Table 4. Estimation results of the financial distress costs model by country and for the full sample

The dependent variable is the financial distress costs borne by the firm ($\mathbf{IC_{it}}$) as measured by the difference between the growth rate of the sales of the sector and the growth rate of the sales of the firm; $\mathbf{IPROB_{it}}$ is the probability of financial distress; $\mathbf{LEV_{it}}$ is the firm's leverage adjusted to its sector; $\mathbf{LA_{it}}$ denotes the firm's holding of liquid assets; $\mathbf{\Delta INV_{it}}$ and $\mathbf{\Delta EMP_{it}}$ stand for changes in the firm's investment and employment policies, respectively; $\mathbf{DEMP_{it}}$ is a dummy variable that takes value one if the firm's probability of financial distress is higher than the average probability in its country, and zero otherwise. The regressions are performed by using the panels described in Table 1 for each country. The rest of the information needed to read this table is: i) Heteroskedasticity consistent asymptotic standard error in parentheses; ii) * , ** indicate significance at the 1% and 5% level, respectively. iii) χ^2 (1) is the the linear restriction test under the following null hypothesis: $H_0 = \beta_5 + \gamma_1$; iv) z_1 is a Wald test of the joint significance of the reported coefficients, asymptotically distributed as χ^2 under the null of no relationship, degrees of freedom in parentheses; v) z_2 is a Wald test of the joint significance of the time dummy variables, asymptotically distributed as χ^2 under the null of no relationship, degrees of freedom in parentheses; vi) z_3 is a Wald test of the joint significance of the country dummy variables, asymptotically distributed as χ^2 under the null of no relationship, degrees of freedom in parentheses; vii) m_i is a serial correlation test of order i using residuals in first differences, asymptotically distributed as N(0,1) under the null of no serial correlation; viii) Sargan is a test of the over-identifying restrictions, asymptotically distributed as χ^2 under the null of no relation between the instruments and the error term, degrees of freedom in parentheses.

Country	**US**	**UK**	**Germany**	**TOTAL**
Explanatory variables	1704 firms.	491 firms.	186 firms.	2381 firms.
$IPROB_{it}$	0.80417* (0.1434)	0.20661* (0.04119)	0.14593* (0.02558)	0.51531* (0.1416)
LEV_{it}	-0.832149* (0.1761)	-0.330297* (0.05523)	-0.439209* (0.05347)	-0.983263* (0.183)
LA_{it}	-1.06477* (0.1294)	-1.62107* (0.03583)	-1.56152* (0.05297)	-1.02550* (0.1478)
ΔINV_{it}	-1.72876* (0.3123)	-1.71194* (0.07951)	-2.44524* (0.07831)	-2.05796* (0.3379)
ΔEMP_{it}	-19.6724 (17.36)	-69.0092* (3.328)	-150.008* (5.658)	-44.0876* (12.75)
$DEMP_{it}$* ΔEMP_{it}	57.2335** (26.92)	-115.514* (6.880)	141.965* (6.805)	39.9293* (26.34)
Q_{it}	-0.020958 (0.01865)	-0.071216* (0.009134)	-0.073227* (0.006894)	-0.04511** (0.02052)
$SECTOR_{it}$	-0.007426* (0.002722)	0.00692* (0.002359)	0.00037 (0.001529)	-0.006927** (0.003348)
$SIZE_{it}$	0.14878** (0.05781)	-0.29941* (0.01735)	0.451465* (0.01616)	-0.14337** (0.05782)
χ^2 (1)	--	281.919*	435.164*	2.29861**
z_1	202.8 (9)	4846. (8)	3703. (9)	181.1 (9)
z_2	48.99 (8)	332.4 (8)	6859. (8)	50.92 (8)
z_3	--	--	--	57.81 (10)
m_1	-1.116	-2.972*	-1.253	-1.130
m_2	1.125	-1.032	1.260	0.7505
Sargan	230.6 (315) 1.0	339.4 (315)0.165	169.6 (315) 1.0	237.4 (315) 1.0

Table 3 - Summary statistics by country

$\mathbf{IC_{it}}$ denotes financial distress costs; $\mathbf{IPROB_{it}}$ is the probability of financial distress; $\mathbf{LEV_{it}}$ is the firm's leverage adjusted to its sector; $\mathbf{LA_{it}}$ denotes the firm's holding of liquid assets; $\mathbf{\Delta INV_{it}}$ and $\mathbf{\Delta EMP_{it}}$ stand for changes in the firm's investment and employment policies, respectively; $\mathbf{Q_{it}}$ is the firm's Tobin's q adjusted to its sector; $\mathbf{SECTOR_{it}}$ is the average profitability of the firm's sector; and $\mathbf{SIZE_{it}}$ is the logarithm of the firm's sales. For each variable and country we report the values of the following statistics: Mean, Standard Deviation, Minimum and Maximum. The last rows are obtained from the panel that results from merging the data of the five countries.

	Country	Mean	Standard Deviation	Minimum	Maximum
$\mathbf{IC_{it}}$	US	0.0933	3.2051	-1.4288	343.2
	UK	0.0982	0.8818	-1.2159	37.8852
	Germany	0.0461	0.6997	-1.0669	24.5426
$\mathbf{IPROB_{it}}$	US	0.1081	0.2304	0	1
	UK	0.0658	0.1819	0	0.9987
	Germany	0.0657	0.1857	0	1
$\mathbf{LEV_{it}}$	US	0	0.2171	-0.427	0.5512
	UK	-0.0005	0.1776	-0.3945	0.5476
	Germany	-0.0001	0.1947	-0.524	0.4454
$\mathbf{LA_{it}}$	US	0.4625	0.2693	0.0466	1.6435
	UK	0.5545	0.2633	0.0501	1.8589
	Germany	0.519	0.2301	0.0674	1.6822
$\mathbf{\Delta INV_{it}}$	US	0.1016	0.1541	-0.2397	0.9589
	UK	0.0907	0.1562	-0.3363	0.9176
	Germany	0.0937	0.1374	-0.2551	0.8811
$\mathbf{\Delta EMP_{it}}$	US	-0.0005	0.0019	-0.0113	0.0067
	UK	-0.0003	0.003	-0.0172	0.0147
	Germany	-0.0003	0.0015	-0.0083	0.0057
$\mathbf{Q_{it}}$	US	-0.1376	1.4084	-2.9676	10.5076
	UK	-0.0472	0.9806	-1.8671	8.1319
	Germany	-0.0113	0.7167	-2.1913	7.0299
$\mathbf{SECTOR_{it}}$	US	0.2294	1.8801	-6.3076	13.5155
	UK	0.1398	1.3131	-7.596	5.8729
	Germany	0.0551	1.5043	-9.1504	5.9789
$\mathbf{SIZE_{it}}$	US	5.9598	1.8392	0.8924	10.2884
	UK	5.7018	1.6936	1.2653	9.8426
	Germany	6.4125	1.7714	2.1558	11.2321

Table 2 - Sample distribution by economic sector classification

All companies in our panels have been allocated to one of nine broad economic industry groups in accordance with the Economic Sector Code (SIC) reported in Compustat Global Vantage, excluding Financial Services (code 5000).

