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Do Better Institutions Mitigate Agency Problems? Evidence from Corporate Finance Choices

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Abstract

This paper examines how firm characteristics, legal rules, and financial development affect corporate finance decisions. In contrast to the existing literature, I use data on unlisted companies to show that institutions play an important role in determining the extent of agency problems. In particular, I find that in countries with good creditor protection, it is easier for firms investing in intangible assets to obtain loans. The protection of creditor rights is also important for ensuring access to long-term debt for firms operating in sectors with highly volatile returns. Ceteris paribus, firms are more leveraged in countries where the stock market is less developed. Unlisted firms appear more indebted than listed companies even after controlling for firm characteristics such as profitability, size, and the ability to provide collateral. Finally, institutions that favor creditor rights and ensure stricter enforcement not only are associated with higher leverage, but also with greater availability of long-term debt.

I. Introduction

Financial development may spur economic growth by providing easier and cheaper access to external finance for firms with high growth potential. This paper investigates whether there are financial system characteristics and institutional arrangements that deal more effectively with market imperfections and, therefore, favor external funding. To this end, it examines whether corporate finance decisions differ across countries because of differences in legal rules and degree of financial market development.

The empirical literature on corporate finance has shown that financial decisions depend on firm attributes that proxy for the extent of agency problems and asymmetric information, such as the availability of collateral (Titman and Wessels

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(1988), Barclay and Smith (1995)). These studies have generally focused on samples of U.S. companies and, therefore, fail to capture the effects of institutional differences on financing decisions. On the other hand, cross-country comparisons of capital structure have generally used aggregate data (Mayer (1988)) and, therefore, have not been able to address the question of how firm attributes affect financial decisions in different institutional environments. A notable exception are Rajan and Zingales (RZ) (1995). They use balance sheet data of large listed companies from G7 countries and find that factors identified in previous studies as correlated with firm leverage in the U.S. are similarly correlated in other countries. In a related paper that examines capital structure in developing countries, Boot, Aivazian, Demirgüç-Kunt, and Maksimovic (BADM) (2001) conclude that debt ratios seem to be affected in the same way and by the same type of variables that are significant in developed countries. Surprisingly, institutional differences seem not to be important, even if theory and common sense would suggest otherwise.

This paper argues that these results may be due to the bias induced by the samples used in previous papers of large listed companies, which often represent only a minor share of the GDP of a country. Large listed companies have easier access to international financial markets and, for this reason, their corporate finance decisions are less subject to the institutional constraints imposed by domestic markets. Using a novel database containing predominantly unlisted companies from several European countries, I find significant differences across countries in how leverage and debt maturity are determined. Furthermore, most of these differences are revealed only in an examination of unlisted companies, which previous studies have not included.

I also find that institutions are responsible for these differences. The institutional variables examined are proxies for the quality of protection of creditor rights, the enforcement of laws, and the degree of financial development. First, by combining firm attributes with these institutional variables, I find that in countries with above average creditor protection, it is easier to obtain loans for firms investing in intangible assets, which cannot be provided as collateral, such as R&D and advertising. Second, the protection of creditor rights is important for guaranteeing access to long-term debt for firms operating in sectors with highly volatile returns. This suggests that if the law does not sufficiently guarantee creditor rights, lenders may prefer short-term debt to control entrepreneurs' opportunistic behavior by using the threat of not renewing the loan. Better protection of creditor rights makes the use of debt maturity to control borrowers unnecessary, and thus prevents the liquidation of temporarily illiquid firms. Third, the protection of creditor rights is important for guaranteeing access to credit and lengthening debt maturity of unlisted companies investing in intangible assets and with highly volatile returns. Interestingly, these sources of agency problems—and, therefore, institutional differences—do not appear to be important for the subsample of listed companies.

This paper belongs to a growing literature that shows that legal rules, degree of investor protection, and enforcement are important determinants of the size of capital markets, share returns, externally financed firm growth, and R&D expenditure (La Porta, Lopez-de-Silanes, Shleifer, and Vishny (LLSV) (1997), (1998),

Demirgüç-Kunt and Maksimovic (1998), Carlin and Mayer (2003)). Unlike this paper, these studies examine only the aggregate implications of laws and institutions. For instance, Demirgüç-Kunt and Maksimovic (1999) examine how debt maturity differs across countries according to the levels of financial market and institutional development. Even if they control for firm characteristics, they exploit only the cross-country variability of the observations. Consequently, they can only conclude that debt is, on average, of shorter maturity in countries in which the quality of enforcement is lower. In contrast, this paper identifies not only the average impact of institutional variables on financing decisions but also the kind of firms that are more subject to institutional constraints.

The paper also improves on the existing literature from a methodological point of view. I use firm-fixed effects in the equations for leverage and debt maturity to study the interaction between observable firm and financial system characteristics. The firm-fixed effects represent the share of leverage and debt maturity that cannot be explained by time-varying firm characteristics such as age, size, and profitability. These are "core measures" of the debt ratios that can be used to examine differences in financial decisions across countries, across financial systems, across sectors, and between listed and unlisted companies. The firm-fixed effects are preferable to the aggregate ratios used by Demirgüç-Kunt and Maksimovic (1999) and BADM (2001), because they do not depend on time-varying differences in firm characteristics. Hence, the possibility of evidencing spurious correlations is reduced.

In addition to the key findings presented above, this paper reports many new results on cross-country differences in firm behavior, and a few results confirming the existing literature. In particular, in countries where the stock market is less developed, firms are more leveraged (as in BADM (2001)). Moreover, systematic differences between listed and unlisted companies can be identified: unlisted firms are generally more indebted, even after controlling for firm characteristics such as profitability, size, and the ability to provide collateral. The availability of bond markets influences the behavior of mature companies, which have higher leverage in countries where this source of credit is more readily available. Institutional factors such as the degree of enforcement and investor protection are important even after controlling for the degree of financial market development. Legal rules favoring creditor rights and stricter enforcement are associated with higher leverage and also with greater availability of long-term debt, as in Demirgüç-Kunt and Maksimovic (1999).

The paper is organized as follows. Section II describes the data set. Section III outlines the within-country correlations of financial ratios with firm attributes. Section IV formulates several hypotheses on the institutional determinants of cross-country differences and describes the statistical model. The results are presented in Section V. Section VI concludes the paper.

II. Data

The primary source of data is the 1998 version of Amadeus (Analyze Major Database from European Sources) Database by Bureau Van Dijk,[1] which provides balance sheets and income statements of individual firms. These data are complemented with proxies for investor rights around the world and measures of the depth of market capitalization taken from LLSV (1998) and RZ (1999). Finally, information on corporate taxation is taken from various issues of *Corporate Taxes: A Worldwide Summary,* published by Price Waterhouse.

A. Firm Level Data

The version of Amadeus used in this paper provides balance sheets for about 150,000 non-financial firms that meet minimum size requirements (sales of over 10 million euros, more than 150 employees, or total assets of over 10 million euros) from 1993 to 1997 for 26 European countries. The survivorship bias should be limited. In fact, information is not backfilled for new firms entering the database in a given year, and firms appear in the database only for the years in which they meet the minimum size requirements. Of course, what the data company is able to report depends on how demanding the accounting standards of a country are and which firms indeed report. Therefore, without any doubt, the sample is biased toward countries with more demanding accounting standards and more transparent firms. This problem also affects the data collected by Global Vantage and by the International Finance Corporation, used by BADM (2001), whose country selection criterion is admittedly the quality of the data available for a reasonably large number of firms. If anything, the sample selection bias should make it harder to find a significant impact of institutions on capital structure.

Amadeus provides consolidated balance sheets if available, and unconsolidated balance sheets otherwise. The shares of firms with an unconsolidated companion in the sample I use is, however, less than 3% and is very unlikely to affect the results.

Bureau Van Dijk standardizes balance sheet information with the stated objective of achieving uniformity and enabling cross-border analysis. The way information is presented has been approved by leading accountancy bodies and practitioners in the field, and the data entry procedures include rigorous checking of individual records, with many data fields subject to automatic validation on entry. The standardization procedures concern, in particular, the treatment of reserves and provisions, which were often erroneously regarded as financial liabilities and impaired attempts to make cross-country comparisons of capital structure. In Amadeus, reserves are included in an item called "other shareholder funds," which is part of the shareholders' funds together with equity. Most importantly, non-current liabilities are subdivided into long-term financial debt and

[1] Besides Amadeus, Bureau Van Dijk offers a collection of databases that includes Bankscope and Global Researcher, which are commonly used by banks and consultancies for credit management, research of potential markets, competitors, and merger and acquisitions analysis. Bureau Van Dijk also provides its products also to business schools, which use the databases for research information.

other liabilities that include provisions. These provisions consist of pension liabilities, equalization accounts for risks (which in some countries must be kept if companies hold stocks in other companies), or anticipated expenses and mandatory severance payments for employees, which have very little to do with capital structure and can bias financial ratios.

The total assets are subdivided into long-term assets and current assets. The long-term assets in turn are subdivided into tangible assets, intangible assets, which consist of R&D, advertising and organizational expenses, and other long-term assets (including financial long-term assets).

