Essays on capital structure and trade financing

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Contents

Introduction

The Research Issue[1]

In this dissertation I touch on two related issues, first on the topic of firms' capital structure choice and second on different types of debt, mainly the use and the extension of trade credit.

Many articles have been written on the choice of capital structure following the seminal paper by Modigliani and Miller (1958). In their frictionless world there is no optimal capital structure, since debt-equity decision by the firm does can be done as well by the investor. A lot of theoretical research and empirical testing has been done since then, for example by Myers and Majluf (1984), Rajan and Zingales (1995) and many others. Empirical evidence is very mixed, an excellent survey on capital structure theories can be found in Harris and Raviv (1991).[2]

There are many different theories based on different assumptions in the capital structure area. Modigliani and Miller (1958) (henceforth MM) demonstrated that in the absence of bankruptcy cost and tax subsidies on the payment of interest, the value of firm is independent of its financial structure; capital structure is irrelevant for the value of a firm. Following MM the observation of a wide variety of capital structures can be interpreted as the result of neutral mutation.

Including tax subsidies on interest payments into their model (Modigliani and Miller (1963)), they showed that borrowing would only cause the value of the firm to rise by the amount of the capitalized value of the tax subsidy. Relaxing these assumptions where there is imperfect competition, bankruptcy costs, asymmetric information, signaling effects and monopoly power it turns out leverage decisions are influenced in one way or another.

[1] Petersen and Rajan (1996) provide a useful survey of theories.
[2] A good survey can be found in Harris and Raviv (1991).

Agency costs inefficiencies due to the separation or ownership and control between stockholders and managers are mitigated by giving managers a fraction of the firm; the larger the fraction given to the manager the larger the reduction of these inefficiencies. Increases in the amount of debt keeping managers' investment constant increase managers' share of equity and reduce the inefficiencies due to agency conflicts.

As Jensen (1986) points out, debt has to be paid back in cash; therefore the amount of free cash flow that could be diverted by the manager is reduced. The view that debt might serve to restrict managers from disposing of free cash flow for their own benefits is not only withheld in the above mentioned article but is the base of models by Grossman and Hart (1982) Stulz (1990) Hart (1993) and Hart and Moore (1995).
In Harris and Raviv (1990) debt may even force managers to abandon inefficient operations.

One of the most famous results based on asymmetric information is the underinvestment result in Myers and Majluf (1984). New shareholders might require severe underpricing of new shares so that even projects with a positive NPV are not carried out since the costs of new equity exceed the benefit of the project to the incumbent shareholders. In their model underinvestment can be avoided by using a security that is not as undervalued as equity – debt.

The pecking order theory[3]

Under this theory, firms are supposed to have a preference over a financial pecking order, that is, firms prefer internal finance to external finance, safe debt to risky debt or convertibles to common stock. It restrains itself for two reasons: first, to avoid any material cost of financial distress; and second, to maintain financial slack in the form of reserve borrowing power. The key points are the cost of relying on external financing. There are administrative and underwriting cost associated with it. Asymmetric information creates the possibility of a different sort of cost: the possibility that the firm will choose not to issue, and will therefore pass up a positive-NPV project. This cost can

[3] Donaldson (1961), Myers and Majluf (1984).

be avoided if the firm can retain enough internally generated cash to cover its positive-NPV opportunities. The advantages of debt over equity issues. It is better to issue debt than equity if the firm does seek external funds. The general rule is “issue safe securities before risky ones”.

Heinkel and Zechner (1990, Narayanan (1988) both show in a slightly different setting that in the case of informational asymmetry with respect to the new project overinvestment can be the result. Negative NPV projects might be undertaken thus reducing the value of the firm. New debt (Narayanan) or debt already in place (Heinkel and Zechner (1990)) reduces overinvestment and thus increases firm value. From Narayanan (1988) follows that new debt issues are god news, rewarded with an increase in share price. Brennan and Kraus (1987) conclude that the underinvestment result might disappear as soon as the firm can use instruments different from straight debt or equity. Noe (1988) reaches a similar conclusion, however firms issuing debt are on average of higher quality than firms issuing equity.

