Determinants of Leverage and Access to Credit: Evidence on Western and Eastern Europe countries

Laurent Weill

LARGE, Université Robert Schuman, Institut d'Etudes Politiques,
47 avenue de la Forêt-Noire, 67082 Strasbourg Cedex, France.
Phone: 33 3 88 41 77 21 ; Fax: 33 3 88 41 77 78

Abstract:

In this paper, we empirically investigate the determinants of leverage in countries from Western Europe and Eastern Europe on a large sample of companies from all sizes. Empirical observation allows us to interpret these variables as the key factors of access to credit after controlling the influence of self-financing. We observe the lack of significance of tested factors in Eastern Europe, in comparison to Western Europe. This result supports the assumption of a different lending behavior of banks in transition countries. This may be explained by the prolongation of old loans or by a higher inefficiency of banks in these countries.

JEL Classification: G21, G32, P34
Keywords: corporate finance, transition economies, debt, banks.

1. Introduction

This paper aims at analyzing the determinants of leverage on an international sample of companies in several European countries, both developed and transition ones. Our starting point is the observation that the issuance of bond debt and equity capital are not commonly used as sources of financing in European countries. Indeed, even in the United Kingdom, whose financial system is considered as the most involved in markets, evidence shows that the major source of external financing remains bank credit (OECD (1999), Edwards and Fischer (1994), Corbett and Jenkinson (1994)). Bond debt, although representing a significant share of external financing[1], is mainly issued by large companies and consequently does not represent an alternative source of financing for the vast majority of companies. Furthermore, data on OECD countries have shown that the external financing by equity issues is typically small

[1] Bond debt represented on average about 8% of total external financing for France and the United Kingdom during the nineties (OECD [1999]).

compared with the financing by banks or by retained earnings (Mayer (1988), Corbett and Jenkinson (1994)).

Therefore, empirical observation corroborates the pecking-order hypothesis suggested by Myers (1977), according to which companies finance their needs in a hierarchical fashion, first using internally available funds, followed by debt and finally external equity. This ranking is theoretically explained by the relative costs of the sources of financing, coming from information asymmetries. Following this observation, our analysis aims to study the explanatory factors of leverage by taking on one side profitability, and on the other side five tested variables into account. By including profitability in the analysis, we control the influence of internal financing. Our analysis then focus on the determinants of access to credit. Indeed the fact that self-financing and bank debt are the major sources of financing - and also the preferred ones according to the pecking-order theory - leads to the fact that after taking retained earnings into account all determinants explain the easiness of access to bank debt.

Most studies on the determinants of leverage were devoted only to large companies (Rajan and Zingales (1995), De Jong and Van Dijk (1998)), which benefit from a better access to financial markets for their sources of financing because of lower costs of access to these markets. As a result, the interpretations of these works were based upon the assumption of a choice of financial structure for firms'managers, having the choice between debt and stock issues. Our analysis is in a larger perspective as we do not restrict our focus to large companies. Consequently, this interpretation in terms of choice of financial structure has to be replaced in our work by an interpretation in terms of access to credit, as the vast majority of companies do not have any satisfactory alternative for the bank financing. To our knowledge, only the work from Rajan and Zingales (1995) tested the determinants of leverage on an international sample. However their study was limited to large companies. As a result, following our focus on the access to credit, **this is the first research providing evidence on the determinants of access to credit in an international comparison for all sizes of companies.**

Next to this international perspective, our study is also innovative by introducing transition countries in the analysis. Two major features characterize the financial systems of these countries. First, the financial markets are underdeveloped (Anderson and Kegels (1998), Scholtens (2000)). As a result, even large companies in transition countries have a limited access to stock and bond issues for their needs of financing. Second, the availability of retained earnings is lower than in Western Europe. Indeed, profitability is strongly lower in

Eastern Europe due to bad economic situation. Consequently, the companies are expected to be more willing to obtain bank loans in countries in transition. These specific features of the financial systems from transition countries make the access to credit a very important issue for the development of these economies.

Therefore, a comparative analysis of the factors of leverage between developed countries from Western Europe and transition countries from Eastern Europe allows to observe the differences in the lending behavior of banks, by comparing the significance and sign of the tested determinants of leverage. Indeed it provides evidence about the valuation of specific features by banks in various countries. This analysis can be interpreted as an investigation of the bank efficiency differences among countries, but from a credit supply-side perspective. Indeed, if we observe that the variables predicted to influence credit decisions do not have any impact in some countries, we can consider these results as evidence in favor of a lower bank efficiency. While the extended literature on bank efficiency focuses on the performances of banks from bank accounting data[2], we look here at the lending behavior of banks from accounting data on borrowers. To sum up this second innovation, **our paper then provides the first elements of comparison of access to credit between developed and transition countries in Europe**.