The reclassification of the balance sheets appears reliable, since no attempt is made to reconstruct items that are missing from the original balance sheets or difficult to reconstruct in ways that can introduce biases. In fact, many variables are missing, especially for firms incorporated in countries where accounting practices are less transparent. For instance, in German civil law countries, advertising and R&D expenses cannot be recorded as assets in the balance sheet. As a consequence, intangible assets are available for only 53 of the 2,339 German companies included in the dataset and, for all of them, the value is always equal to zero.

Therefore, although one should bear in mind the usual caveats about the comparability of international balance sheet data, especially those concerning the valuation of assets (at historical or current value), I believe that the information provided by Amadeus is not less reliable than that provided by Global Vantage.

An important advantage of Amadeus is that most of the firms included in the data set are private, allowing me to focus on a sample that is more representative of the larger mass of firms hidden below the tip of the iceberg sample of large listed companies studied by RZ (1995) and BADM (2001). This naturally entails some shortcomings given that the information available for private firms is less detailed. First, the panel is very unbalanced and, although the number of firms included is very large, many balance sheet items are missing or, even worse, only company name, industry, and address are reported.[2]

Moreover, since firms are not traded, only book values are available and it is not possible to evaluate the market values of debt ratios,[3] which would provide useful additional information. However, I believe that this shortcoming does not hamper the analysis of capital structure because previous studies (RZ (1995) and BADM (2001)) do not find any significant differences in factors correlated with debt to book and market capital.

Finally, due to the coarser information provided by private companies, data on corporate income taxes are rudimentary, making it impossible to construct sophisticated tax variables; also, no distinction is made between bank loans and market debt, and only the maturity of financial liabilities is provided.

The selection of countries used in the empirical analysis is constrained by these data limitations. German civil law countries (and, in particular, Germany) have been excluded because no information on intangible assets is provided.[4] For

[2]This information is very likely to be useful for subscribers, because the data set is often used for marketing.

[3]Unfortunately, Amadeus also omits the market value of equity for listed companies.

[4]Germany is also very poorly represented in the data set, and only the largest companies are included.

certain other countries, for example Finland, financial liabilities are not provided as a separate item but are aggregated with trade credit and other non-financial liabilities. These countries have been excluded as well, because any analysis of financial ratios would be biased. Finally, the Eastern European economies have not been included, since the quality of the balance sheet information provided for these economies is even poorer. Furthermore, there are no data comparable with the indicators of LLSV for the former socialist economies. In these countries, the problems concerning financial laws are largely related to the enforcement and execution of laws rather than their quality, and this would require an independent study that is beyond the scope of this paper.

The final sample includes firms in eight countries: Belgium, France, Ireland, Italy, the Netherlands, Portugal, Spain, and the U.K. For these countries, the only firms that are included are those for which at least short- and long-term debt, intangible assets, age, number of employees, and sales are reported. This reduces the number of the firms included in the sample from 115,230 to 61,557. Table 1 shows how the sample selection affects different countries and listed and unlisted firms within a country. Not all of these firms are present for all five years. The final sample contains a total of 228,675 firm-years.

TABLE 1

Number of Firms in the Original and Final Sample

	Belgium	France	Ireland	Italy	Netherlands	Portugal	Spain	U.K.
Firms in the original sample	8085	25394	1010	20643	11999	2598	14165	31336
Listed firms in the original sample	134	887	46	143	170	45	231	1900
Firms used in the econometric analysis	6531	13096	240	12842	1303	2061	10981	12573
Listed firms used in the econometric analysis	110	673	0	91	2	9	174	92
Median number of employees	102	90	100	66	107	142	72	123

Table 1 reports the number of firms in Amadeus and in the final sample used in this paper. The sample of firms in Amadeus is very unbalanced and not all companies are present for all five years even in the final sample. The firms included in the final sample are the ones for which short- and long-term debt, intangible assets, age, number of employees, and sales are reported.

Table 2 provides details on firm balance sheets by country. A close look at this table highlights, as do RZ (1995), the importance of distinguishing provisions from long-term debt. Provisions are a significant part of non-current liabilities in all countries, but especially in Italy and France, where their inclusion among financial liabilities would cause a substantial overestimation of firm long-term debt.[5] Moreover, reserves are a consistent part of shareholders' funds, often more important than equity. Since listed companies are a very small fraction of the companies in the sample, Table 2 represents to a large extent the average balance sheet of a private company. The average balance sheet of a listed company (not reported) seems to have more long-term assets, due especially to a higher fraction of financial long-term assets (equal to the difference between long-term assets and tangible plus intangible long-term assets). In all countries, listed companies are better capitalized (shareholders' funds are a larger fraction of the sources of funds) and have less current liabilities, mostly attributable to less trade credit

[5]In Italy, companies include in their balance sheets part of employees' remuneration that is deferred to when an employee (voluntarily or involuntarily) leaves the company, while in France, provisions are mainly due to equalization accounts for risks and unanticipated expenses.

(given by the difference between current liabilities and loans). The importance of the different items in the balance sheets of listed companies is comparable with the Global Vantage sample used by RZ (1995).[6]

TABLE 2

Balance Sheets for Firms in Amadeus[a]

	Belgium	France	Ireland	Italy	Netherlands	Portugal	Spain	U.K.
Assets								
Fixed assets	34.92	30.38	39.16	26.46	72.01	37.99	33.29	34.04
(of which)								
Intangible	1.06	3.05	1.45	2.34	2.18	1.8	2.89	1.18
Tangible	21.06	15.63	37.5	18.25	57.88	28.78	21.28	24.85
Current assets	65.08	69.61	60.84	73.54	27.09	62.01	66.7	65.95
(of which)								
Trade debtors	30.08	29.77	22.45	42.04	13.28	28.6	35.01	20.47
Total assets	100	100	100	100	100	100	100	100
Liabilities								
Equity	13.8	15.99	17.78	9.66	5.71	19.03	14.17	16.9
Other shareholders' funds	19.27	9.2	19.88	10.46	34.28	13.09	21.6	7.37
Non-current liabilities	16.36	14.65	17.84	15.72	24.49	13.43	12.16	14.03
(of which)								
Long-term debt	12.91	5.75	15.96	1.56	17.31	12.26	9.87	11.78
Current liabilities	50.48	60.15	44.5	64.15	35.51	54.44	52.06	61.69
(of which)								
Loans	26.37	29.6	29.67	35.67	24.36	12.69	32.73	46.53
Total liabilities	100	100	100	100	100	100	100	100
No. of observations	1243	17423	152	12969	714	995	9544	12551
No. of listed companies	70	633	0	90	2	8	165	89

The value of each item is calculated as a fraction of the book value of total assets, and then averaged across all the firms reporting a given balance sheet item in the country in 1997. The balance sheet in Amadeus is structured as follows. Long-term assets are the sum of intangible assets, tangible assets, and other long-term assets (including financial long-term assets). Current assets include stocks, trade credit, and other current assets, which consist of investment and cash. Total assets are the sum of long-term assets and current assets. On the liability side, the shareholders' funds include equity and other shareholders' funds, mainly reserves. Current liabilities include short-term loans and trade debt, and non-current liabilities include long-term debt and provisions. Total liabilities are the sum of shareholders' funds, non-current liabilities, and current liabilities.

[a]Assets and liabilities may not sum to 100 because of rounding errors or a few firms not reporting a given item.

From the discussion above, it follows that financial ratios must be corrected for the fact that liabilities include accounts payable and provisions arising from labor market contracts or specific regulations with no importance for financing decisions, before attempting any international comparison. The correct definitions of leverage and debt maturity should depend only on short-term and long-term financial liabilities and shareholders' funds.

The definitions of leverage and debt maturity I use are consistent with these observations and are as follows: i) leverage is defined as the ratio of financial debt to the book value of shareholders' funds plus financial debt; and ii) maturity structure is defined as the ratio of short-term debt to financial liabilities.

[6]The only relevant difference concerns the share of long-term debt, which is significantly lower in Amadeus than in Global Vantage for Italy. This is due to the fact that more than half of the companies (both listed and unlisted) report having no long-term debt (while this is true for less than 10% of the companies in all the other countries). If only the companies with a positive amount of long-term debt are considered, long-term debt is approximately 9% of total assets both for listed and unlisted companies, and is comparable with the figure that RZ (1995) show in Table 2. This difference could be explained by the fact that the largest and most visible companies in a country, more represented in RZ's sample, have easier access to long-term debt.

Table 3, which presents the average leverage and debt maturity in 1997 for all the firms in the sample, also provides another measure of leverage that does not correct for provisions for comparison. As expected, the pictures that emerge from different measures of leverage are different. Italy, for instance, appears considerably more leveraged than the other countries when I look at the non-corrected leverage, but not so when I use the measure of leverage that does not depend on provisions. Even though there are cross-country differences in the corrected measure of leverage, they are less pronounced. Moreover, the ranking of the countries with higher leverage differs between average and aggregate leverage (obtained by summing the numerator across all reporting firms in the country and dividing by the denominator summed across the same firms). This implies that firm characteristics, such as size, are very important for understanding cross-country differences in capital structure.