		US			**UK**			**Germany**		
Economic Sector	SIC Code	Number of companies	Number of observations	% of obs.	Number of companies	Number of observations	% of obs.	Number of companies	Number of observations	% of obs.
Basic Materials	1000	109	978	6.39	54	478	10.95	10	95	5.63
Consumer – Cyclical	2000	418	3779	24.70	130	1151	26.37	57	518	30.71
Consumer – Non Cyclical	3000	192	1725	11.27	60	549	12.58	34	310	18.38
Health Care	3500	478	4389	28.69	96	854	19.56	51	454	26.91
Energy	4000	267	2395	15.65	51	453	10.38	20	187	11.08
Capital Goods	6000	165	1405	9.18	76	665	15.23	11	96	5.69
Technology	8000	44	365	2.39	5	45	1.03	1	7	0.41
Communication	8600	24	205	1.34	19	170	3.89	--	--	--
Transportation	9500	7	59	0.39	--	--	--	--	--	--
Total	Total	1704	15300	100.00	491	4365	100.00	186	1687	100.00

Table 1. **Structure of the panels by number of companies and annual observations per country**

For each country, data of companies for which the information is available for at least six consecutive years between 1990 and 1999 have been extracted. The resultant unbalanced panel comprises 186 German (1687 observations), 1704 US (15300 observations), and 491 UK (4365 observations) non-financial quoted companies.

Country	Number of companies	Number of annual observations					Total number of observations
		6	7	8	9	10	
Germany	186	102	168	80	117	1220	1687
US	1704	1014	1246	1416	1584	10040	15300
UK	491	246	406	544	639	2530	4365
Total	2381	1362	1820	2040	2340	13790	21352

Ofek, E. (1993). "Capital Structure and Firm Response to Poor Performance", *Journal of Financial Economics*, **34**, pp. 3-30.

Ohlson, J. (1980). "Financial Ratios and the Probabilistic Prediction of Bankruptcy", *Journal of Accounting Research*, Spring, pp. 109-131.

Opler, T.; Pinkowitz, L.; Stulz, R. and R. Williamson (1999). "The Determinants and Implications of Corporate Cash Holdings", *Journal of Financial Economics*, **52**, pp.3-46.

Opler, T. and S. Titman (1994). "Financial Distress and Corporate Performance", *The Journal of Finance*, **49**, pp. 1015-1040.

Perfect, S. and K. Wiles (1994). "Alternative Constructions of Tobin's q: An empirical comparison", *Journal of Empirical Finance*, **1**, pp. 313-341.

Pindado, J. and L. Rodrigues (2004). "Parsimonious models of financial insolvency in small companies", *Small Business Economics,* **22**, pp. 51–66.

Pindado J. and L. Rodrigues and C. de la Torre (2004). "A new approach to estimate the probability of financial distress", *SSRN Working Paper, http://ssrn.com/abstract=485182*

Pindado J. and C. de la Torre (2003). "Goodness of Proxies for Tobin's q: International Evidence", *Finance Letters*, **1**, pp. 14-17.

Rajan, R. and L. Zingales (1995). "What Do We Know About Capital Structure? Some Evidence from International Data", *The Journal of Finance,* **50**, December, pp. 1421-1460.

Shleifer, A. and R. Vishny (1992). "Liquidation Values and Debt Capacity: A market equilibrinm approach", *The Journal of Finance*, **47**, pp.1343-1366.

Ward, T., Foster, B., (1997). "A note on selecting a response measure for financial distress". Journal of Business Finance & Accounting 24, pp. 869-879.

Warner, J. (1977). "Bankruptcy Costs: Some Evidence", *The Journal of Finance*, **32**, pp. 337-348.

Weiss, L. (1990). "Bankruptcy Resolution: Direct Costs and Violation of Priority of Claims, *Journal of Financial Economics*, **27**, pp. 285-313.

Whitaker, R. (1999). "The Early Stages of Financial Distress", *Journal of Economics and Finance,* **23**, pp. 123-133.

White, M. (1996). The Costs of Corporate Bankruptcy: A US- European comparison, in *Corporate Bankruptcy, Economic and Legal Perspectives*, Edited by Bhandari, J. S. and Weiss, L. A. Cambridge University Press. Chapter 30.

Wruck, K. (1990). "Financial Distress, Reorganisation, and Organisational Efficiency", *Journal of Financial Economics*, **27**, pp. 419-444.

Distressed Firms", *The Journal of Finance*, **52**, pp. 161-196.

Gilson, S.; John, K. and L. Lang (1990). "Troubled Debt Restructurings: An Empirical Study of Private Reorganisation of Firms in Default", *Journal of Financial Economics*, **27**, pp. 315-353.

Greene, W. (2003). *Econometric Analysis*. 5th edition. Prentice Hall, New York.

Jensen, M. (1989a). "Eclipse of the Public Corporation", *Harvard Business Review*, September-October, pp. 1-29.

Jensen, M. (1989b). "Active Investors, LBOs and the Privatisation of Bankruptcy ", *Journal of Applied Corporate Finance*, **2**, pp. 35-44.

John, K.; Lang, L. and J. Netter (1992). "The Voluntary Restructuring of Large Firms in Response to Performance Decline", *The Journal of Finance*, **47**, pp. 891-917.

John, T. (1993). "Accounting Measures of Corporate Liquidity, Leverage and Costs on Financial Distress", *Financial Management*, **22**, pp. 91-100.

Kaiser, K. (1996). "European Bankruptcy Laws: Implications for Corporations Facing Financial Distress", *Financial Management*, **25**, pp. 67-85.

Khurana I. and B. Lippincott (2000). "Restructuring and Firm Value: The Effects of Profitability and Restructuring Purpose", *Journal of Business Finance &Accounting*, **27**, pp.1107-1137.

Kim, E. (1978). "A Mean-Variance Theory of Optimal Capital Structure and Corporate Debt Capacity" *The Journal of Finance*, **33**, pp. 45-64.

La Porta, R.; Lopez-de-Silanes, F.; Shleifer, A. and R. Vishny (1997). "Legal Determinants of External Finance", *NBER Working Paper Series,*No 5879.

La Porta, R.; Lopez-de-Silanes, F.; Shleifer, A. and R. Vishny (1998). "Law and Finance", *Journal of Political Economy*, **106**, pp. 1113-1155.

Lang, L.; Ofek, E. and R. Stulz, (1996). "Leverage, investment and firm growth", *Journal of Financial Economics*, **40**, pp. 3-30.

Lewellen, W. and S. Badrinath (1997). "On the Measurement of Tobin's *q*", *Journal of Financial Economics*, **44**, pp. 77-122.

Mikkelson, W.H. and M. M. Partch (2003). "Do Persistent Large Cash Reserves Hinder Performance?", *Journal of Business and Quantitative Analysis,* **38,** pp. 275-294.

Moulton, B. (1986). "Random Group Effects and the Precision of Regression Estimates", *Journal of Econometrics*, **32**, pp 385-397.

Moulton, B. (1987). "Diagnostics for Group Effects in Regression Analysis", *Journal of Business and Economic Statistics*, **5**, pp. 275-282.

Myers, S. (1977). "Determinants of Corporate Borrowing", *Journal of Financial Economics*, **5**, pp. 147-176.

Altman E. (1984). "A Further Empirical Investigation of the Bankruptcy Cost Question"; *The Journal of Finance,* **39**, pp. 1067-1089.

Andrade, G. and S. Kaplan (1998). "How Costly is Financial (not economic) Financial Distress – Evidence from Highly Leveraged Transactions that Became Distressed", *The Journal of Finance*, **53**, pp. 1443-1493.

Anderson, T.W. and C. Hsiao (1981). "Estimation of Dynamic Models with Error Components"; *Journal of the Amerivan Statistical Association,* **76,** pp. 598-606.

Ang. J.; Chua. J. and J. McConnell (1982). "The Administrative Costs of Corporate Bankruptcy: A Note" *The Journal of Finance,* **37**, pp. 219-226.

Arellano, M. and S. Bond (1991). "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations", *Review of Economic Studies*, **58**, pp.277-297.

Asquith, P.; Gertner, R. and D. Scharfstein (1994). "Anatomy of Financial Distress: An Examination of Junk-bond Issuers", *Quarterly Journal of Economics,* **109**, pp. 625 - 658.