The study aims to analyze the determinants of leverage on a sample of companies from countries from Western (the United Kingdom, France) and Eastern Europe (the Czech Republic, Poland). The choice of the countries results on the one hand from the availability of data, on the other hand from the representativeness of the countries. We test several determinants of leverage: size, innovation, tangibility of assets, growth, profitability, age. By introducing an innovation ratio in the analysis, we focus on the financing of innovation, which is an item of a particular interest for the analysis of the financial structure. We test if the innovative features of companies influence leverage. In other words, we observe if innovative companies are credit-constrained, as suggested by empirical studies from Hall (1992) and Guiso (1998).

The rest of the paper is organized as follows. Section 2 presents the background of our analysis. After developing the former empirical literature on the determinants of leverage, we describe the tested assumptions. We can then present the assumptions made on the tested

[2] See Berger and Humphrey [1997] for a survey of this literature.

determinants of leverage in our study. Section 3 presents data, sample and also main descriptive statistics. We then provide figures on the sources of financing in European countries. Section 4 examines the results of our estimations. We bring some concluding remarks in section 5.

2. Background

2.1 A short review of the empirical literature

A few empirical studies have been performed to analyze the determinants of leverage. Table 1 displays the results of these works. A major difference between the empirical works is the definition of leverage. The broadest definition is the ratio of total balance sheet minus equity divided by total balance sheet. This definition is frequently adopted (Shuetrim et al. (1993), Schwiete and Weigand (1997), Rajan and Zingales (1995) and Michaelas et al. (1999)). However this measure includes the accounts payable that are linked to economic activity, and consequently can not be inserted in the choice of financing between equity and debt. Having more precise data, Johnson (1997) looks at the determinants of three debt ratios.

TABLE 1 :
Empirical Studies on the Determinants of Leverage

Study	Sample	Results
De Jong and Van Dijk (1998)	102 listed Dutch companies for 1996	*Positive relation:* tangibility of assets, marginal tax rate. *Negative relation* : industry-specific risk.
Johnson (1997)	847 American companies for 1989	**Bond debt ratio* : positive relation : tangibility of assets, age, size, leverage[3]. Negative relation: volatility. **Non-banking debt ratio* : positive relation : market-to-book value ratio. Negative relation: tangibility of assets, leverage. **Banking debt ratio* : positive relation : tangibility of assets, leverage. Negative relation: age, size, ratio of market-to-book value.
Michaelas, Chittenden and Poutziouris (1999)	3500 small British companies for 1995	*Positive relation*: growth, future growth opportunities, tangibility of assets, operating risk, size, net debtors. *Negative relation*: profitability, age.
Rajan and Zingales (1995)	4500 listed companies from G7 countries : Canada, France, Germany, Italy, Japan, the United Kingdom, the United States. Period: 1987-1991	*Positive relation* : tangibility of assets, size (negative for Germany). *Negative relation* : market-to-book value ratio, profitability.
Schwiete and Weigand (1997)	230 German companies for the period 1967-1994	*Positive relation* : profitability, capital concentration. *Negative relation*: growth, risk, size.
Shuetrim et al. (1993)	105 Australian companies for the period 1973-1990	*Positive relation*: size, growth, tangibility of assets. *Negative relation*: cash-flow.

Out of the analysis of empirical literature, three remarks can be proposed. Firstly, all studies were performed in developed countries. As a result, the existence of developed financial markets, allowing an alternative financing through the issuance of stock capital, may have an influence on leverage, even if companies choose their source of financing following the pecking-order hypothesis. Secondly, we can observe the focus on five variables: profitability, tangibility of assets, growth, size and in a lesser degree age. Thirdly, it gives us some insights on the expected relations of variables with leverage:

- **There is a positive relation with tangibility of assets:** this relation is observed in all studies.
- **The relation with size is ambiguous** : it is positive for Rajan and Zingales (1995) for all G7 countries (if we except Germany where there is a negative relation), Michaelas et al.

[3] Leverage is here defined as the ratio of equity and long-term debt on total balance sheet.

(1999), Shuetrim et al. (1993) on Australian data). However Schwiete and Weigand (1997) in Germany and Johnson (1997) testing the relation with the bank indebtedness ratio on American data conclude to a negative sign for size.

- **Profitability tends to have a negative relation:** Rajan and Zingales, Michaelas et al., Johnson, Shuetrim et al. conclude all to this result, while Schwiete and Weigand observe a positive relation on Germany.
- **The relation with growth is rather positive:** Shuetrim et al. and Michaelas et al. observe a positive sign for growth variable, while again Schwiete and Weigand obtain a different sign on German data.
- **There is a negative relation with age:** both studies testing this variable obtain this result.

2.2 Tested assumptions

We present here the assumptions made on the predicted influences of variables on leverage. Most former empirical studies were limited to the analysis of leverage of large companies. As a result, the interpretations of these results were based on theories of capital structure, according to which companies choose between debt and issuance of new equity for their sources of financing, assuming no hierarchy based on costs between these sources. However, the starting point of our analysis here is that the vast majority of companies prefers to finance by debt than by external financing by equity, following the pecking-order hypothesis. As a result, after controlling the internal financing by including profitability, we make interpretations here only in terms of access to credit. Indeed, as retained earnings and debt are the preferred – and the most used - sources of financing of companies, we consider that after taking retained earnings into account all determinants explain the access to credit.