TABLE 3

Comparison of the Extent of Leverage across Countries

Countries	Corrected Leverage	Corrected Leverage (listed companies only)	Non-Corrected Leverage (includes provisions)	Short-Term Financial Liabilities to Total Financial Liabilities	Short-Term Liabilities to Total Financial Liabilities (listed companies only)
Belgium	0.55 (0.51)	0.41 (0.33)	0.57 (0.54)	0.73 (0.60)	0.72 (0.56)
France	0.50 (0.44)	0.37 (0.40)	0.54 (0.53)	0.90 (0.63)	0.77 (0.62)
Ireland	0.49 (0.61)	—	0.49 (0.62)	0.75 (0.57)	—
Italy	0.60 (0.54)	0.39 (0.40)	0.67 (0.65)	0.95 (0.96)	0.95 (0.93)
Netherlands	0.49 (0.55)	0.65 (0.64)	0.53 (0.63)	0.65 (0.32)	0.52 (0.56)
Portugal	0.52 (0.53)	0.35 (0.35)	0.53 (0.54)	0.77 (0.54)	0.68 (0.55)
Spain	0.52 (0.51)	0.35 (0.44)	0.54 (0.55)	0.80 (0.60)	0.77 (0.60)
U.K.	0.50 (0.59)	0.47 (0.29)	0.50 (0.60)	0.82 (0.80)	0.76 (0.70)

Simple average and aggregate financial ratios for all firms in 1997 are reported. The corrected leverage is the book value of financial debt divided by the sum of the book value of financial debt and equity. The non-corrected leverage is defined as financial liabilities plus provisions to financial liabilities plus provisions plus shareholders' funds. The aggregate financial ratios (in parentheses) are obtained by summing the numerator across all reporting firms in the country and dividing by the denominator summed across the same firms.

Cross-country differences in debt maturity are even more pronounced (Italy has more than 90% short-term debt; the Netherlands less than 70%). The average of the debt maturity indicator is generally higher than the aggregate debt maturity ratio, indicating that smaller firms have more short-term debt.

Most interestingly, it seems very important to study private firms to understand cross-country differences in capital structure. In fact, the picture that emerges from listed companies is different (U.K. firms are at least as leveraged as French and Italian firms if the population of unlisted companies is taken into account), and recurring differences exist within a country between listed and un-

listed companies. In particular, listed companies are not only less indebted, but they also have longer debt maturity.

Table 4 presents averages and standard deviations (in parentheses) of the main firm characteristics that previous studies have found to be correlated with financial ratios for all the firm-years observations used in the econometric analysis. These firm characteristics include:

1. The maturity of assets defined as long-term assets to total assets, which is expected to be positively correlated with the maturity of liabilities (Barclay and Smith (1995)).
2. The ratio of tangible assets to total assets and the ratio of intangible assets to total assets. These two variables do not sum to one, because, as noted before, the long-term assets include also long-term financial assets. They proxy for the availability of collateral (or the lack thereof). Previous studies have generally found a positive relation between tangibility of assets and leverage (Titman and Wessels (1988), RZ (1995)).[7]
3. The growth rate of sales, defined as the difference between the logarithm of sales at time t and $t-1$. This variable is a proxy for growth opportunities and has been found to be negatively correlated with leverage in several empirical studies (see Kim and Sorensen (1986) and Lang, Ofek, and Stulz (1996)), supposedly because high growth firms are more subject to underinvestment (Myers (1977)) and asset substitution problems, as they have more flexibility in their choice of future investment (Titman and Wessels (1988)).
4. The age, defined as the number of years from the date of incorporation of the firm.[8] On the base of Diamond's (1991) model, this variable can be used as a proxy for firm reputation and, although it has been quite neglected in previous studies of capital structure, it is expected to be positively correlated with leverage. However, since Diamond (1991) shows that firm reputation can affect financing choices only when the firm becomes sufficiently mature and able to access the bond market, the relation is likely to be non-linear.
5. The non-debt tax shields, defined as depreciation to earnings before taxes and interest, which are a good substitute for debt in order to avoid taxation. This variable is expected to be negatively correlated with leverage. However, previous studies had difficulty finding this relation in the data: MacKie-Mason (1990) finds that the negative relation holds only for firms with low cash flow, which are more likely to be close to tax exhaustion.
6. The return on assets, defined as earnings after tax and interest to total assets, which measures profitability. This variable is expected to be negatively correlated with leverage, because internal funds are cheaper than external funds (Myers (1988)).

[7] In particular, Titman and Wessels (1988) find a negative relation between the ratio of intangible assets to total assets and leverage, while RZ (1995) find a positive relation between the ratio of tangible assets to total assets and leverage.

[8] Amadeus provides the date of incorporation for most of the companies.

7. The sectorial variability of the return on assets, defined as the standard deviation of the return on assets by sector and country in a given year, which is a proxy for business risk. This variable has been neglected from previous studies: only BADM (2001) show that business risk seems to have a different effect on debt maturity across countries.
8. The share of the firm equity held by the first shareholder, as reported by Amadeus only for a subset of the companies of the final sample.[9] This variable allows the study of the relation between ownership structure and leverage: controlling shareholders more often may use debt in order not to dilute control.
9. The total assets and the number of employees, which provide alternative measures of firm size and proxy for firm visibility. They have generally been found to be positively correlated with leverage.

To define the growth rate of sales, which is defined as the difference between the logarithm of sales at time t and $t-1$, I lose one observation for each company in the sample. The total number of firm-years remaining is 167118: these are the observations I use in the econometric analysis.

It emerges clearly from Table 4 that the sample of firms is very heterogeneous: firms differ significantly across countries and also within a country. This heterogeneity must be taken into account before drawing any conclusions on cross-country differences in capital structure: the high leverage and short debt maturity of Italian firms might depend on the fact that they are relatively smaller and younger or less profitable than the others. Firms differ significantly also in the structure of their assets: not only does the maturity of their assets differ, but also the amount that firms have invested in tangible, intangible, or other long-term assets, which include long-term credit to customers and participations in other companies.

Not surprisingly, since the sample contains mostly unlisted companies, the first shareholder has more than 50% of the capital in all countries, and, perhaps more surprisingly, more than 80% in the U.K. The situation is different if I look at listed companies alone (not reported): in this subsample, on average, the first shareholder owns less than 50% of the capital in all countries but Portugal (where the average share of the first shareholder is 63%), and only 23% of the capital in the U.K.

B. Indicators of the Legal System and Financial Development

The legal system and the level of financial development can be as important as firm characteristics in explaining cross-country differences in financial ratios. Table 5 presents indicators of financial development and variables that proxy for the quality of laws and regulations and the promptness of their enforcement. Financial development is measured by the ratios of stock market capitalization to GDP and of bond market capitalization to GDP. All values refer to 1996.[10] These indicators proxy not only for the availability of equity and market debt in a coun-

[9] I have only 38636 observations for this variable.

[10] Problems concerning the endogeneity of financial development do not arise, as financial development can certainly be considered exogenous with respect to the individual firm.

TABLE 4

Descriptive Statistics of Firm Characteristics

	Belgium	France	Ireland	Italy	Netherlands	Portugal	Spain	U.K.
Leverage	0.55	0.51	0.54	0.61	0.58	0.54	0.52	0.58
	(0.26)	(0.23)	(0.27)	(0.22)	(0.26)	(0.21)	(0.25)	(0.24)
Debt maturity	0.76	0.82	0.77	0.82	0.72	0.82	0.84	0.84
	(0.24)	(0.20)	(0.26)	(0.15)	(0.31)	(0.21)	(0.21)	(0.21)
Maturity of assets	0.36	0.27	0.35	0.27	0.36	0.36	0.32	0.30
	(0.29)	(0.22)	(0.25)	(0.19)	(0.29)	(0.22)	(0.24)	(0.25)
Tangible to long-term assets	0.18	0.17	0.34	0.19	0.28	0.30	0.23	0.27
	(0.21)	(0.17)	(0.26)	(0.16)	(0.27)	(0.21)	(0.20)	(0.24)
Intangible to long-term assets	0.01	0.03	0.005	0.02	0.01	0.01	0.028	0.01
	(0.04)	(0.08)	(0.03)	(0.05)	(0.05)	(0.04)	(0.068)	(0.05)
Non-debt tax shields	0.82	0.75	0.74	1.05	0.4	0.97	1.91	0.60
	(4.42)	(8.82)	(6.61)	(14.32)	(2.89)	(4.25)	(131.00)	(7.57)
ROA	0.03	0.04	0.07	0.01	0.04	0.02	0.04	0.06
	(0.08)	(0.08)	(0.13)	(0.05)	(1.48)	(0.06)	(0.09)	(0.15)
Variability of returns	0.08	0.78	0.11	0.05	0.39	0.05	0.09	0.12
	(0.03)	(0.014)	(0.06)	(0.02)	(1.43)	(0.02)	(0.03)	(0.08)
First shareholder share	0.64	0.68	0.86	0.71	0.95	0.58	0.66	0.86
	(0.33)	(0.28)	(0.23)	(0.29)	(0.14)	(0.29)	(0.32)	(0.21)
Total assets	46766	50852	136448	47797	131960	40732	25055	164235
	(196970)	(791423)	(675143)	(439017)	(1703864)	(298306)	(138019)	(1739559)
No. of empl.	195	279	243	187	338	278	202	384
	(1097)	(2191)	(572)	(1183)	(3683)	(822)	(1048)	(1859)
Growth rate of sales	−0.01	0.08	0.17	0.11	−0.003	0.23	0.13	0.09
	(0.77)	(0.47)	(0.42)	(0.71)	(0.54)	(0.57)	(0.82)	(0.44)
Age	26.33	24.91	22.24	20.71	28.01	23.80	20.6	26.21
	(21.74)	(18.83)	(16.71)	(14.77)	(22.66)	(18.50)	(15.5)	(21.32)
Obs.	6871	51843	491	37579	3537	2851	29812	34134

