bargaining power of suppliers is positively associated with financial distress.

Hypothesis 1e: High degree of rivalry among existing competitors is positively associated with financial distress.

2.2. *Internal factors*

The resource based theory highlights the importance of firm's resources and capabilities in the competitive environment. The differences in performance arising from heterogeneity resources are the rationale for including internal factors into the analysis. Internal differences may be associated with financial distress (Moreno and Casillas 2007; Collis and Montgomery 1995). Hawawini, Subramanian, and Verdin (2003) suggest that the resource based view perspective arose from the inability of the industrial organization view to provide a rigorous explanation for intra-industry heterogeneity in performance. Amit and Schoemaker (1993) contended that the ability of the company to capture economic rents is a function of how those capabilities are deployed and used.

2.2.1. *Human capital*

The quality of human capital, especially education and professional experience, has often been cited as having an important impact on firm performance (Capeller and Greene 2008; Boden and Nucci 2000). Much of a firm's capabilities and, thus, performance, are based on the capabilities of human capital within company (Ooghe and De Prijcker 2008). Schutjens and Wever (2000) found that education and professional experience affect firm performance and survival. Lee and Tsang (2001) provided evidence that lack of management professional experience was an important cause of financial distress. Headd (2003) and Honjo (2000) found that a manager's education was important for good performance. van Gils (2005) pointed out that manager experience is a key element to firm survival. Better human capital would expect to result in better decisions in the firm, decisions that would also be expected to improve financial performance and, resultantly, decrease financial distress.

Hypothesis 2a: A negative relationship will exist between manager education and financial distress.

Hypothesis 2b: A negative relationship will exist between manager professional experience and financial distress.

2.2.2. *Strategic business planning*

Early work by O'Neil and Drucker (1986) and Drucker (1973) expressed the view that strategic planning should be at the core of business operations, enabling the company to measure achievements against expectations. Formal strategic planning allows firms to anticipate environmental turbulence, effectively allocate resources, and improve performance (Rudd et al. 2008).

While planning generally leads to better decisions, poor planning can be a cause of significant business distress (Carter and Van Auken 2006). Nevertheless, the empirical evidence on the impact of formal strategic planning is largely inconclusive (O'Regan and Ghodabian 2002). Berry (1998) believed that successful small companies use strategic planning to guide long-term growth and development. Perry (2001) found that little formal planning occured among SMEs, but non-failed firms did more planning than similar failed firms (see also Lussier and Pfeifer 2001). Strategic plans would be expected to have an inverse association with financial distress because of contingencies and analyses embedded in the plan.

Hypothesis 3: Firms that develop strategic plans will have less financial distress.

2.2.3. *Innovation, technologynology and quality*

Previous research demonstrated the positive influence of technologynology and innovation on firm performance (Ahuja and Katila 2004). Calvo (2006) and Pérez, Llopis, and Llopis (2004) showed that R&D and innovation increased the performance and survival among Spanish firms. Recently, Andries and Debackere (2007) highlighted that an innovative attitude among SMEs through the adoption of new information technologynology explained the increased performance of small companies.

Innovation in SMEs is associated with production, adaptation of acquired technology or small technologynical improvements (Andreassi 2003). Thatcher and Oliver (2001) found that investment in technologynology lead to higher profits because increases in efficiency lead to higher quality products. Baldwin and Sabourin (2002) and Kotha and Swamidass (2000) showed that firms that incorporated more advanced technologynology were better able to compete in competitive environments. Barnett and Freeman (2001) believed that new technologynology gave firms a competitive advantage. Congden (2005) pointed out that the most successful SMEs aligned strategy and technology.

Quality is a strategic tool that companies use to increase market share or maintain competitiveness (Coulson-Thomas 1992). Because the globalization of markets have made competing on price more difficult, firms increasingly based competitive strategy on product quality (Escanciano, Fernández, and Vázquez 2001). Spanish firms are using quality certification to reduce the risk associated with consumer decisions because the certification ensures that specific quality standards have been met. This assures consistent quality of products, services and processes (Escanciano, Fernández, and Vázquez 2001; Singels, Ruël, and van de Water 2001). Spanish firms obtain a quality certification from an external institution which assures that firm is meeting specific standards relative to procedures in manufacturing and administration processes. Previous literature shows that SMEs are experiencing different effects from quality certifications. Quazi and Padibjo (1998) and Sun (2000) point out that ISO 9000 certification has provided significant

benefits. However, Cheng (2002) and Rahman (2001) concluded that there is no significant difference in performance between SME's with and without quality certification. Naveh and Marcus (2005) showed that the implementation of quality standards improved operating performance, but not necessarily higher performance. The different results may be explained by the firm's motivation to implement the quality certification. Internal motivation is associated with high performance while external motivation is not (Martínez-Costa and Martínez-Lorente 2008). Quality certification, such as ISO, is largely about control rather than continuous improvement. The standard provides some provisions for continuous improvement, but the emphasis is heavily on control.

Higher firm innovation, technologynology and quality would be expected to increase the capability of the firm to compete in the market, leading to a decrease in financial distress.

Hypothesis 4a1: A negative association exists between product innovation and financial distress.

Hypothesis 4a2: A negative association exists between process innovation and financial distress.

Hypothesis 4a3: A negative association exists between management innovation and financial distress.

Hypothesis 4b: A negative association exists between technologynological level and financial distress.

Hypothesis 4c: A negative association exists between whether the firm has quality certification and financial distress.