The survey of the empirical literature has provided elements for the choice of determinants to be tested. Next to the five aforementioned criteria, we decide to add a variable for innovation to analyze the influence of innovative features on leverage. Innovation was not taken into account in previous studies on determinants of leverage, mainly because of lack of data on this item (Rajan and Zingales (1995, p.1451)). We present below the assumptions for each tested determinant.

Profitability: two opposite effects of profitability on leverage can be suggested. On the one hand, a high profitability is considered as a positive signal for banks, as it reduces the bankruptcy risk of the company. A positive relation may then be expected. On the other hand, Myers (1977) suggested the pecking-order hypothesis, meaning that firms prefer to finance

with internal funds rather than debt. Based on relative costs resulting from differences in information asymmetries, this assumption is corroborated in developed countries by the importance of retained earnings in the sources of financing (Mayer (1988)). Confirming this assumption, empirical literature on developed countries suggests that the negative effect is the dominant one. In transition countries, where retained earnings are lower, we can however expect a lesser influence of this negative effect. Consequently, while the expected relation with leverage is negative in developed countries, we can not predict any relation in transition countries, as the dominant effect is hard to evaluate. Thus our first hypothesis is: **H1: Profitability is more likely to be negatively related to leverage in France and the United Kingdom than in the Czech Republic and Poland.**

This variable takes the internal financing into account. We can then assume that other explanatory variables only influence the external financing of the company.

Innovation: literature mainly suggests a lower leverage for innovative firms, providing two justifications. Firstly, innovative projects are less well understood by outside observers, because there are less past realizations to provide benchmarks for their assessment. As a result, information asymmetries between the borrower and the bank are higher in the case of innovative firms. Banks may then be more reluctant to lend them money. Secondly, research and development expenses are less safe assets than tangible assets. Thus, innovative firms may not have enough assets considered as safe enough by banks to secure loans. Hall (1992) on US manufacturing firms and Guiso (1998) on Italian manufacturing firms provided evidence on this issue by concluding that innovative firms are credit-constrained. Hence, our next hypothesis is: **H2: Innovation is negatively related to leverage.**

Growth: a high growth is positively valued by banks, as it is generally considered as a proxy signal for the good financial health of the company. Consequently, our next hypothesis is: **H3: Growth is positively related to leverage**.

Tangibility: theoretical and empirical literature undoubtedly suggests a positive relation with leverage, based on the role of tangibility assets as collateral value. Firstly, the larger the share of tangible assets in total assets for a company the higher the collateral value when requesting a loan. Therefore, this increases the possibilities of banks to secure loans and then to have a higher residual value of the loan in case of default. The hazard moral problem is then reduced, as suggested by Bester and Hellwig (1989). Secondly, collateral can be used as a sorting variable to solve adverse selection: indeed low risk borrowers can signal their type by choosing a loan contract with low interest rate and high collateral, rather a contract specifying high interest rate and a lower collateral (Bester (1985)).

Collateral value plays a major role in the access to credit in European countries: for instance, Michaelas et al. (1999) pointed out that British lenders commonly required collateral, while Hainz (1999) observed that collateralization is also very important in transition countries, which Fan et al. (1996) empirically confirmed for Russia. Hence, our next hypothesis is: **H4: Tangibility is positively related to leverage.**

Size: there are conflicting predictions on the effects of size on leverage, as suggested by the ambiguous results from empirical literature. On the one hand, size can be considered as a proxy of failure risk as big firms are more diversified and fail less often than small ones. Consequently, banks should be more willing to lend money to large companies and the relation should be positive. On the other hand, large companies may have an easier access to financial markets and benefit from better financial conditions on these markets when requesting new issuance of capital. As a result, the relation should then be negative between leverage and size. This negative effect can only play a role in France and the United Kingdom where stock markets offer real possibilities for external financing.

Consequently, the existence of opposite effects makes difficult any prediction about the sign of size for British and French companies. However, because of the weak development of the stock markets in transition countries, we can consider that only the positive effect plays a role for Czech and Polish companies. Then, we assume: **H5: Size is positively related to leverage in the Czech Republic and Poland.**

Age: this variable is considered as a proxy for reputation. As Diamond (1989) showed it, a borrower with a high credit reputation has less incentives to default, as a good credit reputation results in better loan rates that he would loose in case of default. Consequently banks are less reluctant to lend money to a borrower with a good reputation. As a result, the relation between leverage and age is expected to be positive. **H6: Age is positively related to leverage.**

3. Data and variables

3.1 Data

The sample includes about 1800 manufacturing companies from the Czech Republic, France, Poland and the United Kingdom. We use a balanced sample. Data are unconsolidated balance sheet data, except for the United Kingdom where we use consolidated data, from 1996 and 1997. They are extracted from Amadeus database edited by Bureau Van Dijk. Our

choice to work on unconsolidated balance sheet data comes from the fact that Amadeus database only provides unconsolidated data for the countries of our study, if we except the United Kingdom where it only provides consolidated data. Furthermore, Rajan and Zingales (1995) pointed out that the choice of using consolidated data leads to an increase of the indebtedness ratio in the year when a firm moves to consolidate accounts. We limited the analysis to manufacturing companies to have a homogenous sample, because of the discrepancies in financial structure between industries. In this aim, we selected companies with CSO code between 2000 and 4999.