Non-weighted average and standard deviation (in parentheses) of the main variables in Amadeus. Sample: all observations in Amadeus used for the econometric analysis from 1993 to 1997. Variables are defined as follows. Leverage is defined as the ratio of financial debt to the book value of shareholders' funds plus financial debt. Debt maturity is defined as short-term debt to total financial liabilities. The maturity of assets is defined as the ratio of long-term assets to total assets. The non-debt tax shields are the ratio of depreciation to earnings before taxes and interest. The return on assets (ROA) is defined as earnings after tax and interest to total assets. The variability of returns is defined as the standard deviation of the return on assets by sector and country in a given year. The first shareholder share represents the fraction of equity held by the first shareholder. Total assets are expressed in Euro for all countries. The growth rate of sales is defined as the difference between the logarithm of sales of firm i at t and $t-1$.

try, but are also indirect measures of the importance of banks. The concentration of the banking system, measured by the share of assets of the three largest banks, provides complementary information on the market power of banks in a country: high concentration of the banking system is likely to reduce competition and therefore to increase the cost of bank loans.

As RZ (1995) also find in their sample, the main difference between bank and market-oriented countries seem to be in the choice between public (stocks and bonds) and private financing (bank loans) rather than in the amount of leverage: for listed companies, the aggregate leverage is higher in the U.K., where the stock market is very well capitalized, than in Italy, where both bond and stock markets are very thin. Yet, market development may be important for corporate finance choices, because it affects the power of banks and may influence the cost of bank loans and the way in which agency problems are resolved. Not only

TABLE 5

Institutional and Financial Development Variables

Origin	Enforcement	Creditor Protection Index	Creditor Protection Dummy (CRED)	Bond Market Capitalization	Bond Market Capitalization Dummy (BOND)	Stock Market Capitalization	Concentration of the Banking System
English							
Ireland	8.74	1	0	0.03	0	0.49	0.54
U.K.	9.402	4	1	0.22	1	1.31	0.5
French							
Belgium	9	2	1	0.01	0	0.46	0.49
France	9.486	0	0	0.11	0	0.39	0.28
Italy	7.946	2	1	0.03	0	0.21	0.24
Netherlands	9.866	2	1	0.35	1	0.99	0.77
Portugal	7.806	1	0	0.06	0	0.23	0.46
Spain	7.87	2	1	0.02	0	0.43	0.34

Source: LLSV (1998) and Rajan and Zingales (1999). Enforcement measures the level of enforcement of law and a higher level of the index indicates better enforcement. CRED is the creditor protection dummy, which is equal to one in high creditor protection countries. Countries are considered to have high protection of creditors' rights if they are above the average of the LLSV (1998) sample. Stock and bond market capitalization are in ratio to GDP. The dummy BOND is equal to one in countries with higher bond market capitalization. The concentration of the banking system is measured by the share of assets of the three largest banks in a country. The financial development data refer to 1996 end-of-year data.

the leverage but also the maturity of debt may be affected: bonds have generally longer maturity than bank loans and banks are more likely to entertain long-term relations with firms if they face low competition. Heterogeneity in firm characteristics may hide these effects in the cross-country comparison of financial ratios in Table 3.

To a lesser extent, the indicators of financial market development also capture cross-country differences in ownership structure and control: most of the companies in my sample are unlisted and, as is evident from Table 4, are very closely held by the first shareholder. The agency problem between managers and shareholders is likely to be less relevant here than the need to find cheap sources of external funds to finance growth opportunities.

The indicators of the legal system in Table 5 include: the protection of creditor rights warranted by a country's laws and regulations providing a measure of how easily creditors can repossess collateral and the control of the firm in case of default; and a measure of enforcement, which is important because laws and regulations protect creditors only to the extent that they are actually enforced. Both indicators are presented in Table 5. Details on how these indicators are constructed can be found in LLSV (1998). Here it is sufficient to note that these indexes aim to capture aspects of the bankruptcy law that influence ex ante contractibility and availability of debt. If the law, like in France, favors the reorganization of firms in financial distress and the interests of the stakeholders of the firm, such as workers, who have interest in the continuation of the business, the value of the index measuring protection of creditor rights is low. In contrast if, as in the U.K., the law emphasizes the rights of creditors, notwithstanding this can lead to premature liquidations, the value of the index is high. Although heterogeneity in firm characteristics must be taken adequately into account before drawing any conclusions, these institutional differences can potentially explain why in the U.K. small firms have higher leverage than in most of the other countries in the sample (as the simple average of the corrected leverage in Table 3 shows).

In the econometric analysis, I use the values of the indicators of institutional development as well as the dummy variables associated with these indicators, which group countries above and below the average of the samples used in RZ (1999) and LLSV (1998), and facilitate the interpretation of the results.

Finally, since differences in the tax code can generate differences in corporate finance decisions, the previous data are complemented with information on the corporate tax rates, taken from various issues of *Corporate Taxes: A Worldwide Summary,* published by Price Waterhouse. Unfortunately, it is very difficult to control for the effect of the tax code when such heterogeneous firms are concerned, and I make no attempt to calculate proxies for the tax advantage of debt that take into account personal taxation. In fact, this would require knowledge of the personal tax rate on interest income and equity income, which depends on the tax bracket of the investor. This, in turn, significantly affects the conclusions on the tax advantage of debt, as RZ (1995) show. It may be reasonable to use the highest marginal tax rate when listed companies are considered, because it is well known that only the wealthiest individuals invest in the stock market (Guiso, Haliassos, and Jappelli (2001)). However, entrepreneurs who own small companies are not necessarily rich and may have low personal income. In this context, assuming the highest marginal tax rate is much less realistic.

One should also keep in mind that in many countries, small firms are subject to different regimes of tax exemptions and even to different tax rates. These differences, in turn, may depend not only on firms' size, but also on the sector or the region in which they operate, or on specific categories of investments. Consequently, it is unlikely that a positive relation between leverage and country corporate tax rate will be found in the data.

III. Within-Country Determinants of Leverage

The previous section suggests that the aggregate leverages are similar across countries for unlisted companies as well as for listed companies, as RZ (1995) find, notwithstanding the sizeable differences in financial development and legal system. Although creditor protection could explain some differences, the evidence is at best suggestive because the firms included in the sample are very heterogeneous.

Indeed, the empirical literature on capital structure (Harris and Raviv (1991)) shows that firm characteristics, like the ones described in Table 4, can explain differences in leverage for listed companies within a country. Moreover, RZ (1995) show that firm characteristics and leverage are generally similarly correlated across countries when large listed companies are considered. This section examines whether this finding also holds when unlisted companies are taken into account.

Following the previous literature, I estimate an equation for leverage that includes the logarithm of the firm age, the square of the logarithm of firm age (because the reputation effect may become significant only after firms get sufficiently mature), size (measured alternatively by the logarithm of the number of employees or by the logarithm of total assets), profitability, non-debt tax shields,

the ratio of tangible assets to total assets,[11] and growth opportunities as explanatory variables. Moreover, I include a dummy equal to one for listed companies.

I estimate the equation by ordinary least squares using only cross-sectional variability within countries, as RZ (1995) do. In this way, I can compare the estimates and understand how different the relation is between financial ratios and firm attributes when unlisted companies are considered.

Table 6 reports the coefficients' estimates of the equation for leverage by country for 1997: several differences from the findings of the previous literature and across countries emerge. The most striking fact regards differences between listed and unlisted companies. Leverage is lower for listed companies: the dummy for listed companies is negative and generally significant. This is consistent with studies finding that firms usually reduce their leverage by issuing new capital after going public (Pagano, Panetta, and Zingales (1998)).