According to Ross (1977) firms can use debt as a signaling device. If managers know the true distribution of firm returns, while investors don’t, investors take larger debt levels as a signal for higher quality. In Heinkel (1982) high quality firms issue more debt than low quality firms to signal higher quality. Each firm trying to imitate the other type profits on the overpricing of one security but looses on the overpricing of the other, and the costs and benefits are balanced on the margin. Zwiebel (1996) shows in a dynamic setting that entrenched managers choose debt to credibly constrain their future empire building.

Leland and Pyle (1977) is based on the assumption of managerial risk aversion. Managers of high quality firms can signal this fact by having more debt in equilibrium. Dewatripont and Tirole (1994) emphasize managerial moral hazard in a world of incomplete contracts but verifiable results with risk averse principals. Introducing disciplinary action by using a “debtlike” instrument reduces the riskiness in the final value of the firm. Lewis and Sappington (1995) find at least an inverse relationship between equity financing and agent’s productivity.

According to the the static tradeoff hypotheses a firm's optimal debt ratio is determined by a tradeoff between cost and benefits of borrowing, holding the firm's assets and investment plans constant. When facing a financing decision, firms make tradeoffs between the value of interest tax shields and cost of bankruptcy or financial distress. By the assumption that there are no adjustment costs attached to a change of capital structure, it is natural for us to believe that the observed capital structure is the optimal or target ratio of a firm. Unfortunately there are such costs so that in reality what we see is a rather dispersed debt equity ratio scenario.

Financing advantage of trade credits by Schwartz (1974) explains the provision trade credits with three possible advantages of the trade creditor compared to outside creditors. One advantage might be that he is better at investigating the creditworthiness of the client due to excellent knowledge of the industry. The supplier is superior to a financial institution in information acquisition or he can obtain information faster and cheaper since it occurs from normal business.[4] A second cost advantage is given if the seller is better at monitoring or enforcing repayment. If the good provided by the creditor is relatively unique he can always threaten to stop delivery in case of clients misbehavior. The third and last major advantage is the higher ability of the trade creditor to salvaging value in the case of bankruptcy. Banks seize firm's assets to pay of loans as well as the seller.

Schwartz and Whitcomb (1978) argue that trade credits are used as means of price discrimination when explicit price discrimination is not allowed due to legal restrictions. They suggest that if firms with higher cost of capital have a higher demand elasticity, it is profitable to charge them a lower price. Trade credit is a way to achieve this lower price in the presence of legal restrictions.

The model by Brennan, et al. (1988) relies primarily on a lack of competition in product markets combined with adverse selection. Hence price discrimination becomes possible

[4] See for example Smith (1987).

and lucrative. Thus trade credit is a way to reach customers that would otherwise not be able to buy a certain product. The profit with extension of trade credits dominates profits without extension.

In Ferris (1981) trade credit is a way reducing transactions costs by way of separating delivery schedules from payment cycles. If there is strong seasonality in the demand for a firm's products the firm is forced to hold large inventories in order to smooth production, thus incurring costs of warehousing and the costs of producing the inventories while positive cash flows are delayed. By offering trade credits the producer might induce customers to buy earlier or more continuous maybe because they are better at managing inventory positions.

All of these theories make predictions on the relation between debt an firm value or profitability, usually predicting a positive relationship.

Summary of Essays

Capital structure

In this paper we analyze factors influencing firms' leverage. Two different measures of leverage market leverage and book leverage are employed. We use panel data to estimate our model coefficients for the case of Canada, Denmark, and Italy. We found that firm size, profitability, tangibility, market to book ratio have significant impact on firms' choice of capital structure. Tangibility is in all cases positively related to leverage, while profitability shows a negative relation. The impact of market to book ratio depends on the choice of leverage measure. Our parameter estimates are positive for all countries for book leverage and negative for market leverage. This shows clearly how sensitive our model is to the choice of leverage measure. A comparison of the separate estimations for each country with a sample containing all firms shows the inferiority of the estimates from the pooled sample. Thus we can say that there are differences across countries. For Italy a positive even though small time trend is discovered by our study, firms' leverage slowly increases over time. Our model is also estimated in a standard cross-section setting, which leads to inferior results. The major advantage of our panel data approach is that we capture both cross section and a time dimension.