3.2 The measures of leverage

We adopt two definitions of leverage in our analysis.

- The ratio of debt (both short-term bank loans and long-term debt) divided by total assets : this measure indicates the share of the external financing in the whole balance sheet. However, it fails to take the fact that there are some assets that are offset by non-debt liabilities, such as trade credit financed by the accounts payable, into account. This caveat leads us to adopt an alternative definition.
- The ratio of debt (both short-term bank loans and long-term debt) divided by adjusted total assets (total assets minus trade payables): unlike the previous one, this measure is not influenced by trade credit.

We concentrate our analysis on the six variables underlined in the empirical literature. Profitability is measured by the mean return on assets on 1996 and 1997. Growth is the ratio of total balance sheet in 1997 to the 1996's one. Tangibility is measured by the mean ratio of fixed assets divided by total assets on 1996 and 1997. We use this ratio as a proxy for asset collateral value. Innovation is appraised by the ratio of intangible fixed assets to total assets. Intangible fixed assets include research and development expenditures, trademarks, patents and copyrights. Most studies on innovation only adopted the research and development expenditures instead of all intangible fixed assets (Hall (1992), Guiso (1998)). However the lack of this item in our data makes us choose rather the intangible fixed assets as a satisfactory proxy. Size is evaluated by the mean logarithm of operating revenue on 1996 and 1997. Operating revenue is a better indicator of size than balance sheet size for our tests, as it avoids the colinearity with other variables defined as shares of total balance sheet. Logarithm is adopted to reduce the dispersion between companies. Age is the number of years of existence of the company before 1997.

We adopted the Turkey box-plot, based on the use of interquartile range to clean data. Companies with observations out of the range defined by the first and third quartiles more or less one and half the interquartile range were excluded for the following ratios: debt to total assets, adjusted debt to total assets, tangibility of assets, profitability, innovation.

Differences in leverage can be attributed to the different size composition of the country sample. To analyze these differences in size, we divide here the whole sample in 4 classes depending on the turnover in euros : (1) until 10 million euros, (2) from 10 to 20 million euros, (3) from 20 to 50 million euros, (4) above 50 million euros. Table 2 describes the size distribution of each country sample. We observe the higher size of British and French companies, in comparison to Czech and Polish ones: Czech and Polish samples own more than 60% of companies from the two lowest classes, while this figure is only around 40% for France and 30% for the United Kingdom.

TABLE 2

Size distribution of sample

Country	Total	Size < 10m	10m < Size < 20m	20m < Size < 50m	50m < Size
France	644	39 (6.1)	222 (34.5)	179 (27.8)	204 (31.7)
United Kingdom	564	33 (5.9)	142 (25.2)	172 (30.5)	217 (31.7)
Czech Republic	388	183 (47.2)	94 (24.2)	77 (19.8)	34 (8.8)
Poland	224	59 (26.3)	81 (36.2)	56 (25.0)	28 (12.5)
Total	**1820**	**314 (17.2)**	**539 (29.6)**	**484 (26.6)**	**483 (26.5)**

Numbers between brackets are the percentage of companies from the country included in the class.

Table 3 presents for each country median values and standard deviations for balance sheet items and leverage ratios. On the liability side, companies are better capitalized in the Czech Republic and Poland than in France and the United Kingdom. This fact could be misinterpreted as a better financial situation with a lower indebtedness. Nonetheless, Bratkowski et al. (1998) showed that **the reason of the high capitalization ratio in transition economies is the reluctance of banks to provide loans, in comparison with western countries**. As a consequence of the high capitalization, the debt ratio is weaker in both Eastern Europe countries than in Western Europe ones. French companies are strongly less indebted than British ones, due to the importance of trade payables in liabilities. Indeed

trade credit is of high significance in France. On the asset side, we observe a higher proportion of current assets in total balance sheet in the United Kingdom and especially in France, because of the weight of trade credit in this country. This strong difference between both types of countries can result from the overestimation of fixed assets in financial reports, or from lower delays of payment that reduce the weight of trade receivables in the balance sheet. We can summarize our observations about the differences between both types of countries as follows: **(i) equity ratio is higher in the Czech Republic and Poland, (2) Czech and Polish companies own a larger proportion of fixed assets.**

TABLE 3
Sample statistics for balance sheet items and leverage ratios

	France	**United Kingdom**	**Czech Republic**	**Poland**
Fixed assets / TA				
Median	25.99	39.78	49.34	55.32
Std Deviation	15.75	18.03	16.38	14.81
Current assets / TA				
Median	74.01	60.22	50.66	44.68
Std Deviation	15.75	18.03	16.38	14.81
Equity / TA				
Median	37.60	35.58	50.88	52.76
Std Deviation	15.53	15.33	18.81	17.57
Debt / TA				
Median	14.73	30.35	8.73	8.81
Std Deviation	10.56	16.86	9.04	5.87
Payables / TA				
Median	24.66	14.12	15.59	14.66
Std Deviation	13.02	10.78	13.16	11.75
Debt / Adjusted TA				
Median	20.78	36.23	11.10	11.07
Std Deviation	14.13	19.07	11.24	7.13