TABLE 6

Within-Country Determinants of Leverage

	Belgium	France	Ireland	Italy	Netherlands	Portugal	Spain	U.K.
Listed company	−0.13 (−3.11)	−0.13 (−10.34)		−0.16 (−5.76)	−0.06 (−0.25)	−0.21 (−2.60)	−0.5 (−1.84)	−0.07 (−2.36)
Log(age)	−0.02 (−0.25)	−0.04 (−3.57)	−0.02 (−0.13)	−0.01 (−1.01)	−0.1 (−2.24)	0.07 (2.17)	0.44 (0.66)	−0.05 (−4.45)
Log(age)^2	−0.00 (−0.26)	−0.001 (−0.34)	−0.01 (−0.24)	−0.00 (−1.09)	0.01 (1.19)	−0.02 (−3.37)	−0.10 (−0.81)	−0.000 (−0.26)
Size	0.01 (1.76)	0.01 (7.37)	−0.01 (−0.73)	−0.02 (−9.20)	−0.02 (−2.62)	0.002 (0.32)	−0.04 (−0.84)	0.007 (3.88)
TANG	0.02 (1.91)	0.06 (4.4)	−0.13 (−1.54)	−0.35 (−24.29)	0.19 (0.52)	−0.14 (3.85)	0.08 (−0.39)	−0.12 (−12.34)
Growth opport.	0.01 (2.51)	0.01 (1.30)	0.05 (0.09)	−0.05 (−8.49)	0.00 (0.04)	−0.02 (−0.73)	−0.11 (−1.10)	0.02 (2.87)
ROA	−0.83 (−2.83)	−0.92 (−31.08)	−0.54 (−3.52)	−1.06 (−27.42)	−0.14 (−2.28)	−1.02 (−7.30)	−1.78 (−2.20)	−0.35 (−14.02)
NDTS	0.04 (1.23)	−0.000 (−0.47)	0.03 (0.98)	−0.000 (1.08)	0.00 (0.08)	0.000 (0.99)	0.10 (0.79)	0.000 (1.38)
Tax exhaustion dummy * NDTS	−0.71 (−0.78)	0.000 (0.88)	−0.02 (−0.81)	−0.000 (−2.04)	−0.00 (−0.04)	0.10 (0.48)	0.00 (1.58)	−0.00 (−3.05)
Constant	0.54 (5.71)	0.61 (36.56)	0.79 (4.01)	0.87 (36.62)	0.87 (13.22)	0.58 (10.26)	0.79 (6.56)	0.75 (53.53)
Obs.	1243	17423	152	12969	714	995	9544	12551
R^2	0.21	0.13	0.16	0.20	0.06	0.14	0.19	0.10

Leverage is regressed on proxies for firm reputation (age), size (logarithm of the number of employees), the degree of tangibility of assets, measured by the ratio of tangible assets to total assets (TANG), the growth opportunities (growth rate of sales), profitability (ROA), non-debt tax shields (NDTS), and a dummy equal to one for listed companies. The tax exhaustion dummy is equal to one for firms whose cash flow is less than or equal to zero. Estimates are obtained by ordinary least squares using the cross-section of firms in 1997.

Interestingly, collaterals do not seem universally important to guarantee access to credit: the coefficient of the ratio of tangible assets to total assets is negative or not significant for several countries. One of the countries where firms investing in tangible assets are more indebted is France. According to the institutional indicators in Table 5, France has the worst protection of creditor rights

[11] Although in the panel data analysis I focus on the ratio of intangible assets to total assets, here I present the results for the ratio of tangible assets to total assets for comparability with RZ (1995). The qualitative results (not reported) are the same when I use the intangible assets.

of all the countries in the sample. This suggests that collaterals may be more important when creditor rights are poorly protected, and may explain why the correlation between tangible assets and leverage is generally positive when U.S. data are used. In fact, the continuation of business activity is considered more important than the protection of creditor rights in the U.S.

I do not always find a negative correlation between growth opportunities and leverage, as in several previous empirical studies (see Kim and Sorensen (1986) and Lang et al. (1996)), which generally use large listed companies' data from Compustat. Once again, this may depend on the fact that I use a sample of smaller companies incorporated in countries with less developed financial markets than the U.S., although it may be surprising that the correlation is positive for British firms. This may be due to the different behavior of listed and unlisted companies and in particular to the fact that the latter are closely held: first shareholders, fearful to lose control or unable to issue new equity, may choose to fund growth opportunities with leverage and care less about underinvestment problems. Moreover, the stock market capitalization may affect the relation between growth opportunities and leverage: more credit might be available to small firms without access to the stock market if large firms can easily recur to markets, because banks do not have the option to fund these potentially safer borrowers.

Only in France and the U.K. is leverage positively related to size, measured either by the number of employees or by the total assets. The coefficient of size is negative or not significant in all the other countries. Again, this goes against the findings of previous studies in which firm size, interpreted as a proxy for visibility or cash flow diversification, was generally found to be positively correlated with leverage. The few exceptions that emerge in international comparisons of capital structure (RZ (1995), and BADM (2001)) have no easy rationale in terms of the theory.[12] In the present sample, which contains much smaller firms than previous studies, only relatively larger firms may be able to issue equity, and this may explain the negative correlation that I find in most countries.

Leverage seems to decrease with the firm age (although the coefficient is often not significant). Firms do not seem to exploit reputation gains to increase leverage by using market debt as Diamond (1991) suggests. This may be due to the fact that in several countries, bond markets are particularly thin and do not represent a real option. Alternatively, the reputation effect could be difficult to find by looking only at leverage, because profitable firms with a good reputation can also raise equity.

In all countries, profitability is negatively correlated with leverage. This is in accordance with the findings of the previous research (Harris and Raviv (1991), RZ (1995), and BADM (2001)), which supports the pecking order theory of financing (Myers and Majluf (1984)). Finally, the coefficient of non-debt tax shields, which should be negatively correlated with debt, also is generally not significant for the firms close to tax exhaustion (low cash flow firms).

I also estimate a similar equation for debt maturity, in which the explanatory variables include: the maturity of assets, measured by the ratio of long-term assets to total assets, the ratio of tangible assets to total assets, leverage, and the sectorial

[12]For instance, RZ (1995) argue that the existence of fixed bankruptcy costs favors access to debt for large firms; however, they find a negative correlation between firm size and leverage in Germany.

variability of earnings. Also in this equation I include a dummy variable for listed companies.

The estimates of the equation for debt maturity (not reported) suggest that maturity is always longer for listed firms although the dummy is often not significant. As expected, firms with more tangible assets and longer maturity of assets have access to more long-term debt in line with the results of Barclay and Smith (1995). Moreover, high leverage firms have longer debt maturity and, therefore, seem to have higher debt capacity.

More interestingly, in the U.K., the country with best creditor protection in the sample but not everywhere else, firms with highly volatile returns have access to debt with longer maturity. This may depend on creditor protection: usually, creditors use short-term debt to exercise control over the firm by threatening not to renew the loan, but this may not be necessary if they are protected by the law. Therefore, they prefer to lengthen debt maturity to firms with volatile returns, for which inefficient liquidation would be more likely to occur.

To summarize, the within-country analysis of the determinants of financial ratios shows that the factors that are generally thought to affect corporate finance decisions may lead to different choices across countries. Therefore, to understand whether institutions are important to explain capital structure, not only must firm heterogeneity be taken adequately into account, but also how the same firm characteristics affect financial ratios in different countries. The next section formulates several testable implications based on the findings of this preliminary analysis of the data and develops an econometric model for statistical testing.

IV. Formulation of the Hypotheses and Methodology

To some extent, the cross-country differences in the level of the financial ratios and in their correlation with firm characteristics can be attributed to institutional differences. However, to be able to tell whether institutions matter, ex post rationalization is not sufficient and it is necessary to formulate hypotheses about whether they matter and to perform statistical tests.

This section formulates several testable implications on the possible effects of institutions on corporate finance choices, based on the findings of the previous sections. Moreover, it elaborates an econometric methodology to analyze in a pooled sample firms incorporated in different countries and to establish whether cross-country institutional differences indeed matter for corporate finance choices.

The findings of the previous two sections suggest that institutions can influence corporate finance choices as follows.

Hypothesis 1. Firms investing in intangible assets in countries with poor protection of creditor rights have less access to credit.

This hypothesis is based on the finding that the availability of collateral is correlated with high leverage in countries with poor creditor protection (e.g., France). Therefore, the availability of collateral may be important for a firm's access to credit only if creditors are not sufficiently protected by the laws. To test whether this hypothesis is supported by the data, I include a variable equal to

the interaction of the ratio of intangible assets to total assets with the measure of the quality of creditor protection in the regression where I pool the firms from all countries. This variable is expected to be positive and significant if the protection of creditor rights favors access to credit.

Hypothesis 2. The relation between growth opportunities and leverage is positive (or at least non-negative, as previous studies based on large U.S. companies find) for unlisted companies with concentrated ownership. Moreover, a well capitalized stock market favors unlisted companies with high growth opportunities by making more credit available.

The findings of Section III suggest that underinvestment and asset substitution problems, which especially affect firms with high growth opportunities, are less important for unlisted companies, possibly because of their concentrated ownership and above all in countries with developed markets. In fact, controlling shareholders, fearful of losing control, may prefer to use debt rather than equity. Moreover, if large listed companies can easily issue equity in countries with a developed stock market, banks may make more credit available to small borrowers. To test this hypothesis about the relation between growth opportunities and leverage, I include a variable obtained by interacting the proxy of growth opportunity with the first shareholder's share of equity: ownership concentration leads to high leverage for growing firms if this variable is positive and significant. Moreover, the stock market makes indirectly available more credit to unlisted companies if the variable obtained by interacting the proxy of growth opportunities with stock market capitalization is positive and significant.

Hypothesis 3. Firms can exploit their reputation to increase leverage only in countries where the bond market is well capitalized.