3. Methodology

3.1. *Data*

The sample consists of 1006 Spanish SME manufacturing firms with (1) 10–250 employees and (2) annual sales less than 50 million euros or total assets less than 43 million euros (European Union 2003). In this article, firms are in financial distress when their liquidity, solvency and profitability ratios have significantly deteriorated. This definition is adopted because the sample is composed of active companies that are not being liquidated or have not begun the process associated with legal failure. The research focusses on financial distress rather than firms in bankruptcy because obtaining information on bankrupt firms that no longer exist is extremely difficult (Harada 2007). Financial distress limits the firm's ability to successfully complete, and is commonly a prelude to bankruptcy. Examining firms showing evidence of financial distress can provide early evidence of factors that may eventually lead to failure. This approach has the advantage of providing firms insight into the development of policies that may improve firm performance. The difficulty is even more challenging in Spain because of more limited access to bankruptcy information.

Qualitative and quantitative information were obtained from two different sources. (1) A cross-sectional survey developed in the 'Estrategia e innovación de la Pyme industrial en España' project, financed by the *Asociación Española de Contabilidad y Administración de Empresas* and the General Directory of the SME Policy was used to collect primarily qualitative information as well as some quantitative information. This database contains information collected through

a questionnaire sent to the manager of each firm. (2) Quantitative information was gathered from the balance sheets and earning statements of the firms during the period 1999–2003 using the SABI[1] database elaborated by INFORMS CORP.

Data were collected during February–May 2004. A questionnaire was faxed to 9337 manufacturing firms. Distribution of companies was estimated from the Central Directory of Companies published by the National Institute of Statistic (Instituto Nacioanl de Estadística 2003). The sample was proportionately segmented within each stratum, and firms were randomly selected. This procedure was believed to be the best approach to guarantee sample representativeness.

To assure consistency, a telephone call was made after the questionnaires were faxed to verify that the person who completed the questionnaire was the company manager. Firm managers were used for the study because van Gills (2005) provided empirical evidence that SME managers are the most important decision makers. During the telephone call, respondents were reminded that there were no right or wrong answers, the information would be anonymous and summaries of the results would be available (Carbonell and Rodríguez 2006).

A total of 1201 questionnaires were returned, which is a response rate of 12.86%. Thirty-one questionnaires were eliminated because the firm had more than 250 or less than 10 employees. Firms with incomplete financial information from the SABI database were also deleted, leaving a final sample size of 1,006 firms. The precision of the sample, in the most unfavourable case where the relative frequency of answer in a specific item is $p = 0.5$, and is characterized by a maximum error of 2.8% with a significance level of 95%. The distribution of firms by industry is shown in Table 1. Finally, responding firms to the initial faxing (85% of the sample) were contrasted with those responding to the follow-up faxing (15% of the sample) to test for non-response bias (Nwachukwv et al. 1997). No responses on any variable in the questionnaire were significantly different between the two groups using *t*-tests and χ^2 tests. Considering these results, non-response bias and industry bias were not a problem.

Table 1. Industry composition of sample.

Industry sectors	Number of companies	Percentage of firms
Nutritious products and drinks, tobacco	130	12.9
Textiles	54	5.4
Clothing and leather	44	4.4
Skin preparation	44	4.4
Wood and cork	51	5.1
Paper and graphic arts	83	8.3
Chemical	50	5.0
Rubber and plastics	49	4.9
Fabrication of other non-metallic minerals	72	7.2
Metallurgy and production of metals	205	20.4
Machinery	75	7.5
Electronic and optical equipments	60	6.0
Production of motor vehicles	23	2.3
Production of furniture and other manufacturing	66	6.6
Total	1006	100

3.2. *Dependent variable*

Financial distress has a negative influence on company operations and stakeholder relationships. Most research works examined distress either from a financial perspective or in the context of failure. Sudarsanam and Lai (2001) noted that financial distress, which was attributed to inept management strategy, often leads to failure. Pompe and Bilderbeek (2005) pointed out that deteriorating business profits and financial ratios often precede bankruptcy. We use a broad concept of financial distress because our sample consists of active companies that are not in liquidation or legal failure.

Previous studies used liability, liquidity and profitability ratios to assess financial distress (Back 2005). In this study, the financial condition of firms was determined using three measures of liquidity and liability (current ratio: current assets to current liabilities, working capital ratio: working capital to total assets, financial autonomy ratio: equity to total assets) and three measures of profitability (resource generation capacity: cash flow to total revenues, return on assets (ROA) and return on equity (ROE)). Accounting information from the SABI database for the period 1999–2003 was used to calculate these ratios (Table 2 shows correlations among the ratios). Table 2 shows that the current, working capital, financial autonomy and resources generation capacity ratios are significantly positively correlated. This suggests that these ratios strengthen and weaken together. The ROE shows no evidence of being associated with the other ratios. Cluster analysis using the mean value of these six ratios for the period 1999–2003 was completed (Table 3). This procedure determined groupings with high degree of internal homogeneity (within the group) and external heterogeneity (among groups) relative to the six ratios and was used to configure the dependent variable because the sample is composed by active firms. The legal failure definition (bankruptcy) cannot be used because of the impossibility of obtaining survey information from inactive firms.

A non-hierarchical method (clusters of K-Means) that does not require special hypotheses on the statistical behaviour of the variables and allows for the treatment of a high number of observations was used. To avoid scale and outliers problems, a recalculation of the deciles of each ratio (the variables took values from 1 to 10 in function that the company is located for that ratio in the corresponding decil) and Euclidean distance as a criterion were used instead of the original variables.