Beaver, W. (1966). "Financial Ratios as Predictors of Failure", *Journal of Accounting Research* **4**, pp. 71-111.

Betker, B. (1997). "The Administrative Cost of Debt Restructuring: Some Recent Evidence" *Financial Management*, **26**, pp. 56-58.

Bond S. and J. Cummins (2000). "The Stock Market and Investment in the New Economy: Some Tangible Facts and Intangible Fictions", *Brookings Papers on Economic Activity*, **1**, pp.61-124.

Chen, G.; Cheung, J. and L. Merville (1997). "Indirect Cost of Financial Distress and Sales Performance", *Research in Finance,* **15**, pp. 35-54.

Cleary, S. (1999). "The Relationship Between Firm Investment and Financial Status", *Journal of Finance*, **54**, pp. 673-692.

Demirgüç-Kunt, A. and V. Maksimovic (1999). " Institutions, Financial Markets, and Firm Debt Maturiry", *Journal of Financial Economics*, **54**, pp. 295-336.

Doornik, J.; M. Arellano and S. Bond (1999). "Panel data estimation using DPD for Ox", *Working Paper, Nuffield College*, Oxford, *http://www.nuff.ox.ac.uk/users/doornik/.*

Fazarri, S.; Hubbard, R. and B. Petersen (1996). "Financing Constraints and Corporate Investment: Response to Kaplan and Zingales", *NBER Working Paper* No 5462.

Franks, J.; Nyborg, K. and W. Torous (1996). "A Comparison of US, UK, and German Financial Distress Codes", *Financial Management,* **25**, pp. 86-101.

Gertner, R. and D. Scharfstein (1991). "A Theory of Workouts and the Effects of Reorganization Law", *The Journal of Finance*, **46**, pp. 1189-1222.

Gilson, S. (1997). "Transactions Costs and Capital Structure Choice. Evidence from Financially

$FA_{it}=FA_{i,t-1}+I_{it}+ABD_{it}-ABD_{i,t-1}-BD_{it}$ (A.3)

Realigning terms, Eq. A.3 is transformed into expression A.4

$FA_{it}-ABD_{it}=FA_{i,t-1}-ABD_{i,t-1}+I_{it}-BD_{it}$ (A.4)

As $FA_{it}-ABD_{it}=NF_{it}$, i.e. the net fixed assets, the former equation can be rewritten more compactly as in Eq. A.5,

$NF_{it}=NF_{i,t-1}+I_{it}-BD_{it}$ (A.5)

From which the value of investment can be found:

$I_{it}=NF_{it}-NF_{i,t-1}+BD_{it}$.

-Employment policy

This variable measures the variation in the firm's number of employees between one period and the previous one:

$$\Delta EMP_{it}=\left(\frac{N^{o}\,EMP}{K}\right)_{it}-\left(\frac{N^{o}\,EMP}{K}\right)_{it-1}$$

- Sector

The average growth rate of the sectoral profitability is measured as:

$$SECTOR_{it}=\left(\frac{(EBIT_{it}/K_{it})}{(EBIT_{it-1}/K_{it-1})}-1\right)_{Sec}$$

where $EBIT_{it}$ denotes the earnings before interest and taxes of each firm i in the sector.

-Size

$SIZE_{it}$ = *ln Sales*$_{it}$

References:

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

- Tobin's q

$$Q_{it}=q_{it}-q_{itsec}$$

where q_{it} is the firm's Tobin's q, and q_{itsec} is the average Tobin's q of its sector. Tobin's q is calculated as follows:

$$Q_{it}=\frac{MVE_{it}+PS_{it}+MVD_{it}}{K_{i-t}}$$

where PS_{it} is the book value of the firm's outstanding preferred stock; and MVD_{it} is the market value of debt, which is obtained as the sum of the book value of short term debt ($BVSTD_{it}$) and the market value of long term debt ($MVLTD_{it}$).

-Investment policy

This variable measures the variation in the firm's investment between one period and the previous one:

$$\Delta INV_{it}=\left(\frac{I}{K}\right)_{it}-\left(\frac{I}{K}\right)_{it-1}$$

where a firm's investment (I_{it}) is calculated according to the proposal by Lewellen and Badrinath (1997) as follows:

Let FA_{it} be the gross book value of the tangible fixed assets of the period t, R_{it} the gross book value of the old assets retired during year t, ABD_{it} the accumulated book depreciation for year t, and BD_{it} the book depreciation expense corresponding to year t. Then we have the following equalities:

$$FA_{it}=FA_{i,t-1}+I_{it}-R_{it} \qquad \text{(A.1)}$$

$$ABD_{it}=ABD_{i,t-1}+BD_{it}-R_{it} \qquad \text{(A.2)}$$

If we solve Eq. A.2 for R_{it} and substitute it into *Eq*. A.1, we obtain A.3,

defined as $l_{it}=(IPLTD_{it}/BVLTD_{it})$, where $IPLTD_{it}$ is the interest payable on long term debt, which has been obtained by distributing the interest payable between short and long term debt depending on the interest rates. That is:

$$IPLTD_{it} = \frac{i_l * BVLTD_{it}}{i_s * BVSTD_{it} + i_l * BVLTD_{it}} * IP_{it}$$

where IP_{it} is the interest payable, and i_s stands for the interest rate of short term debt, also reported in the Main Economic Indicators.

- *Replacement value of capital*

$$K_{it}=RF_{it}+(TA_{it}-BI_{it}-BF_{it}-BI_{it})$$

where RF_{it} is the replacement value of tangible fixed assets, TA_{it} is the book value of total assets, BI_{it} is the book value of inventories, BF_{it} is the book value of tangible fixed assets and BI_{it} is the book value of inventories. The last four terms were obtained from the firm's balance sheet, and the first one was calculated according to Perfect and Wiles (1994).

$$RF_{it} = RF_{it-1}\left[\frac{1+\phi_t}{1+\delta_{it}}\right] + I_{it}$$

for $t>t_0$ and $RF_{it0}=BF_{it0}$, where t_0 is the first year of the chosen period, in our case 1990. On the other hand, $\delta_{it}=D_{it}/BF_{it}$ and $\phi_t=(GCGP_t-GCGP_{t-1})/GCGP_{t-1}$, where $GCGP_t$ is the growth of capital goods prices reported in the Main Economic Indicators, which is published by the Organization for Economic Cooperation and Development (OECD).

- *Holding of liquid assets*

$$LA_{it} = \frac{CA_{it}}{K_{it-1}},$$

where CA_{it} denotes the firm's current assets.

in the model are Earnings Before Interests and Taxes ($EBIT_{it}$), Financial Expenses (FE_{it}), and Cumulative Profitability (CP_{it}); all of them scaled by the replacement value of the total assets ($K_{i,t-1}$) in the beginning of the period.

The econometric methodology used to estimate this model can be summarized as follows. Once the econometric specification of the model has been developed according to the financial theory, it is estimated by using panel data methodology (i.e., a panel data model with a discrete dependent variable) to check the robustness of the model by eliminating the unobservable heterogeneity. Next, the robust model is estimated in cross-section to incorporate the individual heterogeneity into the probability of financial distress provided by the logit model. Note that the values obtained for the probability of financial distress range from 0 to 1, thus it is a suitable index to proxy the probability of financial distress that stakeholders ex-ante assign to each firm.