All ratios are multiplied by 100
TA : total assets
Adjusted TA: adjusted total assets

Table 4 displays the median values and standard deviations for explanatory variables in every country. Next to statistics on size and tangibility of assets analyzed above, we observe that Czech companies have lower profitability and growth than companies from other countries, even from Poland. This is the consequence of the recession in the Czech Republic during the years of the study, which strongly affected the financial situation of companies. There are strong discrepancies between countries about age: indeed, comparing with British and French companies, the median age is strongly higher for Polish companies (45 years) and

lower for Czech companies (5 years). Finally, one can point out that innovation ratio is very small with median values ranging from 0.21 to 1.64%.

TABLE 4
Sample statistics for explanatory variables

	France	United Kingdom	Czech Republic	Poland
Profitability				
Median	5.35	5.81	0.26	5.53
Std Deviation	6.33	6.37	4.73	9.30
Innovation				
Median	0.37	1.64	0.21	0.63
Std Deviation	1.10	6.48	0.37	0.50
Growth				
Median	106.65	121.10	79.09	115.80
Std Deviation.	18.13	31.61	13.84	26.75
Tangibility				
Median	26.51	39.05	50.12	56.76
Std Deviation	15.38	17.46	16.15	14.11
Size				
Median	10.15	10.38	9.29	9.76
Std Deviation	1.14	1.35	1.05	1.56
Age				
Median	31.00	18.50	5.00	45.00
Std Deviation	26.91	26.02	4.34	52.50

100 in the table multiply all variables except size and age. Age is in years.
PROFITABILITY : the mean return on assets on 1996 and 1997. GROWTH : the ratio of total balance sheet in 1997 to the 1996's one. TANGIBILITY : the mean ratio of fixed assets divided by total assets on 1996 and 1997. INNOVATION : the ratio of intangible fixed assets to total assets in 1997. SIZE : the mean logarithm of operating revenue on 1996 and 1997. AGE : the number of years of existence of the company before 1997.

4. Results

4.1 Analysis

The regression we estimate is :

$$\textbf{Leverage [Firm i]} = \alpha + \beta_1 \textbf{ Profitability} + \beta_2 \textbf{ Innovation} + \beta_3 \textbf{ Growth} + \beta_4 \textbf{ Tangibility} + \beta_5 \textbf{ Size} + \beta_6 \textbf{ Age} + \varepsilon_i$$

We use two measures of leverage: the ratio of debt to total assets, the ratio of debt to adjusted total assets, where adjusted total assets are assets less accounts payable. We perform these regressions for each country. Table 5 displays the results for each dependent variable and each country. We present first the results with the ratio of debt to total assets as the dependent variable, then those obtained with the ratio of debt to adjusted total assets as the

dependent variable. Two major comments can be suggested. First, **the fit of the equations is rather good for France and the United Kingdom, while it is weak for the Czech Republic and Poland**. Rajan and Zingales (1995) obtained an adjusted R^2 between 0.12 and 0.28 depending on the used measures of leverage for France and the United Kingdom. The low adjusted R^2 for both transition countries tends to suggest that the theoretical assumptions on the determinants of leverage do not play the same role in these countries than in developed countries. We will look further this assertion. Second, **there are no major differences between both types of regressions**, meaning that the measure of leverage does not have a strong impact on the results.

Profitability is negatively correlated with leverage in France and the United Kingdom. This finding provides evidence in favor of the pecking-order hypothesis, according to which firms prefer to rely on internal financing rather than external financing. There is no significant relation between profitability and leverage for the Czech Republic and Poland. This may come from the weakness of retained earnings in transition countries that allows the positive effect of profitability on leverage, as a positive signal for banks, to offset the influence of the preference of firms to use their internal financing. **We then support H1.**

Innovation is only correlated with leverage in the United Kingdom. This result suggests that the innovative companies do not suffer from a lower access to credit, or in other words that banks do not consider the innovation feature as a negative signal. **We therefore reject H2.** We observe an unexpected positive and significant coefficient of innovation variable for the United Kingdom with both measures of leverage. However all these results incite to remind the limits of the chosen measure for innovation, that includes all intangible fixed assets and not only research and development expenses. Thus, the use of such a proxy incites to be cautious in the interpretations.