Table 2. Correlations among financial ratios.

	Current ratio	Working capital	Self-financing	Cash flow	ROA	ROE
Current ratio	1					
Working capital	0.113**	1				
Financial autonomy	0.146**	0.717**	1			
Resources generation capacity	0.258**	0.110**	0.407**	1		
ROA	0.010	0.247**	0.293**	0.458**	1	
ROE	−0.005	−0.077*	−0.053	−0.015	0.055	1

Note: **Significant at 1%.
*Significant at 5%.

Table 3. Decile and median values of variables of groups (1999–2003).

	Conglomerates											
	1			2			3			4		
Decile values	Total sample			Total sample			Total sample			Total sample		
Current ratio	2.83			4.12			8.38			6.89		
Financial autonomy	3.14			3.64			8.22			7.23		
Working capital to total assets	3.22			3.42			8.06			7.55		
Resources generation capacity	3.64			5.90			7.95			4.35		
ROA	3.16			6.88			8.37			3.28		
ROE	3.41			7.96			7.31			3.00		
Median values	Total sample	Low technology industries	High technology industries	Total sample	Low technology industries	High technology industries	Total sample	Low technology industries	High technology industries	Total sample	Low technology industries	High technology industries
Current ratio	57.37	54.73	62.73	75.56	75.13	78.45	156.95	156.18	161.29	113.14	111.17	120.57
Financial autonomy	21.99	21.92	22.00	25.45	25.64	25.31	58.03	56.83	59.54	51.48	51.73	50.80
Working capital to total assets	0.57	0.56	4.60	2.81	2.33	5.98	34.30	33.90	39.24	28.27	27.25	33.71
Resources generation capacity	3.41	3.52	2.68	6.22	6.52	5.66	10.08	10.02	11.25	4.08	4.35	3.84
ROA	3.82	3.96	3.33	9.10	9.21	8.90	12.84	12.74	12.71	3.75	3.45	3.82
ROE	3.78	4.00	1.96	17.13	16.54	19.22	14.18	13.85	14.93	3.22	3.15	3.85
Number of firms in each group	267	222	45	256	202	54	266	202	64	217	175	42

This procedure resulted in four groupings (see Table 3). Group 1 includes firms characterized by the lowest values for most of variables and have the worst values relative to liquidity, solvency and profitability. The current ratio shows that these firms can cover only 57.37% of their short-term debts. This increases to 75.5%, 156.95% and 113.14% for the other three groups, respectively. Capital structure is dominated by external financing and their internal financial resources (financial autonomy) is only 21.99%. This external resource dependence is higher in firms that belong to group 1 than for the other firms. Firms in group 1 have low profitability ratios and almost negative working capital (=0.57).

Firms in group 2 show weakness in ratios associated with working capital (2.81), but have good profitability (ROA = 9.10; ROE = 17.13). Group 3 contains firms that have the highest values for all of the variables. Firms belonging to this group have the best position relative to liquidity (current ratio = 156.95), solvency (financial autonomy = 58.03), equilibrium related to assets financing (working capital = 34.30), capacity to generate resources (resources generation capacity = 10.08) and profitability (ROA = 12.84; ROE = 14.18). Group 4 includes firms that have weak profitability (ROA = 3.75; ROE = 3.22), but have strong liquidity and solvency (current ratio = 113.14; financial autonomy = 51.48; working capital = 28.27). The resulting dependent variable is formed by firms in groups 1 (firms in financial distress) and 3 (firms not in financial distress). Companies in groups 2 and 4 were not included in this study because these firms cannot be clearly identified as successful or failed firms. The characteristics of all groups of firms, in both high and low technologynology sectors, were similar. Therefore, the dependent variable definition is not biased by the sector. Stimpert and Duhaime (1997) stated that firm performance is directly related to the characteristics of the industry, and that ignoring industry leads to an incomplete analysis of factors affecting performance. To consider the sector effect, OECD (1997) classification was used to determine the technologynological intensity of the industry (Morikawa 2004). The subsequent statistical analyses are completed after segmenting the sample in two sub-samples according to OECD (1997) classification. These analyses will enhance our understanding of the relationship between the variables and the industry.

Multivariate analysis of variance (MANOVA) validated this classification and confirmed the level of separation among means using Pillia's trace (value = 1.503, significant at 1%), Wilks' lambda (value = 0.066, significant at 1%), Hotellling's trace (value = 5.891, significant at 1%) and Roy's largest root (value = 3.963, significant at 1%).

3.3. *Independent variables*

3.3.1. *External factors*

The questionnaire asked managers to indicate their firm's competitive environment using Porter's five force model, which has been cited as a method to assess SME environmental conditions (O'Regan, Ghobadian, and Gallear 2006). Items were evaluated using a five-point Likert scale (1 = totally disagreed and 5 = totally agreed): (1) new firms can easily enter the industry; (2) high competition among the current firms in the industry (a subjective variable); (3) bargaining power of customers is higher than firms operating in the industry; (4) bargaining power of suppliers is higher than firms operating in the industry and (5) substitutive products

are easily created to replace those manufactured in the industry. Measuring each of Porter's five factors using a single item scale has been used in previous research studies (see, e.g., Spanos and Lioukas 2001).