- *Leverage*

$$LEV_{it} = D_{it} - D_{itsec}$$

where D_{it} denotes the firm's debt ratio, and D_{itsec} the average debt ratio of its sector. Debt ratios are calculated as follows:

$$D_{it} = \frac{MVLTD_{it}}{MVLTD_{it} + VME_{it}}$$

where MVE_{it} is the market value of common equity; $MVLTD_{it}$ is the market value of long term debt, calculated as follows:

$$MVLTD_{it} = \left[\frac{1 + l_{it}}{1 + i_l}\right]^3 * BVLTD_{it}$$

where $BVLTD_{it}$ is the book value of long term debt; i_l is the interest rate of long term debt reported in the Main Economic Indicators; and l_{it} is the average cost of long term debt,

sales of the sector and the growth rate of the sales of the firm:

$$IC_{it} = \left(\frac{Sales_{it} - Sales_{it-1}}{Sales_{it-1}} \right)_{\text{sec}} - \left(\frac{Sales_{it} - Sales_{it-1}}{Sales_{it-1}} \right)$$

where $Sales_{it}$ denotes the firm's turnover, as measured by the gross sales reduced by cash discounts, trade discounts, returned sales excise taxes and value-added taxes and allowances for which credit is given to customers.

- Probability of financial distress

To proxy the probability of financial distress, we followed the methodology developed by Pindado, Rodrigues and de la Torre (2004). This approach is based on Cleary (1999), who adapts Altman (1968) by using a new methodology characterized by the use of stock variables at the beginning of the period and flow variables at the end of the period as explanatory variables. These variables are normalized by the replacement value of total assets at the beginning of the period, instead of the book value used by Cleary (1999). Like Pindado and Rodrigues (2004), the resultant model is more parsimonious than previous models using discriminant or logistic analysis to obtain the probability of financial distress, PI_{it}. Specifically, the model proposed for proxying the probability of financial distress is as follows:

$$Prob\,(Y>0) = \beta_o + \beta_1 EBIT_{it}/ K_{i,t-1} + \beta_2 FE_{it}/ K_{i,t-1} + \beta_3 CP_{i,t-1} / K_{i,t-1} + d_t + \eta_i + u_{it}$$

The dependent variable is a binary variable that takes value one for financially distressed companies, and zero otherwise. Like Wruck (1990), Asquith, Gertner and Scharfstein (1994), Andrade and Kaplan (1998) and Whitaker (1999), a firm is classified as financially distressed whenever their Earnings Before Interests, Taxes, and Amortizations are lower than their financial expenses. The explanatory variables included

estimated probability turns out to be better than traditional leverage-based indicators. In fact, its coefficient is highly significant and presents the correct sign for all the countries analyzed, providing more stable information regarding the consequences of the probability of financial distress for financial distress costs. Moreover, the separation between the effect of this probability and that of leverage is one of the major contributions of this work, since it allows us to adequately take into consideration the potential benefits of leverage in financial crises. Actually, consistent with Jensen (1989a) and Wruck (1990), our results show that leverage negatively affects financial distress costs in all the analyzed countries.

Financial distress costs are also negatively related to the holding of liquid assets in all countries, thus confirming that the benefits of keeping higher levels of liquid assets more than offset their opportunity cost. The relation between financial distress costs and the investment policy is negative, showing that the underinvestment problem is more relevant than the overinvestment one. Concerning the employment policy, the labor legislation makes employment reductions an unfeasible option for facing a financial distress process. Finally, institutional differences exert a direct influence on financial distress costs, especially regarding their sensitivity to leverage across countries.

Appendix. Variable definitions

- *Financial distress costs*

Our dependent variable is measured as the difference between the growth rate of

problem is more relevant than the overinvestment one. The results for the employment policy variable support that, in general, this mechanism of facing financial distress is less disadvantageous for high-probability firms (see the linear restriction test in the last column of Table 4). Finally, the results obtained for the z_3 Wald test reject the null hypothesis of the non-joint significance of the country dummies, thus supporting the relevance of institutional differences across countries for the analysis of financial distress costs.

7. Conclusions

This study represents an integration between two lines of research on financial distress: the empirical studies on financial distress prediction, and the studies on financial distress costs. Additionally, it provides evidence at an international level on the determinants of financial distress costs, by using samples of several countries, which are representative of different legal systems. The estimation method used represents an important innovation, too. We have used the panel data methodology to eliminate the unobservable heterogeneity, and control for the endogeneity problem.

To achieve our main objective of developing a model of financial distress costs we also include important advances in the choice of the explanatory variables, their measurement and sectoral adjustments, and their interpretation. In this way, instead of leverage itself, we have estimated an alternative indicator of the probability of financial distress, which is explained in essence by the trade-off between a firm's capacity to generate returns and financial charges reflecting the burden of its debt service. This

the UK and Germany, our study integrates financial distress costs into the debate about investor protection across these countries' laws. We have controlled for institutional effects in our model by comparing the absolute values of the estimated coefficients of the leverage variable across countries, since the coefficient of this variable is negative. The expected relation between the coefficients of the countries analyzed is: the more debtor friendly the code, the higher the coefficient of the leverage variable. As shown in the first column of Table 4, financial distress costs in US firms present the highest sensitivity to leverage; this sensitivity is the lowest for UK firms (second column of the table); and German firms lie somewhere in between. These results confirm that, as Franks, Nyborg and Torous (1996) and Kaiser (1996) point out, German laws present a smaller pro-debtor bias than US laws, in spite of the latter being of common origin and, consequently, being expected to more strongly protect investors (La Porta, Lopez-de-Silanes, Shleifer and Vishny, 1997; 1998).

Additionally, we have performed an analysis of the sensitivity of the variable coefficients to make a suitable interpretation of the determinants of financial distress costs. This way, our financial distress costs model has been estimated for the full sample including country dummy variables, $\mathbf{c_t}$ **,** in the error term (i.e. $\varepsilon_{it} = \eta_i + d_t + c_t + v_{it}$). As shown in the last column of Table 4, where the GMM estimation results of this global model are provided, the coefficients of all explanatory variables are significant and of the expected sign, thus corroborating the correct specification of the proposed model. In short, we find that financial distress costs are positively related to the probability of financial distress, and negatively related to leverage and the holding of liquid assets. The negative coefficient of the investment policy variable confirms that the underinvestment

distress costs borne by UK and German firms, whereas it does not seem to be so relevant in the US. The significance of the sector effect confirms that the magnitude of the financial distress costs borne by the firm is conditioned by the growth rate of the sectoral profitability. Finally, the size variable is significant for all the analyzed countries, which confirms its relevance as a control variable in our model.

6.2 Financial distress costs in different institutional contexts

One of the major contributions of our study is that it offers the possibility of analyzing how the differences in institutional contexts across countries influence financial distress costs. The studies of La Porta, Lopez-de-Silanes, Shleifer and Vishny (1997), La Porta, Lopez-de-Silanes and Shleifer (1998) and Demirgüç-Kunt and Maksimovic (1999) examine the impact of the different legal systems on firms' financial structure in general, and on financial distress processes in particular. These studies opened a new strand of financial literature that explicitly takes into account the degree of investor protection in a more systematic way than it was untill the 1990s.

Within this context, the countries analyzed in our study allow us to compare different classifications of institutional systems. La Porta, Lopez-de-Silanes, Shleifer and Vishny (1997, 1998) point to the legal tradition (common law *versus* civil law) as the most important institutional feature affecting firms' financing. The US is a common-law country that is expected to strongly protect investors and, accordingly, would have a *pro* creditor code similar to that of the UK. However, Franks, Nyborg and Torous (1996) and Kaiser (1996) characterize the US code as more debtor friendly in several bankruptcy legislation features than the German code, which is civil in origin. Focusing on the US,

divestitures mainly consist of abandoning profitable projects. This result indicates that the ex-post financial distress costs could be a source of underinvestment, supporting the inverse relationship between investment and ex-post financial distress costs found in Asquith, Gertner and Sharfstein (1994), and Andrade and Kaplan (1998).