TABLE 5
Factors correlated with measures of leverage

	France	United Kingdom	Czech Republic	Poland
Debt to Total Assets				
Intercept	0.225***	0.298***	0.094	-0.018
	(4.830)	(4.997)	(1.422)	(-0.365)
Profitability	-0.375***	-0.807E-3***	-0.634E-4	0.301E-3
	(-5.953)	(-7.645)	(-0.621)	(0.630)
Innovation	0.425	0.307***	-0.499	0.347
	(1.175)	(2.864)	(-0.406)	(0.438)
Growth	0.054**	0.053**	0.105***	0.057***
	(2.428)	(2.529)	(3.020)	(3.457)
Tangibility	0.149***	0.121***	0.056**	0.013
	(5.669)	(3.073)	(2.000)	(0.467)
Size	-0.015**	-0.515E-3	-0.721E-3	0.281E-2
	(-4.078)	(-1.006)	(-1.634)	(0.735)
Age	0.187E-4	0.0355E-4	0.206E-4	0.201E-4
	(1.251)	(-1.365)	(0.194)	(0.654)
Number of obs.	644	564	388	222
Adjusted R^2	0.1175	0.1362	0.0234	0.0546
Debt to Adjusted Total Assets				
Intercept	0.331***	0.415***	0.119	0.39E-2
	(5.318)	(6.157)	(1.470)	(0.066)
Profitability	-0.584E-3***	-0.973E-3***	-0.165E-3	-0.132E-3
	(-6.937)	(-8.159)	(-1.310)	(-0.233)
Innovation	0.777	0.302**	-0.854	0.026
	(1.606)	(2.497)	(-0.562)	(0.028)
Growth	0.092***	0.080***	0.178***	0.088***
	(3.090)	(3.366)	(4.124)	(4.513)
Tangibility	0.108***	0.072	0.015	-0.046
	(3.079)	(1.614)	(0.431)	(-1.327)
Size	-0.021***	-0.010*	-0.968E-3*	0.28E-2
	(-4.227)	(-1.801)	(-1.776)	(0.612)
Age	0.448E-5	-0.442E-4	-0.219E-4	0.129E-4
	(0.224)	(-1.505)	(-0.167)	(0.142)
Number of obs.	644	564	388	222
Adjusted R^2	0.1175	0.1392	0.0358	0.0973

t-statistic in parentheses.

*, ** and *** are significant at the 10, 5 and 1 percent level respectively.

Growth is positively correlated with leverage for all countries. We then accept H3. This result comes from the positive valuation of growth by banks in transition countries. In France and the United Kingdom, we have to make the distinction between firms having access to markets and others. For the latter ones, the explanation is the same one than for Czech and Polish firms: banks positively value firm growth in credit decisions. For firms accessing to markets for external financing, this may result from a better valuation by banks than by markets of growth.

Tangibility is positively correlated for France, the United Kingdom and the Czech Republic with the first measure of leverage, but only with the second measure of leverage for France. This relation is in conformity with our expectations as tangibility of assets is a proxy for collateral value. Indeed, banks positively value the collateral value formed by tangible fixed assets as it improves possibilities to secure loans. Whole empirical literature on developed countries found the same result. What is however more surprising is the observation of no significant relation in Poland for the first measure of leverage and the significance of tangibility only for France with the second measure of leverage.

The disparity in results obtained with both measures of leverage suggests the existence of a relation between tangibility of assets and the share of trade payables in total balance sheet. Indeed, while the first measure of leverage is the ratio of debt to total assets, the second one is the ratio of debt to total assets minus trade payables. This is a rather intuitive relation: there exists a positive link between trade payables on the liabilities side and trade receivables on the asset side as both are influenced by the activity of the company, as a result higher the share of trade payables is higher the share of current assets will be and then lower tangibility of assets will be. A deeper analysis of data shows that there exists indeed a significant and negative relation between tangibility of assets and the share of trade payables. Thus, the existence of this negative relation explains this difference between both regressions: the expected positive influence of tangibility on leverage is then offset in the second regression by the negative relation between tangibility and the share of trade payables.

The absence of any result for Poland is very surprising as the role of collateral value is expected to be of high importance in transition countries where banks should exert a special care to secure loans, because of the higher uncertainty on economic activity. However, this observation has to be linked to the median age of Polish companies, which is higher than in other countries, especially when comparing to Czech companies. Consequently, it means that most companies were incorporated during the communist regime. As loans are often

prolonged in transition countries due to the reluctance of bank managers to make companies fail, the debt of old companies may then have been granted for a long time and then the current financial situation may not have any influence on the access to credit.

To sum it up, our results about tangibility of assets **tend to support the assumption H.4**, but we have to take into account on one side the fact that this result is dependent of the chosen measure of leverage, on the other side the observation that there is no significant relation for Polish companies.

The regression coefficients for size are negative in general, however their significance varies depending on the country and especially of the chosen measure of leverage. These results suggest that the negative effect of size, the better access and conditions on stock markets, dominates the positive effect, coming from the lower risk of failure. This dominance was expected to be particularly relevant in Western Europe countries, as the development of financial markets remains very weak in Eastern Europe.