Using Trade Credits (Chapters 2 and 3)

In this paper the use of trade credits in two of the more advanced east European transition economies, Poland and Hungary, is analyzed. In both countries the use of trade credits by the firms in the sample declines over the period 1991-1997 while the extension of trade credits increases. The use of bank loans is small in Hungary while their use increase over time in Poland. The development for retained earnings is exactly the opposite. This might be an indicator of the improvement of the financial system in Poland while retained earnings seem to be the relatively cheapest source of financing in Hungary. A panel model is estimated to identify microeconomic factors that influence the use of trade credits. Our most important finding is -contrary to the findings of Petersen and Zingales (1996) for the USA and Deloof and Jegers (1999) for Belgian firms- a positive relation between bank loans and trade credits in both countries. Furthermore we find a positive size effect, while other variables shift in signs and significance level.

Trade Credits in Industrialized Countries

This essay serves mainly as a complement to essay 1 and is concerend with use of trade credits in industrialized countries. In this paper I investigate the use of trade credits in the US, Canada and 10 European countries along the lines of Petersen and Rajan (1996) and Deloof and Jegers (1999). A total of 2081 firms are used in the regressions. The use of trade credits is subject to large variations between the twelve countries ranging from 1% for US firms to 15.2% of total assets for Belgian firms. Bank loans are found to be mostly negative correlated to the use of trade credits as well as tangibility. Reputation as measured by age is also found to play an important role. The findings on bank loans are opposite to those in essay 1 supporting the view that trade credit is used to alleviate financing constraints.

Firm Performance, Bank Loans and Trade Credits

This paper examines the relation between capital structure and firm performance comparing a sample of Polish and Hungarian firms to a large sample of firms originating in Industrialized countries; a total of 2143 firms are included.

Panel data analysis is used to reveal the relation between total debt and performance as well as between different sources of debt, namely bank loans and trade debt, and firms' performance measured by their profitability.

A positive relation between debt and performance is expected, a significant and negative relation is found for most of the countries. The findings on the relation between bank loans, trade debt and firm performance are quite inconclusive.

Profits and the provision of trade credit

This last essay is concerned with an empirical test of the price discrimination theory of trade credit proposed by Brennan, et al. (1988). This theory predicts under different assumptions including asymmetric informational, monopolistic or oligopolistic supply, that the vendor's profit-function when extending trade credit dominates profit without the provision of trade credit. Another important conclusion of the theory is that trade credit will profitably be provided by vendors while banks will not provide credit since they will not break even in the case of asymmetric information. Trade credit might thus be a way to circumvent the collapse of credit markets in high-risk transition economies. The empirical evidence is mixed; however, in most of the countries companies extending more trade credit earn higher profits ceteris paribus.

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Capital structure

Theories and empirical results - a panel data analysis

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Abstract:

In this paper we analyse factors influencing firms' leverage. We use market capital ratio and book capital ratio and book debt ratio as the leverage measure. We use an unbalanced panel for 7 countries: Canada, Denmark, Germany, Italy, Sweden, UK, and US. We find that firm size, profitability, tangibility, market to book ratio have significant impact on firms' choice of capital structures. Tangibility is positively related to leverage in all three models, while profitability shows a negative significant relation to leverage. The Size variable is significant for all three models. The impact of the market-to-book ratio varies in the "book-debt"-ratio model but shows a negative significant relation for all countries in the market leverage model except Denmark. It is possible that by taking into account of the other variables, this variable is crowded out in the leverage measures based on accounting data. Our results support conventional capital structure theories to a very high degree.

The major advantage of our panel data approach is that we capture both the cross section and time dimensions and the estimations are both efficient and consistent.