As shown in Table 4, the coefficient of the employment policy variable is significant, except for the US. The negative coefficient found for UK and German firms indicates that in these countries the labor legislation makes employment reductions an unfeasible option for facing the financial distress situation. However, the costs of this policy vary depending on the probability of financial distress, this dependence being conditioned by the institutional context. This evidence points out the need of jointly analyzing the employment policy and the probability of financial distress. In fact, the coefficient of the interaction term, γ_1, is significant for all countries, which confirms that there are differences in the intensity with which financial distress costs react to variations in employment between firms with low and high probability of financial distress. Moreover, the consequences of employment policy in high-probability firms differ across countries, the US being the only country where firms with a high probability of financial distress could use employment to mitigate their financial distress costs. Note that the effect of employment reductions in high-probability UK and German firms is negative and significant (see the linear restriction tests in Table 4)

The coefficients of Tobin's q, sector and size variables are generally significant, which confirms that these effects should be controlled for when analyzing financial distress costs. The negative sign of the coefficient of Tobin's q in the UK and Germany indicates that the existence of good investment opportunities mitigates the financial

6.1. The determinants of financial distress costs

The first three columns of Table 4 present the GMM estimation results of our financial distress costs model for the US, the UK and Germany. The positive coefficient of *IPROB* for all the analyzed countries confirms that the expected effect of the probability of financial distress is correctly captured by the indicator proposed in this paper. Furthermore, the significance and correct sign of this coefficient across countries suggest that we are dealing with a better proxy for the probability of financial distress than those used in previous research, such as leverage. This is reinforced by the role the leverage variable plays in our model, whose coefficient is significant and negative for all countries. Consistent with Jensen (1989a, 1989b) and Wruck (1990), this evidence reveals the benefits of leverage and, consequently, this variable does not proxy for the probability of financial distress. In fact, the negative effect of leverage has been revealed because a more suitable proxy for the probability of financial distress has been used. Also as expected, the holding of liquid assets is negatively related to financial distress costs in all cases. This result confirms that, as shown by Opler, Pinkowitz, Stulz, Williamson (1999), the benefits of maintaining relatively large stocks of liquid assets more than offset their implicit costs. That is, a more liquid asset structure can grant a low-cost and flexible mechanism of prevention of financial distress in the analyzed countries.

Concerning the reaction variables, the results are, in general, as expected. The investment policy variable always has a significant and negative coefficient, which supports that the underinvestment problem is more relevant than the overinvestment one. Our interpretation is that firms react to the financial distress by divesting, and that such

it is consistent because it eliminates unobservable heterogeneity. As Greene (2003) points out, efficiency must be considered a secondary criterion that helps us to choose the best estimator from among the consistent ones. In this way, as we have previously mentioned, our GMM estimation based on Arellano and Bond (1991) is not only consistent, but more efficient than other consistent estimators, such as the one proposed by Anderson and Hsiao (1981).

The estimation was carried out using DPD for Ox written by Doornik, Arellano and Bond (1999). To check for the potential misspecification of the model we used the Sargan statistic of over-identifying restrictions, which tests for the absence of correlation between the instruments and the error term. Additionally, we perform the m_2 statistic, developed by Arellano and Bond (1991), to test for lack of second-order serial correlation in the first-difference residuals. Finally, Table 4 provides two Wald tests as well. z_1 is a test of the joint significance of the reported coefficients, and z_2 is a test of the joint significance of the time dummies.

6. Results

In this section, estimation results of the proposed model of financial distress costs are presented. First, we discuss the determinants of financial distress costs in US, UK and German firms. Next, a global model is estimated to perform a sensitivity analysis, which will allow us to address the institutional influence on financial distress costs across countries.

the error term of our model, ε_{it}, has the following components:

$$\varepsilon_{it} = \eta_i + d_t + v_{it}$$

where η_i is the firm specific effect that captures unobservable heterogeneity; d_t is the time effect that captures the influence of macroeconomic variables; and v_{it} is the random disturbance.

Besides heterogeneity, the endogeneity of the explanatory variables may also bias our results. In fact, it is hard to assume the strict exogeneity of the explanatory variables in our model, since there may be a delay between the financial decision and its execution. Particularly, investment and employment policies are simultaneously determined with financial distress costs and, consequently, they are clearly endogenous in the model. We have thus estimated our model by using the generalized method of moments (GMM), which allows us to control for the endogeneity of all the explanatory variables by using instruments. Following Arellano and Bond (1991), we have used all the right-hand side variables in the model lagged twice or more as instruments. This strategy, which consists of obtaining additional instruments using the orthogonality conditions that exist between lagged values of the right-hand side variables, improves efficiency in our estimations with respect to other GMM estimators.

Although the above-mentioned simultaneity between financial distress costs and the investment and employment policies can also be controlled by using a simultaneous equation estimator (e.g., maximum likelihood and two- or three-stage least squares) our choice is based on consistency concerns. In other words, the above- mentioned estimators are more efficient than GMM, but they are not consistent since they do not eliminate unobservable heterogeneity. In contrast, our GMM estimation implies less efficiency, but

Helping to reduce this survival bias, our panels combine the available CG Industrial Active files (containing information on active companies) and CG Industrial Research files (providing data on companies which were suspended from quotation for some reason after a certain period in the capital market[5]). The structure of the panel by number of companies and number of annual observations per country is provided in Table 1.

All the companies in our samples have been organized in nine broad economic industry groups in accordance with SIC - *Economic Sector Codes* –to exclude financial companies (code 5000), since they have their own specificity in financial distress. Table 2 shows the sectoral diversity of these panels, which allows us to make the necessary sectoral adjustments of the variables. The summary statistics of the variables used in the estimation are shown in Table 3.

5. Estimation method

Our model of financial distress costs has been estimated by using the panel data methodology. Unlike cross-sectional analysis, the panel data methodology has a great advantage, since it allows us to control for individual heterogeneity and, consequently, to eliminate the risk of obtaining biased results because of such heterogeneity (Moulton, 1986, 1987). Specifically, we control for heterogeneity by modeling it as an individual effect, η_i, which is then eliminated by taking first differences of the variables. This way,

[5] Firms that filed for bankruptcy are an example. However, companies in such a situation only represent a small percentage of the available data and, even in these cases, the available information is of poor quality as a natural consequence of the degradation of information flows characterizing severe crises.

4. Data

The scope of our analysis requires both enough sectoral and institutional diversity to develop a general model explaining financial distress costs. We have thus used an international database – the Compustat Global Vantage (CG) – as our source of information. Unlike other approaches followed in previous research, the econometric methodology applied in this paper requires data for at least six consecutive years. In fact, having five periods is a necessary condition to test for second-order serial correlation (Arellano and Bond, 1991) and, since we lost one year of data in the construction of some variables (see Appendix), six consecutive periods are needed. Unfortunately, there are only three countries for which samples with the mentioned structure can be selected, namely the US, the UK and Germany. Besides being highly representative in the world economy, these three countries allow us to account for a variety of institutional environments in order to examine how the different legal systems influence financial distress costs. In fact, the US, the UK and Germany cover a broad spectrum of financial distress procedures regarding their pro-debtor and pro-creditor biases (see Franks, Nyborg and Torous, 1996).

For each country, we have constructed an unbalanced panel comprising companies with six to ten year-data between 1990 and 1999, which allows the number of observations to vary across companies, thus representing added information for our model. This way we can use the largest number of observations and reduce the possible survival bias that arises when the observations in the initial cross-section are independently distributed and subsequent entries and exits in the panel occur randomly.

facing financial distress. Furthermore, the interaction of this variable and the *DEMP* dummy will allow us to investigate whether there are differences in the intensity with which financial distress costs react to variations in employment between firms with low and high probability of financial distress (β_5 *versus* $\beta_5 + \gamma_1$). The comparison of the coefficient of this variable between these two categories of firms requires checking the statistical significance of the coefficient when the dummy variable takes value one; we have thus performed a linear restriction test of the null hypothesis H_0: $\beta_5 + \gamma_1 = 0$.