3.4. *Internal factors*

3.4.1. *Training and manager age*

Manager educational level was measured as a binary variable (1 = manager had a university degree and 0 = manager did not have university degree) (Lussier and Corman 1996; Lussier and Pfeifer 2001; Aragón-Sánchez and Sánchez-Marín 2005). The use of age of the manager as a proxy for experience is consistent with the approach by Honjo (2000).

3.4.2. *Strategic planning and management control systems*

The managers were asked whether the firm had a written strategic plan (1 = firm had a strategic plan and 0 = firm did not have a strategic plan) (Perry 2001; Lussier and Pfeifer 2001). The questionnaire also asked about the use of management control systems (MCS) (cost accounting system, cash budget and financial analysis) using a five-points Likert scale (1 = a lot and 5 = not much) (Hoque and James 2000). The MCS variable is the average of these three items. Information in Table 4 verifies the validity of this variable.

3.4.3. *Innovation*

Innovation was measured through the managers' ranking (five point Likert scale, 1 = low and 5 = high) of their firm's competitive position relative to four aspects (see Table 5) of product, process and management innovation (Hughes 2001). These four items were subsequently averaged to arrive at an overall ranking for each type of firm innovation. This method was previously used in European Union Harmonized Studies on Innovation (2004). The reliability of the scales was verified using Cronbach's alpha. Factor analysis was also used to demonstrate that the indicators could be used as a single factor of each innovation measure. Table 5 shows the items used as well as the values of scales reliability and statistic tests. The statistical tests support the validity of the proposed methodology.

Such subjective, which are based on self-reporting, measures are appropriate for SMEs since objective measures tend to underestimate degree of innovation

Table 4. Manager ranking of use of MCS (1 = low use and 5 = high use) ($n = 533$).

	Item	Scale validation
Management control cystems	– Implementation and control of cost accounting system – Establishment of short-term cash-flow budgets – Analysis of economic and financial situations	Cronbach's alpha = 0.7371 Factorial: 1 factor Explained variance: 66% Significant Bartlett: 0.000 KMO: 0.654

Table 5. Product, process and management innovation measures ($n = 533$).

Type of innovation	Items	Scale validation
Products	Number of new products introduced or modified per year Pioneering character of company when introducing new products Speed of new products introduced by other companies Cost of new products	Cronbach's alpha = 0.7812 Factorial: 1 factor Explained variance: 61% Significant Bartlett: 0.000 KMO: 0.771
Processes	Number of processes modifications or introduced per year Pioneering character of company when introducing new process Speed of new processes introduced by other companies Cost of new processes	Cronbach's alpha = 0.8252 Factorial: 1 factor Explained variance: 66% Significant Bartlett: 0.000 KMO: 0.798
Management	Number of changes in management systems per year Newness of management systems Search by managers for new management systems Pioneering character of company when introducing new management systems	Cronbach's alpha = 0.9014 Factorial: 1 factor Explained variance: 77% Significant Bartlett: 0.000 KMO: 0.804

(Hughes 2001). Previous studies show that perceptual measures are highly correlated with objectives measures of innovation and have the advantage of facilitating comparisons among firms in different industries (Frishammar and Hörte 2005).

3.4.4. *Technological position*

Technological orientation was measured using the same methodology of AECA (2005) and Aragón-Sánchez and Sáchez-Marín (2005). Technological orientation was incorporated into the analysis as a dummy variable to be consistent with these studies. The scale was divided into two categories: (a) strong or good technology-nological position (company uses internally developed or acquired technologynology and strives to achieve better results than competitors), and (b) sustainable or weak competitive position (technology used by the company is similar or inferior to that used by competitors). Technology position is a dummy variable that assumes a value of 1 when the company has a strong or good technologynological position and value of 0 when the company has a sustainable or weak competitive position.

3.4.5. *Quality*

Information was collected about whether the company had a quality certification, which is used as a proxy for quality control in the firm. This measure is included as a dummy variable that assumes a value of 1 when the company possesses quality certification and value of 0 otherwise (Quazi and Padibjo 1998; Sun 2000). Quality is essential for the competitiveness and the company's success, especially for SMEs

since their competitive advantage is often based on reliability and quality rather than price (Prajogo and Brown 2006).

3.5. *Control variables*

3.5.1. *Size*

The relationship between company size and failure risk has been studied in the literature from different perspectives. Audretsch (1990) pointed out that the probability of survival is positively related to firm size. Audretsch (1995) considered the flow structure of accessing and leaving companies in a sector as a conical revolving door. The *conical revolving door* is characterized by a slowly rotating top part that represents big companies in the sector, and by a bottom part composed by small companies that gyrates at a much faster pace. Studies on companys' insolvency prediction also consider size as an explanatory factor of financial risk (Mora 1994; López, Gandía, and Molina 1998; Fariñas and Moreno 2000; Segarra and Callejón 2002). The financing disadvantages associated with small size include financing constraints, difficulties accessing external resources (Maroto 2001; Martín and Sáez 2001) and higher financing costs (Fariñas and Jaumandreu 1999; Melle 2001).

The mean number of employees in 2003 is used as a proxy for firm size. Sales and total assets were used, but not reported since no differences in the analysis were found. Esteve-Pérez and Mañez-Castillejo (2008) justify using size as a variable because it underlines firm's ability to adapt to changing competitive environment (also pointed out by Levinthal (1997)). According to Mata and Portugal (1994), current size is a better predictor of performance and survival than initial size because it contains information about the firm over time.