This hypothesis takes into account that older firms, having acquired a reputation, may have access to financing opportunities, such as market debt, which are too costly for young firms. The effect of firm reputation on capital structure, however, may depend also on the financing opportunities available in a country. To study the effect of firm reputation on leverage, I interact the firm age with the bond market capitalization of the country where it is incorporated. If the access to the bond market matters, I expect this variable to be positive and significant. Moreover, since the relation between firm age and leverage is likely to be non-linear, I also include a quadratic term of the logarithm of firm age.

Hypothesis 4. Good protection of creditor rights helps to lengthen debt maturity for firms with volatile returns.

Firms in sectors with highly volatile returns are more likely to default for problems of temporary illiquidity. Longer maturity of debt could help to reduce inefficiencies in these sectors. However, only in a few countries, notably the U.K., is high variance of returns correlated with longer debt maturity. This cross-country difference may depend on the protection of creditor rights: if creditors are well protected, frequent loan renewals associated with short-term debt are less valuable. This hypothesis has empirical support if the variance of the return

on assets interacted with the index of protection of creditor rights is negatively correlated with the fraction of short-term debt.

Hypothesis 5. Listed companies have lower leverage and longer debt maturity than unlisted companies, even after controlling for firm characteristics.

Since listed companies have access to markets, they can more easily substitute equity to debt. Moreover, they are more likely to issue bonds, which have longer maturity than bank loans. This hypothesis is supported by the data if the listed company dummy is negatively correlated with the financial ratios defined in Section III.

Hypothesis 6. Institutions affect the level of leverage, also after heterogeneity in firm characteristics has been taken into account.

From the findings of BADM (2001) and Demirgüç-Kunt and Maksimovic (1999) for listed companies and the preliminary empirical evidence presented in the previous sections, I expect that leverage is higher in countries with good creditor protection, high enforcement of law, low stock market capitalization, high bond market capitalization, and a high corporate tax rate. As noted before, these variables proxy, respectively, for the effects of the quality of law and its enforcement on ex ante contractibility, the availability of debt and equity through the markets, and its cost in comparison to internal funds and other sources of external finance. For the same reasons, debt maturity is expected to be longer in countries with high enforcement of law, high creditor protection, high capitalization of the bond market, and low capitalization of the stock market, as equity and long-term debt are to some extent substitutable. Also the concentration of the banking system can affect leverage and debt maturity, because it influences the nature of bank-firm relationships: lack of bank competition favoring close bank-firm relations may increase the availability of long-term debt. However, since a noncompetitive banking system is also likely to be associated with high loan interest rates, high banking system concentration may be correlated with lower leverage.

To test these hypotheses, I pool together observations from different countries and use both the cross-section and time-series variability. I estimate the following system of equations,

$$\begin{aligned}
\text{leverage}_{it} &= \alpha_{0i} + \alpha_1 \log(\text{age}_{it}) + \alpha_2 \log(\text{age}_{it})^2 \\
&\quad + \alpha_3 \frac{\text{intangible assets}_{it}}{\text{fixed assets}_{it}} + \alpha_4 \text{growth}_{it+1} + \alpha_5 \text{size}_{it} \\
&\quad + \alpha_6 (\text{tax shields})_{it} + \varepsilon_{1it} \\
\left(\frac{\text{short-term debt}}{\text{debt}}\right)_{it} &= \beta_{0i} + \beta_1 (\text{return volatility})_{it} + \beta_2 (\text{maturity of assets})_{it} \\
&\quad + \beta_3 \text{leverage}_{it} + \beta_4 \text{collateral}_{it} + \varepsilon_{2it},
\end{aligned}$$

where $i = 1, \ldots, N$ refers to firms, and $t = 1, \ldots, T$ to time periods. The error terms of both equations, ε_{1it} and ε_{2it}, are identically distributed and uncorrelated

across observations and with the exogenous variables, but $\text{cov}(\varepsilon_{1it}, \varepsilon_{2is})$ may be different from zero if $t = s$.

To test the previous hypotheses, I interact the explanatory variables with the indicators of institutional and financial development, as explained above. I also control for firm cross-sectional differences that are not observed or are invariant over time, such as the institutional environment, by including firm-fixed effects in both equations (fixed-effect estimator).[13] These firm-specific effects also help to control for eventual data problems due to the definitions of balance sheet items in Amadeus. Even if there are cross-country biases in the way in which provisions are treated, they are unlikely to vary over time and, therefore, the conclusions regarding the tests of Hypotheses 1 through 4, which concern time-varying firm characteristics, are not affected.

I also take into account that leverage and the ratio of short-term debt to the total financial liabilities are jointly determined. Therefore, ordinary least squares in the equation for debt maturity[14] may be inconsistent, since leverage may be correlated with the residuals. To account for this endogeneity problem, I estimate the equation for debt maturity using two-stages least squares.

Finally, to test Hypotheses 5 and 6, I allow the coefficient of the firm-specific intercept, which can be recovered from the fixed effects estimates,[15] to depend on firm time-invariant characteristics as follows,

$$\begin{aligned} \alpha_{0i} &= a_o + a_1' Z_1 + u_1, \\ \beta_{0i} &= b_o + b_1' Z_2 + u_2, \end{aligned}$$

where Z_1 and Z_2 are two matrices of time-invariant explicative variables of dimension $g_1 \times N$ and $g_2 \times N$, respectively, and a_1 and b_1 are the vectors of the parameters of interest with dimension $g_1 \times 1$ and $g_2 \times 1$, respectively. Ordinary least squares provide consistent estimates of the coefficient of the time-invariant variables as N goes to infinity, as long as the error terms, u_1 and u_2, are not correlated with the time-invariant explicative variables.[16] The t-statistics I present are corrected for eventual clustering of the errors within a country. Under these assumptions on the error terms, I can study how firm-fixed effects vary across countries according to the level of financial development, the enforcement of laws, corporate tax rates, and between listed and unlisted companies.

Since the fixed effects estimator exploits only the time-series variability, I also present pooled time-series, cross-sectional estimates by ordinary least squares for an equation including both time-varying and time-invariant firm characteristics for comparison. In this estimation, the calculation of standard errors has been

[13] The Hausman test rejects the hypothesis that the random effects estimator is consistent, because individual fixed effects are correlated with the explicative variables in both equations. In contrast, it is always possible to reject the null that the individual fixed effects are not significant at 1%.

[14] The fixed effects estimator is equivalent to an ordinary least squares estimator applied to the equation with all the variables expressed in deviations from the individual mean.

[15] After estimating the equation $y_{it} = \alpha_i + \beta x_{it} + \varepsilon_{it}$ using the fixed effects estimator, the estimates of the individual fixed effects may be recovered as follows: $\hat{\alpha}_i = \bar{y}_i - \hat{\beta}\bar{x}_i$, where $\bar{y}_i$ and $\bar{x}_i$ are individual time averages.

[16] A detailed description of this two-stage method to estimate the effect of time-invariant individual characteristics may be found in Hsiao (1986).

corrected to take into account that the errors may be correlated across time within firms.

Finally, since looking at incremental debt policies helps to interpret the results—changes in the debt ratio may be due to a variation in the book value of equity as well as to the amount of outstanding debt—I estimate an equation for debt flows by ordinary least squares. In this equation, the dependent variable is obtained by deflating the first difference of the book value of debt with the initial period book value of debt plus equity; the explicative variables of the equation are the same in levels, but when appropriate they are expressed in first differences to be consistent with the specification of the dependent variable.[17]

V. Results

A. Time-Varying Determinants of Leverage

The estimates of the coefficients of the time-varying variables in the equation for leverage are presented in Table 7. For comparison, I report the estimates of an equation without interaction variables (Table 7, column 1) and the ordinary least squares estimates of the equation of interest including time-invariant institutional variables and time-varying firm characteristics (Table 7, column 2).

For the most part, the data support the view that the financial system characteristics affect the extent of agency problems and capital structure. There is strong support for Hypothesis 1: good creditor protection favors access to credit for firms investing in intangible assets. The coefficient of the variable obtained by interacting the share of intangible assets with a dummy variable that is equal to one if the index of creditor protection is above average, and zero otherwise, is positive and significant (Table 7, columns 2 and 3). These effects are also economically significant: according to the fixed effects estimates, if the level of tangible assets to total assets increases by one standard deviation, leverage decreases by more than 7% in countries with poor protection of creditor rights and by 3.9% in the others. Since to associate, for example, Italy with the U.K. with regard to the protection of creditor rights may be controversial, I also use the value of the index of LLSV (1998) instead of the dummy variable as an interaction variable; the results (not reported) remain qualitatively unchanged.

Future growth opportunities are another intangible asset requiring external finance. As in previous studies (see, e.g., Lang, Ofek, and Stulz (1996)), from the ordinary least squares estimates that do not take into account firm-fixed effects, future growth opportunities are negatively correlated with leverage, but in countries with highly capitalized stock markets, high growth firms become more indebted (Table 7, column 2). Therefore, high stock market capitalization has an indirect effect on unlisted firms' leverage, as it seems to make more credit available to firms that do not resort to the stock market to raise capital.