Regarding the control variables, they are significant and show the expected sign, hence we can conclude that these variables should be controlled for. The significance of the coefficient of Tobin's q will support the need to control for investment opportunities when explaining financial distress costs. The idea is that if a firm has good investment opportunities as compared to its sector, this could mitigate the financial distress costs borne by the firm. The sector variable is intended to capture the effect of the economic performance of the industry on a firm's individual performance. Therefore, a positive coefficient of this variable will imply that financial distress costs are lower in growing sectors, whereas the opposite sign will indicate that those firms in declining and mature sectors are the ones bearing lower financial distress costs. Finally, a negative sign of the coefficient of the size variable will confirm that larger firms deal more easily with financial distress. However, the effect of this variable on financial distress costs is not so straightforward, since larger firms may face greater difficulties in expanding than other firms of smaller size in their sector.

with our indicator of financial distress costs to validate our proxies for these two variables. Consistent with Jensen (1989a, 1989b) and Wruck (1990), a negative coefficient of adjusted leverage will support the benefits of leverage in improving performance and reducing financial distress costs. A negative relationship between financial distress costs and the holding of liquid assets will imply that insolvent firms can take advantage of maintaining larger stocks of this kind of assets, instead of them leading to more enduring situations of financial distress.

The explanatory variable that accounts for the investment reaction policy in our model is the change in a firm's investment rate, since this variable allows us to address which investment distortion (underinvestment or overinvestment) has a stronger effect on the financial policy. Thus, a negative coefficient of this variable would indicate that divestures increase the financial distress cost, and, consequenttly, that the negative effect of foregoing negative net present value (NPV) projects outweigths the positive effects of abandoning negative NPV projects. If this is the case, we could conclude that the underinvestment problem has a stronger effect on the financial policy than the overinvestment problem.

The employment policy is also treated as a reaction variable, but its use as a way of dealing with financial crises will be more dependent on the institutional context, because the country-specific employment laws impose serious restrictions to employment reductions even in cases of financial distress. Hence, we can take advantage of a joint analysis of this variable and the financial distress probability. This way, a negative relation between the employment variable and financial distress costs will suggest that labor legislation can turn employment reductions into an economically feasible policy for

Chen, Cheung and Merville (1997) suggest that the financial distress status of the firm must be considered jointly with its investment opportunities when analyzing sales performance. Although the book-to-market ratio is sometimes used as proxy for investment opportunities, Pindado and de la Torre (2003) show that Tobin's q is better, and Lang, Ofek and Stulz (1996) find a strong positive relationship between Tobin's q and all proxies for a firm's growth. These findings lead us to anticipate that a firm's investment opportunities (Q_{it}) will influence its expected sales growth. Differences in sectoral performance ($SECTOR_{it}$) are also entered into our model, since a firm performance can only be evaluated by taking into account the trend followed by the average earnings before interest and taxes (EBIT) of its sector (Opler and Titman, 1994). Note that, following Opler and Titman (1994) and Bond and Cummins (2000), we also account for sectoral effects by adjusting leverage and Tobin's q, whose influence strongly depends on their average sectoral levels. These adjusted variables should present stronger evidence on the effect of leverage and investment opportunities on financial distress cost. Finally, according to Rajan and Zingales (1995), size would be a proxy for the inverse of the probability of financial distress, a traditional assumption that relies on the negative correlation that may be established between size and cash flow volatility. Chen, Cheung and Merville (1997) point out that the firm size is a potential determinant of its sales performance, and that the negative impact of financial distress costs is higher in smaller firms.

We now turn to the expected signs of the coefficients of the explanatory variables of our model, according to the arguments discussed in the previous section. The probability of financial distress variable is expected to maintain a positive relationship

3. A model of financial distress costs

In this section, we propose a model in which financial distress costs are explained by the probability of financial distress occuring and the determinants of the costs that this situation would give rise to, controlling for investment opportunities, sector and size effects. Given this premise, our financial distress costs model is as follows:

$$IC_{it} = \beta_o + \beta_1 IPROB_{it} + \beta_2 LEV_{it} + \beta_3 LA_{it} + \beta_4 \Delta INV_{it} + (\beta_5 + \gamma_1 DEMP_{it}) \Delta EMP_{it}$$

$$+ \beta_6 Q_{it} + \beta_7 SECTOR_{it} + \beta_8 SIZE_{it} + \varepsilon_{it} \qquad (1)$$

where IC_{it} denotes financial distress costs as measured by the difference between the growth rate of the sales of the sector and the growth rate of the sales of the firm; $IPROB_{it}$ is the probability of financial distress; LEV_{it} is the firm's leverage adjusted to its sector; LA_{it} denotes the firm's holding of liquid assets; ΔINV_{it} and ΔEMP_{it} stand for changes in the firm's investment and employment policies, respectively; $DEMP_{it}$ is a dummy variable which takes value one if the firm's probability of financial distress is higher than the average probability in its country, and zero otherwise; Q_{it} is the firm's Tobin's q adjusted to its sector; $SECTOR_{it}$ is the average profitability of the firm's sector; $SIZE_{it}$ is the logarithm of the firm's sales; and ε is the random disturbance[4].

The econometric specification of the model reflects our idea that financial distress costs are determined by both the probability of financial distress and the ex-post financial distress costs, proxied by leverage, holding of liquid assets, and changes in investment and employment policies. Additionally, we also control for the effect of another three variables on a firm's sales performance to make a correct specification of the model.

[4] The first subscript of the variables, i, refers to the individual cross-sectional unit, and the second, t, to the time period. A detailed definition of the variables can be found in the Appendix.

firm's investment policy may also be influenced by the investment opportunity set and even by financial constraints, which, according to Fazzari, Hubbard and Petersen (1996), is a different concept from financial distress. However, the effect of financial constraints is accounted for in our research by means of the leverage and liquid asset variables, and investment opportunities are explicitly controlled for in our financial distress costs model, as will be discussed in Section 3.

2.5.2. The relation between employment and firms' restructuring

According to Opler and Titman (1994), financial distress *per se* does not have a significant effect on investment nor assets sales, whereas employment is seriously affected during financial crises. Our expectation is that employment usually follows the trend of sales performance. This direct relation may be the result of the agency conflicts that exist between shareholders and creditors, since the latter may require production and labor restructurings as a way of assuring debt payments. In fact, insolvent firms, as John, Lang and Netter (1992) and Ofek (1993) point out, usually make use of employment reductions as a way of restructuring. However, we must take into account that this policy may be highly conditioned by the legal costs that the specific labor legislation imposes. Consequently, it is important to evaluate whether firms change their employment policies and in which way when facing a high probability of financial distress, and how this process is influenced by the institutional context.

selected these two decisions as responses to financial distress[3], which will have a dynamic impact on the current performance of the firm. Including these reaction variables implies the existence of simultaneity in our financial distress costs model, because of the dynamic way in which investment and employment policies relate to financial distress costs.

Asquith, Gertner and Scharfstein (1994) and Opler and Titman (1994) also recognize that firms' investment and employment behavior is affected during a financial crisis, and offer an attempt to evaluate this connection by analyzing common determinants of both policies and bankruptcy costs. We go one step further, since both investment and employment policies are incorporated in our model as explanatory variables of financial distress costs, which allows us to explicitly take into account the potential simultaneity between them. Note that despite the problems that this simultaneity would have in a traditional ordinary least squares framework, the generalized method of moments methodology we propose, which will be discussed in Section 5, is suitable for dealing with the simultaneity between the dependent and the explanatory variables in the model.