Keywords: Capital Structure, Panel Data, Industrialized Countries

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[1] E-mail: ChenYing.Hong@economics.gu.se, Klaus.Hammes@economics.gu.se. We are greatly indebted to Almas Heshmati for his help on the econometrics, to participant at the SNEE-conference in Mölle 2003 for helpful comments on earlier versions of this paper. This paper is based on an earlier paper presented at the Conference on Financial Regulation at Groningen, Netherlands, 1997 by the same authors.

1 Introduction

How do firms choose their capital structures? What is the relationship between capital structure and firm value? A first answer to the question was provided by Modigliani and Miller (1958). In their frictionless world there is no optimal capital structure, since debt-equity decisions made by the firm can be mimicked by the investors. Since then, theories of capital structure have been developed incorporating market frictions and asymmetric information. Theories and empirical results can be found in Leland and Pyle (1977) Rajan and Zingales (1995), among others. Excellent surveys on capital structure theories can be found in Myers (1984), and Harris and Raviv (1991). More recently, La Porta, Lopez-de-Silanes, Shleifer and Vishny (1996, 1997, 1999) address the importance of the difference in institutional structures and their possible influences on capital structure across countries.

The purpose of this paper is to employ theoretical models of capital structure and apply to a sample of countries and analyse the determinants of capital structures in those countries and the possible explanations of the discrepancy. We follow Rajan and Zingales (1995) model of capital structure and do empirical testing for he period 1990 to 1996 on firms in Canada, Denmark, Germany, Italy, Sweden, UK, and the USA. In addition, we compare our results of panel data method with those obtained by using cross-sectional approach in Rajan and Zingales (1995).

This paper is organized as follows: Section 2 is a partial survey of capital structure theories. Section 3 introduces the model and the methodology. Section 4 deals with variables and related theoretical argument. Section 5 is a comparison of leverage of the selected 7 countries. Sections 6 and 7 present empirical results and an institutional comparison. Section 8 presents some conclusions.

2 Theories of Capital Structure

The "irrelevance capital structure" theory by Modigliani and Miller (1958) is a milestone from which several relevant theories developed by relaxing the assumptions made by the study and adding new conditions of, among others, asymmetric information and agency costs, but excluding ownership structure and product market uncertainties, etc., although important but not for our purpose (see Leland and Pyle, (1977), Myers (1984), La Porta, et al. (1996, 1997). The theories of capital structure based on considerations of asymmetric information, legal environments and agency costs are summarized in this section. Note that the categorizations of the different theories are not mutually exclusive.

2.1 The "irrelevance" of capital structure theory

Modigliani and Miller (1958) in their seminal paper "The cost of capital, corporation finance, and the theory of investment" demonstrated that in the absence of transaction cost, tax subsidies on the payment of interest, individuals and corporations borrow at the same rate, firm value is independent of its financial structure. The model is based on a framework that starts with the idealized assumption of perfect competition in factor and product markets. MM conclude that a firm cannot increase its value by using debt as part of its permanent capital structure. This argument was based on the premise that investors could assume personal debt to help finance the purchase of unlevered shares, if the value of the levered shares is greater than the unlevered ones. In the presence of perfect arbitrage capital structure is irrelevant to firm value if the assumptions holds.

Including tax deductibility of interest payments into their model (Modigliani and Miller (1963)), they showed that borrowing would only cause the value of the firm to rise by the amount of the capitalized value of the tax subsidy. Relaxing MM's assumptions in their original model and by introducing imperfect competition, bankruptcy costs, asymmetric information, and monopoly power, financial structure appears to be an influencing factor to firm value to which we now turn to.

2.2 Static trade-off theory: bankruptcy costs

The optimal debt ratio of a firm is determined by a trade-off between cost and benefits of borrowing, and holding the firm’s assets and investment plans constant. Firms balance debt and equity position by making tradeoffs between the value of interest tax shields and cost of bankruptcy or financial distress. Provided there are no adjustment costs attached to capital structure changes, the observed capital structure should be optimal in the sense that it maximizes the firm value (Myers (1984)). Risky firms borrow less. Firms with specialized, intangible assets or growth opportunities borrow less than firms with assets having an active second-hand market. Since the former firms have a higher chance of losing value than the latter ones in an adverse situation.