3.5.2. *Growth*

To account for firm growth during the period examined, sales and assets growth rates for 1999–2003 are examined. A strong growth rate of an SME can cause variations in profit and liquidity. The impact of growth on profit and liquidity depends on the nature of cash in/ouflows associated with the growth. Growth that requires high cash outlays and delayed cash inflows can be detrimental while growth that has low cash outlays and quick cash inflows would not be as detrimental to the firm (Berger and Udell 1998).

3.5.3. *Age*

Firm age, measured as the number of years since the firm was established, was used by Holmes and Nicholls (1989) and Yasuda (2005) to study financial distress. Henderson (1999) believes that the liability of newest, liability of adolescence and liability of obsolescence are associated with failure. He considers different points of view about how age affects firm failure: (1) *Liability of newness*, this approach attributes higher failure rates during the first years; (2) *Liability of adolescence*, this approach associates the highest rates of failure to the following years after setting-up the business, these rates of failure decrease during the following years and finally; (3) *Liability of obsolescence*, this approach considers that the failure rates increase with the age. Mata and Portugal (1994) and Audretsch and Mahmood (1994) point out

that company failure is inversely related to company age. Lane and Schary (1991) suggested that the (1) age of the firm influences entrant and exit flows in an economy, (2) chance of failure decreases as firms become older and (3) population distribution by age is a determinant of the industrial failure rate. Fariñas and Moreno (2000) showed an inverse relationship between the financial distress and firm age among Spanish manufacturing firms. Older firms would have lower failure rates than younger firms because of higher levels of resources and experience (Headd 2003). Thornhill and Amit (2003) suggest that failure among younger firms may be attributable to deficiencies in managerial knowledge and financial management abilities than failure among older firms.

3.6. *Statistical analysis*

3.6.1. *Univariate analysis*

The results were initially summarized using univariate statistics to provide a better understanding of the respondents and characteristics of the responding companies. Differences between the two groups (firms in financial distress and firms not in financial stress) for each technologynological industry (high versus low technology industry) were examined using (1) *t*-tests of mean differences for independent samples for continuous variables and the Kruskall–Wallis test when the hypotheses of normality and variances homogeneity were not matched; and (2) contingency analysis based on the χ^2 of Pearson test, with Yates's test due to tables 2×2, for categorical variables. When differences are statistically significant, Cohen's d and φ coefficient have been used to adjust for the effect of the size difference.

3.6.2. *Multivariant analysis*

Logistic regressions were used to investigate differences between firms relative to financial distress for each technologynology sector. The independent variables were those that showed statistical differences in the univariate analysis. The dependent variable took a value = 1 to identify the firms in financial distress. A total of two regressions were completed – high technologynology sector firms, and low technologynology sector firms. These regressions are useful to analyse whether different factors are associated with financial distress relative to sector.

$$F_{\mathrm{di}} = a + b_{1j}\ \text{control variables}_{ji} + b_{2j}\ \text{external factors}_{ji} + b_3 j\ \text{internal factors}_{ji} + \xi_i$$

where

F_{d}: Financial distress (1 = firm in financial distress and 0 = firm not in financial distress)

Control variables$_{ji}$: Number of employees, growth and age of the company (2003)

External factors$_{ji}$: High threat of new entrants (1 = strongly disagree and 5 = strongly agree)

Highly competitive market (1 = strongly disagree and 5 = strongly agree)

High bargaining power of customers (1 = strongly disagree and 5 = strongly agree)

High bargaining power of suppliers (1 = strongly disagree and 5 = strongly agree)

	High threat of substitute products (1 = strongly disagree and 5 = strongly agree)
Internal factors$_{ji}$:	Manager education (1 = university degree; 0 = otherwise)
	Manager age (continuous)
	Strategic plan (1 = Yes; 0 = No)
	Mean degree of use of MCS
	Product innovation (continuous)
	Process innovation (continuous)
	Management innovation (continuous)
	Technological position (1 = strong technology; 0 = otherwise)
	Quality control (1 = firm has quality certification; 0 = otherwise).

4. Results

4.1. *Sample characteristics*

Table 6 compares characteristics of firms in financial distress with those that are not in financial distress within the high and low technology industries. No difference in mean sales and growth rates (sales and assets) between the two groups of firms is evident. Significant differences in age are evident between firms in both the high and low technology industries that are in financial distress and those that are not in financial distress. Difference in the number of employees exists only for firms in the low technology industry. These results show that low technology industry firms in financial distress have fewer employees and are younger than other firms, while in the high technology industry firms in financial distress are younger but not smaller than other firms.

4.2. *Internal and external factors*

Table 7 compares firms in financial distress with those not in financial stress using manager ranking of Porter's five forces (1 = agree and 5 = disagree). Table results show that nearly all mean rankings are higher for firms that were in financial distress as compared with those that are not. Managers of firms in distress ranked new firm entry into the market as being more difficult (5% significance), industry competition higher (1% significance) and bargaining power of customers higher (1% significance) than firms not in distress. Although Cohen's *d* values can be classified as medium and medium-low for these significant differences, we cannot compare our results with previous studies because other research has not reported the effect size. These results provide support for the first hypothesis – more competitive environments are positively associated with firms that are experiencing financial distress. However, this hypothesis is only supported for the low technology industry because the differences are not statistically significant for the high technology industry. More competitive environments are not associated with firms in the high technology industry that are in financial distress.