Indeed, the negative influence of the size variable is particularly significant in both Western Europe countries: it is significant for France with both ratios, for the United Kingdom only with the second ratio. In Eastern Europe, we only observe a significant relation for the Czech Republic and for the second ratio: this relation is then negative. Consequently, the major point is that the positive relation we expected in transition countries obtains no support. This is a surprising result as, in these countries with a high frequency of company failure, size can be considered as one of the best signals of the probability of survival. To sum it up, **we then find no evidence for H5.**

Age is not correlated with leverage. Indeed, we do not obtain any significant regression coefficient for this variable in any of our tests. Consequently, **we reject H6**. In the brief survey about the empirical studies of determinants of leverage, we mentioned that both studies testing the link between age and leverage concluded to a negative relation (Johnson (1997), Michaelas et al. (1999)) while the intuition suggested a positive connection as age can be considered as a proxy of the lender reputation. Petersen and Rajan (1994) also observed this negative relation on a sample of small companies. Michaelas et al. (1999) explained this result by asserting that the older firms tend to accumulate retained earnings: consequently they would need less external financing.

This interpretation does not seem satisfactory to us for two reasons. First, the impact of internal financing has already been included with the ‘Profitability’ variable in the

regressions, taking the mean return on assets on 1996 and 1997 into account. As a result, only the retained earnings happened before 1996 would then influence the sign of age. Second, this explanation does not seem satisfactory for transition countries in which retained earnings do not represent important volumes. It could be argued that our Polish sample has a median age of 45 years, which would result in a low discrimination of banks regarding age. Nevertheless, the Czech sample has a median age of 5 years, which does not lead to a significant and positive influence of age on leverage.

4.2 Interpretations

The objective of this paper is twofold. First, we proceed to an international comparison of the determinants of leverage on a sample of companies from all sizes. Second, we compare the factors of access to credit between developed countries from Western Europe and transition countries from Eastern Europe to observe the differences in the lending behavior of banks. The tests presented here provide several interesting elements for the empirical analysis of the determinants of leverage.

First, **we observe a clear distinction on the significant determinants of leverage between countries from Western Europe and those from Eastern Europe**. There are few significant variables in the regressions on Czech and Polish samples: on the six tested variables, only two are significant for the Czech Republic in each regression, while only growth is significant for Poland. This fact is confirmed by the weak fit of the regressions for these countries. In comparison, four variables are significant for France and the United Kingdom in both regressions. Consequently, **our main conclusion is that the usual determinants of leverage and access to credit find no support in the Czech Republic and Poland.**

How to interpret this result for transition countries? Two explanations can be suggested, as key determinants that should be positively valued by banks do not find strong support in the transition countries of our tests. First, loans may have been granted for a long time and then be prolonged without taking the evolution of the financial situation of the borrower into account. Reason may be either collusion between bank managers and borrower's managers, or the refuse of the bank to consider a loan as a loss. It has also been suggested that state-owned banks were incited by political authorities to prolong loans to large state-owned companies to avoid social costs. However this argument does not play a role for the vast majority of companies in transition economies, that does not reach a size large enough to incite the authorities to care about their survival.

As a result of this “prolongation assumption”, the key financial features that are tangibility of assets and size do not matter in transition countries. This interpretation is supported by the high median age of our Polish sample.

A second interpretation is the inefficiency of risk management departments in banks from transition countries. This is based upon the fact that a higher bank inefficiency in transition countries results in the fact that banks do not take the useful financial information into account in the credit decisions. As a result, the predicted variables do not have any influence on leverage of companies. This “inefficiency” interpretation can be justified by the lack of know-how in risk management in countries where there was no financial decision other than planification aims a decade ago. No study was yet performed to provide satisfactory efficiency measures of the banking sectors in transition countries to be compared to western banking standards. Consequently, literature does not provide currently any study supporting this interpretation. Further analysis in this area will help to evaluate the relevance of this assumption. Both interpretations are not self-excluding as collusion between bank managers and borrower’s managers can result in inefficiency leading to the prolongation of former loans.

Second, **our study provides new evidence on the determinants of leverage, which is not restricted to large or small companies.** As we underline above the specific features of transition countries, we limit here our comments to France and the United Kingdom to compare the observed signs of variables on these countries with former studies. In accordance with the empirical literature surveyed above, we observe a positive influence of tangibility of assets and growth, and a negative impact of profitability. Regarding age, we provide evidence about the absence of any impact on leverage, in opposition to the two only studies analyzing this feature that concluded to a negative impact. Furthermore, our tests provide limited evidence on a negative impact of size on leverage.

Finally, the introduction of a proxy for innovation does not provide clear evidence, as only the coefficient with the second measure of leverage is significant for the United Kingdom. This rather counterintuitive result suggests some specific features in the financing of innovation in this country. Nevertheless, the imperfections of the used indicator strongly limit the significance of our results for this variable.

5. Conclusion

The research presented here has analyzed the determinants of leverage on an international sample of companies from all sizes from European countries (France, the United Kingdom, the Czech Republic, Poland). The aim was to provide new evidence on the explanatory variables of leverage, as until now only one international study was ever performed but it was limited to large companies. Furthermore we aimed to compare the determinants of leverage between developed and transition countries.

The starting point of our study was the observation of a preference of companies for self-financing and bank debt for their financing needs. As a result, we consider that, after controlling for the effect of retained earnings, the variables tested as determinants of leverage can be also interpreted as factors of access to credit.