2.3 Capital structure models based on agency cost and asymmetric information

2.3.1 Signalling models

Asymmetric information between lenders and borrowers can generate under-investment (Leland and Pyle (1977) Myers and Majluf (1984))) as described above. The under-investment can be reduced if information transfer can occur. Capital structure serves as a signal of private insider information given a fixed level of firm investment.

Ross (1977) develops an incentive signalling model, which provides a theory for the determination of the financial structure of the firm. In the model it is assumed that the manager possesses inside information about the activities of the firm and thus is precluded from trading in his own instruments. In a competitive equilibrium, given that the investors know the manager’s incentive scheme, financial choices made by the manager will signal the firm’s worth.

In Leland and Pyle (1977) entrepreneurs signal their projects’ worth by investing more in their projects than would be the case if they could costlessly communicate the true project value. A welfare reduction effect is associated with the higher level of entrepreneur holdings compared to the case with costless information transfer. In equilibrium the valuation function of the firm is strictly increasing with the entrepreneur holding of the firm. Also, in equilibrium, for any level of firm valuation, greater project risk implies lower optimal debt.

Heinkel (1982) introduces asymmetric information into the otherwise perfect, Modigliani-Miller world and develops a signalling equilibrium in which investor expectations about individual firms depend on the capital structures of the firms. A critical assumption for this costless equilibrium is that the credit risk of the firm is positively related to the value of the firm such that the benefit gained from issuing safer debt through misrepresentation offsets the loss from issuing equity. This constructs a costless separating equilibrium in which no firm has incentive to misrepresent itself.

Dewatripont and Tirole (1994) develop a model that rationalizes multiple outside investors: debt holders and equity holders with managerial moral hazard in a world of incomplete contracts. Capital structure thus serves as a control mechanism to discipline managers via managerial incentive scheme.

Lewis and Sappington (1995) consider a risk averse principal with under-diversified investment and his choice of capital structure in the context of an agency relationship. They find that outside financing can be valuable even when internal funds are available. Outside financing limits the agent's rents from his private information and limits the risk from stochastic production that the principal is forced to bear.

Zwiebel (1996) shows in a dynamic setting that entrenched managers choose a debt level to restrict their ability to future empire building and a level that which proves to be sufficiently efficient to avert takeover threats in order to retain control. In equilibrium, managers trade off the benefits of empire building with the benefit of staying in control using debt as a committing device.

2.3.2 Agency cost models

Inefficiencies due to the separation of ownership and control between stockholders and managers arise when managers hold less than 100% of the residual claim.

Another type of conflict of interest relates to that of debt holders and equity holders (Jensen and Meckling, 1976). The optimal capital structure can be obtained by trading off the agency cost of debt against the benefit of debt.

Jensen (1986) argues that debt has to be paid back in cash; therefore, the amount of free cash flow that could be diverted by the manager is reduced by debt. Thus, debt serves as a mechanism to discipline the manager from engaging in self-serving activities e.g. perquisite consumption, empire building, etc. Grossman and Hart (1982) argue that short term debt can serve as a mechanism to align managerial incentive with that of shareholders since bankruptcy is costly for management.[2] The agency cost of debt financing arises when equity holders invest suboptimally, for example, by engaging in riskier project than the contract dictates. This is a classic hold-up problem. The loss of efficiency can be borne by the equity holders themselves if the debt holders correctly anticipate the risky behaviour of the borrower. These costs can be reduced but not eliminated.

2.4 The pecking order theory

If investors are less informed than the current firm insiders about the value of the firm equity may be mispriced by the market. When firms need to finance new investment, under-pricing may be so severe that new investors capture more than the NPV of the project resulting a dilution of value to the existing investors. This can lead to under-investment. To avoid this, firms have a preference over a financial pecking order. Firms prefer internal finance to external finance, safe debt to risky debt and convertibles, and finally common stock (Donaldson (1961), Myers and Majluf (1984), Myers (1984)). There is no well-defined target debt-equity ratio according to this theory. The observed debt-equity ratio represents firm's cumulative requirements for external finance.