However, the fixed effects estimates, which use only the time-series variability of the observations, show that firms become more leveraged as their growth opportunities improve. This is due to the subsample of unlisted firms, since the

[17] In particular, I included the first difference of the firm size, and expressed all the remaining variables in levels.

TABLE 7

Time-Variant Determinants of Leverage

	Fixed Effects	OLS with Time-Invariant Variables	Fixed Effects	Fixed Effects	OLS with Time-Invariant Variables,[a] Listed Companies
Log(age)	−0.026	−0.029	−0.030	0.007	0.02
	(−3.978)	(−5.33)	(−4.65)	(0.684)	(0.56)
Log(age)2	−0.015	−0.001	−0.021	−0.037	−0.001
	(−7.444)	(−1.37)	(−9.85)	(−11.02)	(−1.12)
Log(age)^2 * bond		−0.003	0.019	0.038	−0.01
		(−5.53)	(9.77)	(7.9)	(−2.36)
Size	0.013	0.001	0.013	0.011	0.02
	(11.88)	(0.96)	(11.69)	(6.033)	(5.51)
INTANG	−0.13	−0.19	−0.278	−0.30	0.05
	(−7.387)	(−7.91)	(−10.19)	(−9.66)	(0.76)
INTANG * CRED		0.098	0.27	0.23	−0.003
		(2.37)	(7.33)	(3.46)	(−0.01)
Growth opportunities	−0.0018	−0.025	0.005		0.02
	(−2.19)	(−12.61)	(3.52)		(1.08)
Growth opportunities * stock market capitalization		0.033	−0.010	−0.021	−0.03
		(10.38)	(−5.64)	(−4.95)	(−0.99)
Growth opportunities * first shareholder				0.006	
				(2.37)	
ROA	−0.35	−0.58	−0.356	−0.50	−0.56
	(−52.845)	(−20.46)	(−53.15)	(−37.477)	(−2.63)
NDTS	0.000	0.000	−0.000	0.000	0.006
	(1.63)	(1.38)	(1.60)	(1.32)	(1.88)
Tax exhaustion dummy * NDTS	−0.000	−0.000	−0.004	−0.0004	−0.009
	(−5.13)	(−3.07)	(−5.07)	(−3.633)	(−2.72)
Obs.	167118		167118	38636	2046
R^2	0.06	0.1	0.06	0.09	0.14

Leverage is regressed on proxies for firm reputation (age), size (logarithm of the number of employees), the degree of intangibility of assets, measured by the ratio of intangible assets to total assets (INTANG), the growth opportunities (growth rate of sales), profitability (ROA), and non-debt tax shields (NDTS). To identify the effect across countries, various dummies are introduced, and interacted with the independent variables. All dummies are described in Table 5. The tax exhaustion dummy is equal to one for firms whose cash flow is less than or equal to zero. First shareholder is the equity share of the largest shareholder of the firm. Estimates of the equation for leverage are calculated by introducing firm dummies (fixed effects estimates) and by introducing time-invariant firm attributes in the ordinary least squares (OLS) regression. The coefficients of the time-invariant firm attributes are reported in Table 9, column 1. White-corrected standard errors are shown in parentheses. The standard errors of the OLS regression have been corrected to take into account the eventual correlation of errors over time for a given firm.

[a]The coefficients of the time-invariant variables have been omitted for this regression.

ordinary least squares coefficient is significant only for this subsample (estimates not reported), which does not use the stock market to issue new equity. The higher the stock market capitalization, the weaker this effect is, as is apparent from the negative and significant coefficient of the variable obtained by interacting the stock market capitalization and the growth rate (Table 7, column 3). Therefore, there seems to be a tendency to fund future growth with debt, although high growth firms (a characteristic captured by the firm dummy in the fixed effects estimate) are usually less indebted in countries with less developed stock markets.

Restricting the sample to firms for which information on the ownership share of the main shareholder is available, it appears that firms with more concentrated ownership are more inclined to finance growth with debt: in support of Hypothesis 2, in column 4 of Table 7, the coefficient of the growth rate of sales interacted

with a measure of the ownership share of the main shareholder is positive and significant.[18]

Both the coefficients of the logarithm of age and of the square of its logarithm are generally negative and statistically significant. Mature firms decrease leverage at an increasing pace as they age (the square of the logarithm of age is negative and significant). However, this does not necessarily imply that older firms retire debt and use internal funds as the pecking order theory suggests, it may be that older firms with an established reputation issue new capital and substitute equity to debt. A closer look at the coefficients of the debt flow equation (not reported) confirms this supposition. While the linear term is negative, confirming that very young firms prefer to substitute debt with internal funds, as Fluck, Holtz-Eakin, and Rosen (1997) also find, the coefficient of the quadratic term is positive. Therefore, firms start to issue more debt as they acquire a certain level of visibility. This is not evidenced in the reported coefficient estimates because of the confounding effect due to the issues of new equity.[19] Overall, the pecking order theory is supported only for very young firms, while a reputation effect is present for relatively older firms.

The ordinary least squares estimates do not support Hypothesis 3 as the coefficient of age interacted with bond market capitalization is negative and significant. However, once firm-fixed effects have been adequately taken into account, it emerges that mature firms have higher leverage in countries with more developed bond markets: the coefficient of the square of the logarithm of firm age interacted with the dummy that is equal to one for firms incorporated in countries with highly capitalized bond markets is positive and significant. Therefore, if highly capitalized bond markets exist, as they do in the U.K. and the Netherlands, firms have the option of issuing market debt when they are sufficiently mature, and leverage decreases more slowly either because bank loans are substituted with bonds,[20] or simply because the mere existence of an outside option decreases bank rates. As the theoretical models on the choice between bank loans and market debt based on reputation predict, the effect of a highly capitalized bond market is irrelevant in the early stage of a firm's life, since the dummy that distinguishes across countries with different bond market capitalization is not significant if interacted with the linear term.[21]

The coefficient of firm size, measured alternatively by the logarithm of the number of employees or the logarithm of total assets,[22] is positive but significant only in the fixed effects regression. Interestingly, there are relevant differences between listed and unlisted firms when the cross-sectional variability of the ob-

[18]These results might be criticized because the growth rate of the individual firm may be endogenous: firms that obtain more credit may be able to grow more, even if ex ante they did not have better growth opportunities. To overcome this problem, I measure growth opportunities using the average growth rate at time t of all the firms in the same sector and in the same country of firm i. The results (not reported) are qualitatively invariant.

[19]Indeed, the estimation of an analogous equation for the equity flows (not reported) confirms that firms issue new capital when they become relatively older.

[20]Several theoretical papers argue that bank loans are more expensive than market debt because banks can extract informational rents from borrowers (Rajan (1992)), or because they exercise costly monitoring to solve moral hazard problems (Diamond (1991)).

[21]Estimates are omitted for brevity.

[22]Only estimates obtained using the logarithm of the number of employees are reported.

servations is used. The ordinary least squares coefficient of size is positive and significant for listed companies (Table 7, column 5), but negative and nonsignificant for unlisted companies. This explains why in Section III I do not find any support for a positive relation between size and leverage for most countries. Listed companies seem to exploit the economies of scale due to their size by issuing debt. In contrast, unlisted firms are usually smaller and generally more indebted, and there seems to be no relation between their leverage and their size. The fixed effects capture systematic differences in leverage, and the positive relation between size and leverage emerges also for unlisted companies. This implies that leverage grows as firm size increases both for listed and unlisted firms.

Profitability, measured by the return on assets, is always negatively correlated with leverage. As noted before, this is perfectly consistent with pecking order theories. I also control for non-debt related corporate tax shields. The coefficient is always insignificant and close to zero. The coefficient is significant and has the expected negative sign only for the firms close to tax exhaustion (low cash flow firms), as in MacKie-Mason (1990).

B. Time-Varying Determinants of Maturity Structure

The estimates of the time-varying determinants of debt maturity are presented in Table 8. Debt maturity depends on the volatility of firms' returns in line with Hypothesis 4. The way in which the tradeoff is resolved between excessive liquidation, which is more likely when debt is short-term and returns are highly volatile, and creditors' fears of asset dissipation, which is favored by long-term debt, depends on institutions. When I distinguish countries according to the degree of creditor protection, debt maturity decreases as the volatility of the return on assets increases (the coefficient is positive and significant) only in countries where creditor rights are relatively less protected. In contrast, in countries where creditor protection is above average, the volatility of returns has no effect on debt maturity: both in the ordinary least squares and the fixed effects estimates, the coefficient of the variable obtained by interacting the variance of the return on assets with a dummy equal to one if creditor protection is above average is negative and significant. Moreover, I cannot reject the hypothesis that its magnitude is equal in absolute value to the coefficient of the variance of returns. Hence, in countries with high creditor protection, volatility has no effect on debt maturity. These results remain qualitatively unchanged if I use the level of the index of creditor protection rather than the dummy variable in the interaction variable.

The remaining control variables are significant and have the expected sign in all the specifications. The coefficient of the ratio of long-term assets to total assets, used to measure the maturity of assets, is significant and has the expected negative sign; that is to say, firms do try to match the maturity of their assets with that of liabilities. Furthermore, the ability to provide collateral, measured by the ratio of tangible assets to total assets, lengthens debt maturity.