2.5.1. Investment and financial distress

Asquith, Gertner and Scharfstein (1994) and Andrade and Kaplan (1998) find that there is a big decline in capital expenses in insolvent firms. Therefore, a negative relation between investment and financial distress costs is expected, specially when considering the firm's investment policy as a mechanism of reaction to financial distress processes. A

[3] Note that if all decisions were considered, then we would be measuring the "non-management costs", not the inability of the firm to achieve a good financial position in its sector.

are used as a good and necessary first line of defense against financial distress or, in contrast, they extend the inefficient conditions by slowing the reaction to the crisis remains open.

2.5. The reaction to the crisis: Investment and employment policies

As financial distress turns more serious and the probability of bankruptcy rises, the way in which firms react to the crisis must also be taken into account. We have selected a set of managerial decisions that are simultaneously determined with financial distress costs, thus having a dynamic impact on them, to introduce the reaction to the crisis in our model.

According to Kuhurana and Lippincott (2000), firms' restructurings can be classified in two basic categories: one consists of firing employees, the other in abandoning business lines. John, Lang and Netter (1992), Ofek (1993) and Opler and Titman (1994) also relate certain managerial decisions to the way in which firms react to a situation of financial distress. Specifically, John, Lang and Netter (1992) show that firms react with promptness to financial distress by reducing the number of employees, the labor costs, and the sales costs.

The eventual recovering or bankruptcy of the firm will be the result of a trade-off between the benefits of the firm's reaction and the financial distress costs it bears. However, beyond a certain point, these costs may be high enough to offset the capacity of management to react. Previous literature emphasizes the investment and employment policies as the most important mechanisms to deal with a crisis. In this context, we have

It is worth mentioning that both hypotheses of the positive and negative effect of leverage on financial distress costs are not mutually exclusive, and that these opposing effects may offset each other with leverage turning out not to be significant in explaining financial distress costs. Therefore, we should consider these opposing effects of leverage when incorporating this variable in our model; however, we expect that the management reaction to a higher leverage translates into better performance and, consequently, the relationship between leverage and financial distress costs will be negative.

2.4. The trade-off between the benefits and costs of the holding of liquid assets

The holding of liquid assets is another factor that has been historically linked to the analysis of financial distress, particularly from a short term perspective. Liquid assets are usually considered a backing against crises, since they allow firms to save funds, for example by not being obliged to sell assets in unfavorable conditions to face their payment obligations (Shleifer and Vishny, 1992) or by avoiding the higher cost of other sources of funds to finance their activities and investments (Mikkelson and Partch, 2003).

Alternatively, it has also been shown that insolvent firms usually waste their liquid assets covering losses, instead of allocating them to profitable projects (Opler, Pinkowitz, Stulz, and Williamson, 1999). Moreover, as John (1993) and Opler, Pinkowitz, Stulz, and Williamson (1999) argue, the holding of liquid assets causes firms to bear an opportunity cost because of the lower return on this kind of assets.

In short, financial literature recognizes the benefits and costs of the holding of liquid assets, but we do not know how the trade-off between benefits and costs of these assets affects financial insolvency. Therefore, the discussion about whether liquid assets

financial distress, respectively.

2.3. The role of the leverage in the financial distress process

The issue of the causes and consequences of financial distress costs has often been immersed in the capital structure puzzle, which has led to only a weak development of a specific theory that remains disconnected from the empirical research on financial distress and bankruptcy prediction. Leverage continues to be considered a basic explanatory variable in modeling financial distress costs, and the positive relationship between leverage and the probability of financial distress and, consequently, between leverage and financial distress costs, has been generally assumed (Opler and Titman, 1994).

However, these relations turned out to be too simplistic and began to be seriously challenged by the agency arguments in Jensen (1989a, 1989b) and Wruck (1990). These authors offer a new perspective of the problem, in which not only the costs, but also the potential benefits of debt for financial distress processes are considered. For instance, Jensen (1989a) states that organizational, ownership, and control structures have evolved in a way that it is possible for firms to take advantage of financial distress as a starting point towards an efficient restructuring. There is thus a trade off between the costs and benefits of leverage and, as Jensen (1989a) points out, the latter are generally higher than the former and, consequently, a positive relationship between leverage and performance is expected. Additionally, Ofek (1993) offers results consistent with the argument that higher pre-distress leverage improves the short term reaction of the firm to poor performance.

less developed indicator based on Altman's *Z Score*, and conclude that the main indirect financial distress cost is the opportunity cost associated with the abnormal fall in sales and the consequent reduction in market value[1]. However, this relationship between economic fundamentals and firm value is not clear. Following Pindado, Rodrigues and de la Torre (2004), we have applied a new methodology to obtain the probability of financial distress that presents important innovations. This approach consists first of the estimation of fixed and random effect logistic models for panel data, which ensures the correct specification of the probability of financial distress model by controlling for unobservable heterogeneity. Second, and once the correct specification of the model is ensured, a more consistent estimation of the probability of financial distress for each year and country is obtained[2].

This probability is entered into our model owing to the need to consider not only the consequences of the financial distress in the case of it occurring, but also the consequences of the probability of its occurrence. At the same time, using this variable leads to a better specified model, since it allows us to control for the effect of the probability of financial distress on other variables that have been traditionally used as proxies for this probability, not only leverage (Opler and Titman, 1994) but also debt service ratios (Andrade and Kaplan, 1998).

Our measure of the probability of financial distress is expected to maintain a positive relationship with our financial distress costs variable, since this relation will validate the usefulness of both indicators as proxies for the probability and costs of

[1] Chen, Cheung and Merville (1997) provide empirical evidence on the fact that when controlling for size, leverage and intangible assets, the financial status of the firm (as measured by the variation in the average Z Score during the last four periods) determines the trend followed by the firm's sales.
[2] More details on this estimation strategy can be found in the Appendix.

Within this context, we measure financial distress costs by an indicator of performance, understood as a wide concept of profitability. As in Altman (1984), the sales variable is used to evaluate the financial distress costs, because this variable is less influenced by specific institutional characteristics than market values or earnings. Moreover, and according to the proposal of Opler and Titman (1994) we evaluate the seriousness of the crisis by comparing the growth rate of the firm's sales with the growth rate of the sales of its sector. In fact, insolvent firms have a strong tendency to lose their position inside their sector, even if they do not get involved in bankruptcy processes. Hence, our view of financial distress costs relies on the fact that the sectoral behavior may not be proportionally distributed among all firms, and insolvent firms always go behind the rest of them.

2.2. A more accurate proxy for the probability of financial distress

Previous research on financial distress costs has traditionally used leverage to capture the effect of the probability of financial distress. Like Opler and Titman (1994), many scholars have assumed that these two variables are closely connected, without taking into account that according to Jensen (1989a) there is a trade off between the costs and benefits of leverage.

Unlike prior studies, we propose a measure of the probability of financial distress that stems from the estimation of logistic models and captures most of the impact of financial distress on performance. Chen, Cheung and Merville (1997) use a similar but

2.1. Indirect financial distress costs

Financial literature has traditionally differentiated two types of financial distress costs, namely direct and indirect costs (see, for instance, Kim, 1978).

On the one hand, as we have previously mentioned, a relative consensus about direct financial distress costs has already been reached and, since the first attempt of Warner (1977) to measure them, subsequent empirical evidence is quite unanimous about their low relative value in proportion to the firm's pre-bankruptcy market value. Warner (1977) estimated direct financial distress costs of 5.7% of the total market value of the firm's debt and equity issues. Ang, Chua and McConnell (1982), and Weiss (1990) report percentages of 2% of the firm value and 3.1% of the market value of equity plus the book value of debt, respectively. More recently, Gilson, John and Lang (1990), Gilson (1997) and Betker (1997) also quantify the direct financial distress costs, and reach similar values, always around 2 to 4%.