Table 8 compares firms in financial distress with those that are not in financial stress relative to internal company factors. The results show no statistical difference between the firm groups relative to manager education or experience (measure by age). These findings do not support hypotheses 2a and 2b. Table values also show no

Table 6. Information about control variables for (1) total sample and (2) low and high technologynology industries.

	Firms in financial distress		Firms not in financial stress		Significance	
Variables	Low technology industries	High technology industries	Low technology industries	High technology industries	Low technology industries[a]	High technology industries[a]
Mean number of employees 2003 (Standard deviation)	35.45 (35.60)	41.73 (35.66)	42.29 (42.62)	47.59 (56.95)	1.753* −0.17[b]	0.609
Mean sales 2003 (euros) (Standard deviation)	5,011,240 (9,888,304)	6,269,293 (12,382,408)	6,243,866 (8,549,673)	7,486,080 (12,546,126)	1.347	0.501
Mean assets 2003 (euros) (Standard deviation)	4,377,947 (8,264,290)	5,037,528 (8,827,585)	5,596,814 (8,074,858)	5,891,320 (7,780,383)	1.511	0.533
Mean sales growth rate 99–2003 (Standard deviation)	37.60% (0.731)	375.04% (22.27)	55.42% (2.197)	33.22% (0.377)	1.106	−1.22
Mean assets growth rate 99–2003 (Standard deviation)	58.96% (1.045)	94.25% (3.974)	72.51% (2.507)	51.40% (0.504)	0.715	−0.848
Mean firm age 2003 (years) (Standard deviation)	24.25 (18.87)	24.11 (19.50)	31.40 (23.21)	31.16 (20.18)	3.410*** −0.34[b]	1.806* −0.35[b]

Note: [a]*t*-test.
*$p \leq 0.1$; **$p \leq 0.05$; ***$p \leq 0.01$.
[b]Cohen's d: $(\text{mean}_{\text{financial distress}} - \text{mean}_{\text{Non financial distress}})/\sigma$, where σ is the standard deviation of either group.

Table 7. Managers mean ranking of Porter's five forces (1 = agree and 5 = disagree).

	Firms in financial distress		Firms not in financial stress		*t*-statistic (significant)	
Porter's forces (standard deviation)	Low technology industries	High technology industries	Low technology industries	High technology industries	Low technology industries	High technology industries
New firm entry into market is easy	3.08	2.52	2.77	2.82	−2.484**	1.311
	(1.26)	(1.21)	(1.22)	(1.12)	0.25[b]	
High rivalry among the existing firms	4.36	4.20	4.06	3.97	−3.507***	−1.392
	(0.83)	(0.78)	(0.94)	(0.89)	0.34[b]	
Customers have more bargaining power than firms	3.79	3.58	3.52	3.44	−2.735***	−0.780
	(0.97)	(0.90)	(0.98)	(0.87)	0.28[b]	
Suppliers have more bargaining power than firms	2.91	2.95	2.80	2.81	−1.081	−0.773
	(0.99)	(0.91)	(1.01)	(0.98)		
Development of substitute products is easy	2.53	2.22	2.36	2.44	−1.418	1.153
	(1.27)	(1.02)	(1.05)	(0.96)		

Note: *$p \leq 0.1$; **$p \leq 0.05$; ***$p \leq 0.01$.
Kruskall–Wallis test has been used when there is no homogeneity between the variances and when the normality hypothesis is not held.
[b]Cohen's d: $(\text{mean}_{\text{financial distress}} - \text{mean}_{\text{non financial distress}})/\sigma$ where σ is the standard deviation of either group.

Table 8. Comparison of internal factors: Firms in financial distress versus firms not in financial distress.

	Firms in financial distress		Firms not in financial stress		Statistic	
Firm internal factors (standard deviation)	Low technology industries	High technology industries	Low technology industries	High technology industries	Low technology industries	High technology industries
[a]Percentage of managers who have university degree	51.3	62.2	48.7	66.7	0.166	0.227
[b]Manager age (Years)	47 (9.70)	50.91 (9.04)	48.43 (10.10)	50.45 (8.67)	1.432	−0.263
[a]Percentage of firms with strategic business plan	49	70.5	47.3	68.4	0.112	0.048
[b,c]Mean degree of use of MCS	3.43 (0.87)	3.60 (0.78)	3.54 (0.81)	3.58 (0.94)	1.232	−0.117
[c,d]Product innovation	3.03 (0.67)	3.21 (0.81)	3.09 (0.70)	3.45 (0.62)	0.874	1.649 0.34[e]
[c,d]Process innovation	2.96 (0.67)	3.16 (0.79)	3.053 (0.63)	3.25 (0.65)	1.335	0.620
[c,d]Management innovation	3.14 (0.78)	3.26 (0.80)	3.24 (0.76)	3.42 (0.76)	1.217	1.018
[a]Percentage of firms with a strong technologynology	45.9	70.5	65.3	72.6	15.183*** 0.20[f]	0.057
[a]Percentage of firms that have quality certification	57.1	77.3	59.2	89.1	0.168	2.733* 0.16[f]

Note: [a]χ^2 Pearson test *$p \leq 0.1$; **$p \leq 0.05$; ***$p \leq 0.01$.
[b]Five-point likert scale (1 = high use of control systems and 5 = low use of control systems).
[c]t-test: *$p \leq 0.1$; **$p \leq 0.05$; ***$p \leq 0.01$.
[d]Mean value of items associated with product, process and management innovation.
[e] Cohen's d: $(\text{mean}_{\text{financial distress}} - \text{mean}_{\text{non financial distress}})/\sigma$ where σ is the standard deviation of either group.
[f]φ coefficient: $(\chi^2/N)\hat{}(1/2)$ where N: is the number of firms in the total sample.

statistical difference between the two groups of firms relative to the percentage of firms that developed a business plan. Hypothesis 3 is also not supported. The lack of statistically significant differences is shown for both technologynology intensity sectors.