We provide new evidence about the determinants of leverage in developed countries. When comparing with former studies, our analysis presents the advantages to include all sizes of companies and to take the innovation feature into account. Our results show new evidence in favor of the positive influence of tangibility of assets and growth and the negative impact of profitability as expected. About the more ambiguous predicted signs of size and age, we tend to support the negative influence of size but find no significant sign for age. Finally, innovation ratio is generally not correlated to leverage, if we except an unexpected positive sign in one regression. Nevertheless a deeper analysis of the role of innovation in access to credit would require micro-data on volume of research and development expenditures, which were not available for our study.

We also provide evidence on the fact that the determinants of leverage suggested by theory and empirical literature do not obtain clear support in transition economies. It consequently means that the lending behavior of banks does not respect the same rules than in developed countries. We suggest two interpretations for this result. On one hand, this can be the consequence of the prolongation of loans that were granted during the communist regime or in the early years of the transition. Then, banks may prefer to prolong loans instead of not renewing them, whether the non-renewal would lead to a loss or whether there are collusive relations between banks' and borrowers'managers. On the other hand, the fact that the lending behavior is not sensitive to key financial elements of the borrower may be the result of the inefficiency of banks. Indeed, banks from transition countries may suffer from inefficiencies in their credit decisions. In the lack of a comparison of bank efficiency between developed

and transition countries, we can not tend in favor of an interpretation rather the other one. However further analysis in bank efficiency in transition countries will provide key elements about the discrepancy in efficiency between transition and developed countries. This extension on banking efficiency will be of a major interest for transition countries, as the underdevelopment of financial markets gives to banks a fundamental role in the financing of the economy.

REFERENCES

Anderson, R. W., Kegels, C., 1998, Transition Banking, Clarendon Press, Oxford.

Berger, A., Humphrey, D., 1997, Efficiency of financial institutions: international survey and directions for future research, European Journal of Operational Research, 98, 175--212.

Bester, H., 1985, Screening and rationing in credit markets with imperfect information, American Economic Review 75, 4, 850--855.

Bester, H., Hellwig, M., 1989, Moral hazard and equilibrium credit rationing: an overview of the issues, in G. Bamberg, G., Spremann, K. (Eds), Agency Theory, Information and Incentives, Springer, Berlin, pp.135--166.

Bratkowski, A., Grosfeld, I., Rostowski, J., 1998, Investment and finance in de novo private firms: Empirical Results from the Czech Republic, Hungary, Poland, CASE-CEU Working Paper Series n°21, Center for Social and Economic Research, Central European University, Warsaw, October.

Corbett, J., Jenkinson, T., 1994, The financing of industry, 1970-89: an international comparison, CEPR Discussion Paper, n°948, London.

De Jong, A., Van Dijk, R., 1998, Determinants of leverage and agency problems, Working Paper, Tilburg University, Center for Economic Research.

Diamond, D., 1989, Reputation acquisition in debt markets, Journal of Political Economy 97, 828--862.

Edwards, J., Fischer, K., 1994, Banks, Finance and Investment in Germany, Cambridge University Press.

Fan, Q., Lee, F., Schaffer, M., 1996, Firms, banks and credit in Russia", in Commander, S., Fan, Q., Schaffer, M. (Eds), Enterprise Restructuring and Economic Policy in Russia, (EDI Development Studies), Washington D.C, pp. 140--165.

Guiso, L., 1998, High-tech firms and credit rationing, Journal of Economic Behavior & Organization 35, 39--59.

Hainz, C., 1999, Credit contracts and restructuring in transition economies: on the role of bank competition and collateral, Munich Economics Discussion Paper, n°99-13.

Hall, B., 1992, Investment in research and development at the firm level: does the source of finance matter?, NBER Working Paper n°4096.

Johnson, S. A., 1997, An empirical analysis of the determinants of corporate debt ownership structure, Journal of Financial and Quantitative Analysis 32, 1, 47--69.

Mayer, C., 1988, New issues in corporate finance, European Economic Review 32, 5, 1167-1183.

Michaelas, N., Chittenden, F., Poutziouris, P., 1999, Financial policy and capital structure choice in U.K. SMEs: empirical evidence from company panel data, Small Business Economics 12, 113--130.

Myers, S. C., 1997, Determinants of corporate borrowing, Journal of Financial Economics 9, 147--175.

OECD, 1999, Financial Accounts.

Petersen, M., Rajan, R., 1994, The benefits of lending relationships: evidence from small business data, Journal of Finance 47, 1367--1400.

Rajan, R., Zingales, L., 1995, What do we know about capital structure? some evidence from international data, Journal of Finance 50, 1421--1460.

Schwiete, M., Weigand, J., 1997, Bankbeteiligungen und das Verschuldungs Verhalten Deutscher Unternehmen, Kredit und Kapital, 30, 11--34.

Scholtens, B., 2000, Financial regulation and financial system architecture in Central Europe, Journal of Banking and Finance 24, 525--553.

Shuetrim, G., Lowe, P, Morling, S., 1993, The determinants of corporate leverage : a panel data analysis, Research Discussion Paper n°9313, Reserve Bank of Australia.