The data also show that high leveraged firms have less short-term debt, suggesting that firms, which are able to obtain more loans perhaps because of their reputation as "good borrowers," also have easier access to long-term finance.

TABLE 8

Time-Variant Determinants of Debt Maturity

	Fixed Effects	OLS with Time-Invariant Variables	Fixed Effects	Fixed Effects, Listed Companies Only
Leverage	−0.2	−0.13	−0.19	−0.54
	(−7.984)	(−8.26)	(−7.7)	(−4.059)
Volatility at time *t*	0.0034	3.18	0.112	0.51
	(2.275)	(7.32)	(2.016)	(1.131)
CRED * volatility at time *t*		−3.2	−0.109	−0.56
		(−8.38)	(−1.956)	(−1.225)
Long-term assets/total assets	−0.22	−0.43	−0.22	−0.21
	(−37.07)	(−65.30)	(−37.1)	(−4.9)
TANG	−0.099	−0.078	−0.099	−0.064
	(−14.671)	(−11.65)	(−14.67)	(−0.848)
Obs.	167118	167118	167118	2046
R^2	0.02	0.2	0.03	0.02

The dependent variable is defined as short-term financial debt to total financial liabilities. Volatility is the variance of the return on assets in the sector of a given firm at time *t*. TANG is the ratio of tangible assets to total assets. The variable CRED measures creditor protection and is described in Table 5. Estimates are calculated by applying two-stages least squares to control for the endogeneity of leverage. White-corrected standard errors are shown in parentheses. The standard errors of the ordinary least squares regression have been corrected to take into account the eventual correlation of errors over time for a given firm.

C. Time-Invariant Determinants of Leverage and Debt Maturity

Table 9 shows the estimates of the time-invariant determinants of leverage and debt maturity, obtained with the two-stages method and ordinary least squares, respectively. In the ordinary least squares estimation of the equation for leverage, the coefficients of the time-invariant variables are always significant (Table 9, column 1). Moreover, the coefficients of firm-fixed effects to which I refer as "core leverage" depend on time-invariant country and firm characteristics nearly in the same way (Table 9, column 2). According to both estimation methods, listed firms are less indebted than unlisted companies, in accordance with Hypothesis 5. In countries with better capitalized stock markets, firms use less debt to finance investment, as BADM (2001) find. Moreover, as expected, firms are able to obtain more debt finance in countries with better protected creditor rights and better enforcement of the law. Ceteris paribus, firms are less indebted if the banking system is highly concentrated, perhaps in order to escape banks' market power. Bond market capitalization increases access to debt. Institutional differences are economically very important: a one-standard deviation increase in stock market capitalization or an analogous decrease in the protection of creditor rights or in the level of enforcement decrease the core leverage by 66%, 19%, and 8%, respectively.

Finally, the coefficient of the corporate tax rate is positive and significant only in the two-stages estimate. This is not surprising, because only the two-stages method of estimation is consistent if time-variant firm characteristics are correlated with firm unobserved heterogeneity.

The time-invariant firm attributes of the equation for debt maturity (Table 9, columns 3 and 4) reveal that in countries with deeper stock markets, firms obtain less long-term debt. Probably, the higher the stock market capitalization, the more

TABLE 9

Time-Invariant Determinants of Leverage and Debt Maturity

	Leverage: Coefficients of Institutional Variables in OLS Regression	Core Leverage	Maturity: Coefficients of Institutional Variables in OLS Regression	Core Maturity
Listed companies	−0.11	−0.05	−0.009	−0.12
	(−13.10)	(−3.13)	(−8.91)	(−6.44)
Enforcement	0.03	0.04	−24.41	−0.068
	(2.84)	(14.74)	(−8.94)	(−18.13)
Creditor rights protection	0.054	0.04	−7.67	−0.054
	(16.19)	(7.71)	(−8.94)	(−18.74)
Stock market capitalization to GDP	−0.19	−0.29	48.41	0.23
	(−9.82)	(−8.3)	(8.95)	(16.52)
Banking system concentration	−0.15	−0.12	79.19	13.66
	(−5.47)	(−6.01)	(8.92)	(5.81)
Bond market capitalization to GDP	0.59	0.17	−96.83	−0.66
	(7.24)	(4.98)	(−8.94)	(−9.87)
Corporate tax rate	−0.08	1.12		
	(−8.64)	(3.38)		
Obs.	167118	61557	167118	61557
R^2	0.1	0.11	0.02	0.08

"Core leverage" and "core maturity" are the coefficients of the firm-fixed effects in the equations for leverage and short-term debt to total financial liabilities, respectively. Sectorial dummies have been included in the regressions. The *t*-statistics are presented in parentheses. White-corrected standard errors are shown in parentheses. The standard errors of the equation for core leverage and core maturity have also been corrected for eventual clustering of the errors within countries. The standard errors of the ordinary least squares (OLS) regression have been corrected to take into account the eventual correlation of errors over time for a given firm.

equity becomes an effective substitute for long-term debt. Furthermore, the debt maturity of listed companies is always longer. This may be due to the fact that publicly quoted firms are usually more transparent, because they must disclose more information in order to be listed, and because share prices reveal information to creditors. This makes listed companies less risky, and explains their ability to obtain more long-term debt. Listed companies are also more likely to choose public debt, which usually has a longer maturity than bank loans. In agreement with this interpretation, debt maturity is longer in countries where recourse to market debt, measured by the ratio of bond market capitalization to GDP, is greater. In contrast, against the expectation that low bank competition favors long-term bank-firm relations, maturity is shorter in countries where the banking system is more concentrated. Debt maturity is longer when laws are better enforced and creditor rights well are protected, as Demirgüç-Kunt and Maksimovic (1999) also find. Also, institutional characteristics are economically important: according to the two-stages method, for all the institutional variables, with the exception of the concentration of the banking system, a one standard deviation change in the indicator provokes a change in the ratio of short-term debt to total financial liabilities larger than 10% in absolute value. In particular, a standard deviation increase in the level of enforcement lengthens maturity by approximately 35% and an analogous improvement in protection of creditor rights by 12%.

The qualitative results are similar if the coefficients of time-variant and invariant variables are estimated by pooling together cross-sectional and time-series variability (without controlling for unobservable firm characteristics) or by using the two-stages method. However, the magnitude of the estimated coefficients of

the institutional variables varies considerably. One should remember, however, that only the two-stages method is consistent if time-variant firm characteristics are correlated with the unobservable fixed effects.

D. Robustness

The signs of coefficients, and usually also their significance remain qualitatively similar if I run the regressions for subsamples of firms that differ in size. The only exceptions are large firms (firms with more than 1,000 employees) and listed companies. Interestingly, neither the share of intangible assets nor the interaction variable is significantly correlated with leverage for companies with more than 1,000 employees and for listed companies. Furthermore, the effect of the variance of returns on maturity is not significant for firms with more than 1,000 employees. This confirms that it is important to look at small unlisted companies to study cross-country differences in agency problems and capital structure.

Finally, by dropping each country from the results in turn, I check to see if any country disproportionately influences the previous results. No differences emerge when I exclude the smaller countries or the U.K. However, leaving out Italy and France, the two most represented countries, does influence the coefficients' estimates of the equation for leverage. This is not surprising. Italy, for instance, has the lowest ratio of stock market capitalization to GDP in the sample, and if one is to study the effects of stock market capitalization on corporate finance decisions in such a small sample of countries, the observations on Italy are needed.

VI. Conclusions

This paper examines how firm characteristics, legal rules, and financial development affect corporate finance decisions in eight European countries. Several important differences emerge regarding the availability of finance and debt maturity. First, firms that invest more intensively in intangible assets are penalized less for lack of collateral in countries with good creditor protection. Second, highly protected creditor rights also help to lengthen debt maturity for firms in sectors with highly volatile returns, and thus may help to avoid distortions due to the excessive liquidation of firms in temporary difficulty, which is often associated with frequent short-term debt renewal decisions.

Interestingly, highly protected creditor rights improve financing opportunities primarily for unlisted companies, as lack of collateral and volatility of returns do not seem to have a significant effect on the financing choices of public companies.

Furthermore, the analysis helps to identify other features of the financial system that seem to be responsible for the observed patterns of cross-country differences in corporate finance decisions. For example, firms are highly indebted if the domestic stock markets are underdeveloped. The low quality of law enforcement and the lack of protection of creditor rights in the country of incorporation clearly contribute to the short maturity of firms' liabilities.

The analysis could be extended to a larger sample of countries. An examination of both developing and developed countries would increase the cross-country variability and provide a greater range of institutional differences for a deeper understanding of how the extent of agency problems depends on institutions.

Moreover, many issues regarding the choice between bank loans and market debt remain unexplored because the data set does not provide this information. However, this paper provides an indirect analysis of the choice between market debt and bank loans over the firm's life cycle, and finds that in countries where the bond market is underdeveloped, mature companies issue less debt. This is most likely due to firms being unable to replace bank loans with market debt. This point deserves further attention because low bond market capitalization, which is often coupled with an undercapitalized stock market, may constrain firm growth due to a lack of cheap sources of external finance.

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