Table 8 results do not provide support for hypotheses 4a2 and 4a3 for both low and high technology industries. The mean ranking of importance of product, process and managerial innovation by firms in financial distress are lower than for firms not in financial distress, but these differences are not statistically significant. The analyses show divergent results for low and high technology industries. For the low technology industry, firms in financial distress are not less innovative or characterized by a lower quality than firms not in financial distress. On the contrary, the technologynology level of equipment appears to be a key competitive advantage in the low technology industry. About 70.5% of firms in financial distress develop or maintain strong technologynology in equipment, and the percentage increases to 72.6% for firms not in financial distress. For this difference, the ϕ coefficient is 0.20. Product innovation in the high technology industry is statistically significant according to the non-parametric U Mann–Whitney test. The competitive position of firms in financial distress relative to product innovation (3.21) is lower than that for firms that are not in financial distress (3.45) (Cohen's d of 0.34). Additionally, quality certification is the most important competitive factor in the high technology industry. Only 77.3% of firms in financial distress develop a quality certification while more than the 89% of firm not in financial distress obtained a quality certification (ϕ coefficient is 0.16).

4.3. *Logistic regressions*

The results of the logistic regressions are shown in Table 9. The joint significance of the variables is accepted by the likelihood and Hosmer and Lemeshow tests. The Cox and Snell R^2, Nagelkerke R^2 and cases correctly classified also show good fit for the regressions.

Results for the low technologynology industry indicate that high rivalry among the existing firms in the industry (coefficient = 0.357, significant at 1%) and high bargaining power of customers (coefficient = 0.187, significant at 10%) are positively related to firms in financial distress. The higher the competition in the sector and more bargaining power of customers, then the more likely the firms were to be in financial distress. Technological level of the firm (coefficient = −0.759, significant at 1%) and company age (coefficient = −0.014, significant at 1%) were negatively associated with firms in financial distress. Firms in financial distress were likely to be in a weaker technologynological level and younger. The likelihood of financial distress is accentuated when the firms operate in highly competitive sectors and when the bargaining power of the customer is high. The likelihood of financial distress is higher for firms that are both younger and lower technologynological levels.

For firms in high technology industries, quality control (coefficient = −1.502, significant at 5%) is negatively related to financial distress while the company age is negatively related to financial distress (coefficient = −0.031, significant at 5%). No other variables are significant.

Table 9. Logistic regression: Factors affecting financial distress (dependent variable: firm in distress (=1) versus firm not in distress(=0)).

	Coefficients Wald χ^2 statistic	
Independent variables	Low technology industry ($n = 424$)	High technology industry ($n = 109$)
Size (number of employees 2003)	−0.04 1.925	
Company age 2003	−0.014 6.904***	−0.031 5.531**
High rivalry among the existing firms	0.357 7.326***	
Customers have more bargaining power than firms	0.187 2.570*	
Technological level of the firm (*Strong technological level*)	−0.759 11.771***	
New firm entry into market is easy	0.105 1.364	
Quality certification		−1.502 5.100**
Product innovation		−0.436 2.004
Intercept	−1.415 4787**	3.171 5.979**
χ^2 (significant)	44.114 (0.000)	12.160 (0.007)
−2 log likelihood	480.339	119.586
Cox and Snell R^2	0.110	0.117
Nagelkerke R^2	0.147	0.158
Cases correctly classified	64.4%	67.3%

Note: *$p \leq 0.1$; **$p \leq 0.05$; ***$p \leq 0.01$.

5. Discussion and conclusions

This article examines the factors associated with financial distress from two theoretical frameworks: (1) the industrial organizational theory and (2) the resource based view of the firm. Few previous studies have analysed financial distress considering a mix of these two perspectives. The variables used in the analysis included external factors, such as the firm competitive environment using Porter's five forces model and internal factors, such as education and age of the manager, strategic planning, technology, innovation and quality certification.

Financial distress occurs when promises to creditors of a company are broken or honoured with difficulty. Firms can experience varying degrees of financial distress that range from difficulty to pay bills, technologynical insolvency (inability to pay bills) and bankruptcy. The costs of financial distress include negative effect on firm value, damage to supplier customers, employees and creditors relationships, limits on credit from suppliers, loss of customers, etc.

The study analysed 1006 manufacturing SMEs, distinguishing between the technologynological intensity of the industry according to the OCDE classification.

Qualitative information about the external and internal factors were from a questionnaire addressed to the firm manager. Accounting information to identify if the firm was in financial distress were from SABI database. The article examined firms that showed evidence of financial distress. Understanding factors affecting financial distress can enable firms to develop policies that improve operating performance and avoid bankruptcy.

The results answer the research questions initially posed in the article: Do factors associated with the firm's competitive environment and related to the company's strategy explain organizational distress? Do the variables related to financial distress vary by high technologynology versus low technologynology industry?