On the other hand, indirect financial distress costs are in essence the consequence of running a firm that cannot meet its financial obligations. In contrast to the former, these costs have an unobservable nature, and were properly considered as opportunity costs by Warner (1977). Despite the difficulty in measuring them, our study focuses on indirect financial distress costs, not by quantifying the losses in terms of market value, but identifying the determinants of these losses. This way, our explanatory model of financial distress costs may lead the main stakeholders to be more conscious of the determinants of their firms' losses in case of financial distress and to be able to avoid them.

critical point when a firm reaches a financial distress situation, that is, when its earnings before interests, taxes, and amortizations (EBITDA) are smaller than its financial expenses.

We have thus adopted a definition of financial distress that emphasizes the initial period of development of the process, when it is still possible for the firm to react and recover, although bearing most of the indirect financial distress costs. This definition focuses on a financial concept of financial distress which, as opposed to bankruptcy, does not depend on the legal consequences of this situation and, consequently, is not country specific. Following this definition, we obtain an indicator of the probability of financial distress that integrates recent developments of financial theory and, at the same time, can be applied to different country/economic and legal contexts.

By adopting this indicator of the probability of financial distress we can go futher in our insight about the role played by other variables in a firm's financial distress costs. Specifically, the model we propose here to explain financial distress costs takes into account, on the one hand, the probability of financial distress occuring and, on the other, the costs originated by such a situation. As discussed below, these ex-post financial distress costs are determined to some extent by several firm characteristics (leverage and the holding of liquid assets) and by the dynamic effect of the firm's investment and employment policies as a way to react to the crisis.

main results of the estimation of our model of financial distress costs, making a particular reference to the role played by the institutional context. Finally, Section 7 presents our conclusions.

2. Theory

Previous literature on financial distress costs reveals a weak development of a specific theory, which remains quite disconnected from the empirical research on financial distress and bankruptcy. It was not until the 90's that scholars began to develop explanatory models that were no longer limited to the study of bankrupt firms. In fact, White (1996) points to ex-ante financial distress costs as the most important source of bankruptcy costs. Moreover, Ward and Foster (1997) point out that studying only bankruptcy leads to an important bias because firms usually get into a financial distress cycle and a lack of financial flexibility several years before filing for bankruptcy, and Pindado and Rodrigues (2004) also indicate that bankruptcy is only one of the possible outcomes of financial distress, which is mainly of a legal nature, without any specific economic and univocal significance.

Accordingly, Opler and Titman (1994) applied a broader definition of financial distress as the non-sporadic situation where companies can no longer meet their liabilities when they become due, and either break their commitments with creditors or face them with severe difficulties. Wruck (1990), Asquith, Gertner and Scharfstein (1994), Andrade and Kaplan (1998) and Whitaker (1999) use a similar definition to characterize the

developed countries (the US, the UK and Germany) by the generalized method of moments (GMM), which allows us to solve endogeneity problems by using instruments. We also control for the unobservable heterogeneity, which arises when the individuals analyzed are firms, by using the panel data methodology.

Our results indicate that financial distress costs are positively related to the probability of financial distress, and negatively related to leverage and the holding of liquid assets. The negative coefficient of the investment policy variable supports the idea that the potential benefits of first eliminating any non-profitable projects for firms facing financial distress will be exceeded by the underinvestment costs that arise when the firm is forced to abandon and/or forgo profitable investments. Our evidence also indicates that there is a general tendency to reduce employment following the deterioration of the financial condition of the firm; however, the effect of this policy on financial distress costs depends on the different institutional systems. Finally, we find that differences in legal systems exert a direct influence on our model, financial distress costs in US firms being the most sensitive to the probability of financial distress, leverage and liquidity of assets, whereas this sensitivity is the lowest for UK firms, and German firms lie somewhere in between.

The remainder of the paper is organized as follows. In Section 2 we describe the theoretical framework, highlighting the advantages of considering an indicator of the probability of financial distress other than leverage, and formulate our hypotheses. Section 3 specifies an explanatory model of financial distress costs that allows us to test our hypotheses. Sections 4 and 5 describe the data set used in our study and the estimation method, respectively. Throughout Section 6, we present and comment on the

distress. However, as Jensen (1989a) states, the relationship between debt and financial distress is perhaps one of the least understood aspects of organizational evolution, and leverage can also be beneficial for financially distressed firms (see Jensen, 1989b; Wruck, 1990; Ofek, 1993). Consequently, our study distinguishes between the effect of the probability of financial distress and that of leverage, by using an alternative and more accurate indicator of this probability that would allow us to examine the real effect of leverage on financial distress costs. Additionally, the international scope of our study permits us to analyze how the different institutional systems influence financial distress costs. In fact, the financial insolvency law is recognized nowadays as one of the most important aspects of the institutional framework and, as Jensen (1989a) remarks, we cannot circumscribe the impact of financial distress to the problem of investor protection and to those firms that opt for legal bankruptcy procedures.

In summary, our main objective is to provide evidence on the determinants of financial distress costs, by integrating both the studies on financial distress prediction and the studies on financial distress costs. To achieve this aim, we have developed a model in which financial distress costs are determined, on the one hand, by the probability of financial distress and, on the other, by a set of variables that, according to financial theory, explain the magnitude of the costs borne by a firm in case of financial distress. We thus assume that the probability of financial distress influences, directly and/or indirectly, a firm's performance. This way, financial distress costs correspond to a negative performance, as measured by the variation in the firm's sales (as proposed by Altman, 1984) in relation to the average variation in the sales in its sector.

The resulting model has been estimated on large data panels of three well-

1. Introduction

This study integrates two lines of research that had so far been developed separately, without exploring the potential of cross-fertilization. The first one, mainly theoretical, deals with financial distress costs. The second one finds its roots in the empirical studies on financial distress prediction. This integration relies on the idea that financial distress costs are determined, on the one hand, by the probability of financial distress, and on the other, by the costs that the firm will incur in case of financial distress (ex-post financial distress costs).

Financial literature on financial distress costs focused firstly on direct financial distress costs, which are the administrative and legal costs of the bankruptcy process. This strand of literature (see, for instance, Warner, 1977; Ang, Chua and McConnell, 1982; Weiss, 1990; Gilson, John and Lang, 1990; Gilson, 1997; Betker, 1997) seems to have already reached a relative consensus about the low weight of this type of costs in the total loss suffered by a large quoted firm filing for bankruptcy. On the other hand, the interest in indirect financial distress costs, i.e. those costs borne by all firms that can no longer meet their financial obligations when they become due (Beaver, 1966) and that can bring the firm closer to bankruptcy, came later.

Previous research on the determinants of financial distress costs is quite scarce and does not account for appropriate indicators of the probability of financial distress. Opler and Titman (1994) and Andrade and Kaplan (1998) both use debt-based indicators assuming that the higher the firm's leverage the higher its probability of financial

Determinants of financial distress costs: New evidence from international data

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Abstract

This study examines the determinants of financial distress costs, by making use of a more accurate indicator of the probability of financial distress. Our results reveal the importance of the abovementioned indicator, since it positively affects financial distress costs for all the countries analyzed. Furthermore, since our model controls for the probability of financial distress, we can test the trade-off between the benefits and costs of debt. In fact, we show that the benefits outweigh the costs, since the relationship between financial distress costs and leverage is negative. Our results also indicate that distress costs are negatively related to liquid assets, hence their benefits more than offset their opportunity costs. In addition, our dynamic model also controls for the reaction to the distress situation by taking into account the investment and employment policies. Finally, the sensitivity of financial distress costs to leverage depends on the institutional context.

Key words: Financial distress; probability of financial distress, leverage.

JEL classification: G33.

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