Results from this study, which provides insight into the first research question, show that environmental conditions and some strategic variables are associated with financial distress. Specifically, the results demonstrated that high bargaining power of buyers is positively associated with financial distress (H1c) and high degree of rivalry among existing competitors is positively associated with financial distress (H1e) in the low technologynology industry. These results are consistent with research by Audretsch, Houweling, and Thurik (2000); Bowman and Helfat (2001); Nair and Kotha (2001); Carter and Van Auken (2006) which found that the firm's environment can cause financial distress. The results also showed that a negative association would exist between technologynological level of the firm and financial distress (H4b) in the low technologynology industry. This result is inconsistent with Heunks (1998) who reported that innovation level (commonly associated with technologynology of the firm) often lowered financial performance, but is consistent with a number of studies that supported a direct relationship between innovation and financial performance (Ahuja and Katila 2004; Calvo 2006).

The results also provide insight into differences in variables affecting financial distress relative to technologynological level of the industry. In low technology industries, the variable with the higher association with financial distress is the technologynological level of firm's equipment, followed by the rivalry among existing firms and customer bargaining power. The capacity of SMEs to maintain a strong technologynological position in its equipment decreases the risk of failure. The multivariate model showed that young SMEs with low technologynology and in a highly competitive environment had a higher probability of financial distress. These results are consistent with the liability of newness (Bruno and Leidecher 1988; Gaskill, Van Auken, and Manning 1993). The development of technologynology may be used by managers in low technology industries to moderate the effect and threats from the firms' operating environment.

In high technology industries, quality control explains a high percentage of the dependent variance. Firms with a quality certification have better quality control procedures that ultimately improve financial performance of firms in the technologynology industries. This result is consistent with studies, which found that quality certifications are important to Spanish firms (Escanciano, Fernández, and Vázquez 2001; Singels, Ruël, and van de Water 2001). SME quality certification is mostly orientated towards quality control, but also considers continuous improvement processes. Both quality control and quality certification imply the obligation to periodical quality system reviews. This orientation involves resources and technologynological capacities accumulation that ultimately leads to performance improvement and the associated cost control (Ayala, Fernández, and

González 2004). Finally, financial distress in high technology industries is not affected by external factors. This result can be explained by the fact that these industries are characterized by a high-value-added activity sector.

Differences in results between high and low technologynology sectors may have some implications regarding the role of selection versus adaptation in industry change. For firms in the low technologynology sector, for example, the results may provide some evidence that industry change may be selection because the external environment appears to matter in low technology sector, but is less significant in high technology sector. For firms in the high technologynology sector, the results may suggest that industry change may be adaptive in which internal factors (principally experience, innovation and quality) are the principal discriminating factors.

The results of the study may be useful for both governments and SMEs. The findings can be used in the development of public policy aimed at supporting SME competitiveness in Spain. Government policies designed to meet the needs of the specific condition that each sector has as a consequence of the technologynological intensity can improve the efficiency of public resources. While public policy that encourages technologynology can improve the competitiveness and survival of low technology industries, public policy that supports quality in the high technology industry can be important for SME competitive advantage. The results may also provide insights for managers who must keep their firm financially strong. Additionally, the evidence from this study can be useful for financial entities to increase the efficiency of their rating model in the lending decisions. Lehmann (2003) and Grünert, Norden, and Weber (2005) showed that the use of soft information increased the ability to discriminate between defaulting and non-defaulting firms. Brunner et al. (2000) also reported that ratings using qualitative factors were more stable than quantitative ratings.

The study has several limitations that provide avenues for potential future research. This study considers only a narrow definition of financial distress because of the impossibility to obtain information through a questionnaire from bankrupt Spanish firms. The results cannot necessarily be generalized to failed firms because of the possibility that distressed firms may become healthy in the future. Future research could focus on different financial distress proxies. Different definitions of financial distress may provide different results and lead to a more comprehensive understanding of the relationship between non-financial factors and financial distress. As this study analyses a general model about the factors and relationships associated with financial distress, important variables, such as human and strategic planning variables, are not analysed deeply. Future research could examine information about the composition, size and background of the management team (Westhead 1995 and Wiklund 1998), investment in human and social capital (e.g. previous experience and membership in an association) for SMEs (Bosma et al. 2004) as well as information about barriers to strategy deployment (O'Regan and Ghobadian 2002). Future studies could also expand the measure of Porter's five factors by using a multi item scale. Such a study could provide more exact information about the relationship between Porter's factors and financial distress.

The data were also collected at a single point in time. A longitudinal study can provide evidence on the impact of changes in qualitative and quantitative measures over time. Such a study can capture these effects over both strong and weak economic time periods. Future studies can expand the scope of the research to

examine other industries outside of the manufacturing sector. This type of study might reveal how changes in the qualitative and quantitative measures affect firms by sector. The study can also be expanded to identify differences in the qualitative and quantitative measures in different countries, especially those in the European Union. Comparing differences by country can lead to different policies encouraging innovation in different countries or a European Union-wide policy initiative. Finally, future research could employ a case study approach to provide in-depth understanding of issues related to how firms manage financial distress using both the qualitative and quantitative measures. Results from a case study in the form of a single respondent analysis can also be used in a university class in a discussion about managing financial distress. Assuring external validity, controlling extraneous variables and assessing potential bias in all survey instruments will provide future research studies with valid data on how firms react to and manage financial distress. Ensuring validity is especially important for studies that might be used in the development of government and/or company policies.

Note

1. SABI database (Sistema Annual de Balances Ibéricos) contains relevant information for 850,000 Spanish firms. SABI covers 31% of firms with more than nine employees, and more than 50% of larger firms.

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