[2] See also Stulz (1990), Harris and Raviv (1990), Hart (1993) and Hart and Moore (1995), among others.

2.5 The Legal Environment

Different legal environment should influence firms financing decisions. The influence of the legal environment has been analysed by La Porta, et al. (1996) and many of their following papers (La Porta, et al. (1997) and La Porta, et al. (1999)). In La Porta, et al. (1997) legal determinants of external finance are analysed. They find that countries with poorer investor protection have smaller and narrower capital markets, both for debt and equity. This finding surely affects capital structure, if the capital markets are smaller and narrower, this affects the costs of external finance and firms may rely more on internal finance or inter-firm credit.

In La Porta, et al. (1999) the authors find evidence of higher valuation of firms in countries with better protection of minority shareholders, which should affect the choice between debt and equity. In countries with lesser protection of minority shareholders, the costs of equity finance are higher than those of countries with better minority shareholder protection.

3 Model and variables

3.1 The model

The model is motivated by Rajan and Zingales (1995) but differs in estimation technique. We run the following model using the panel data method for seven countries separately and compare the differences found. [3]

$$\mathbf{Leverage_{it} = \alpha+\beta_1 time + \beta_2\, Tangibility_{it} + \beta_3\, MBR_{it} + \beta_4\, size_{it} + \beta_5 Profit_{it} + u_{it}}$$

Leverage = Book leverage or market leverage. Book leverage is defined as book value of debt divided by total assets. Market leverage is defined as book value of debt divided by book value of debt plus market capitalization of the equity.

Tangibility = ratio of fixed assets to total assets

[3] Baltagi, Griffin and Xiong (1998), Mátyás and Sevestre (1992).

MBR = Market-to book ratio. We define it as market value of equity plus debt divided by total assets.

Size is the logarithm of firm turnover, i.e. log (sales). .

Profit = Profitability, earnings before interest, depreciation and taxes divided by total assets.

u_{it} = Random error term.

3.2 Variables

3.2.1 Leverage

Neither a borrower nor a lender be. Never borrow unless you have to. This verse can be true with unlimited liability. The latter if directed to modern corporations is at least over-cautious. It has been established that firms can trade off bankruptcy risk with firm value up to an optimal point (Myers (1984)).

The leverage can be measured by different financial ratios.[4] Ross, et al. (2002) define leverage as either the debt ratio, i.e., the ratio of total debt to total assets, or the debt-equity ratio (also called capital ratio) that is total debt divided by total capital. Another measure of leverage, interest coverage, given by earnings before interest and tax (EBIT) divided by interest expense, measures a firm's ability to meet its obligation of interest payment and provides information of the firm's short-term debt serving power. It is important but not addressed in this study. Measures aim at accommodating different accounting practices in different countries in an attempt to achieve comparable results can be found in Rajan and Zingales (1995), including the treatment of pension liabilities and near cash instruments, among others.

We use capital ratios, both book capital ratio and market capital ratio as primary measures of leverage, where market capital ratio is market capitalization replacing the book equity. We use book debt ratio (TD/TA) as a secondary measure. We notice that different measures of leverage could result in slightly different parameter estimates, which can be used to crosscheck the quality of our results. We expect that similar countries with similar legal environments and social values have similar parameter

[4] See Rajan and Zingales (1995) and Titman and Wessels (1988) for different measures of leverage.

values, and where differences could be due to reasons other than those mentioned. We have not yet found a way to test social institutions and their connection to firm behaviour.

We are aware of the fact that adjusted debt to capital ratio measures are suggested by Rajan and Zingales (1995). In their model, adjusted debt is given by subtracting cash and marketable securities from total debt. Adjusted book equity is book equity plus provisions plus deferred taxes less intangibles. We agree that these measures make sense in international comparison but they need not be the optimal way to study leverage. One reason is that the accounting difference might be an optimal response to the existing legal environments. We therefore use raw measures and draw inference from basic information provided by accounting data without homogenizing the data *a priori*.

3.2.2 Tangibility

Tangibility is defined as the ratio of tangible assets to total assets. Harris and Raviv (1990) predicts that firm with higher liquidation value will have more debt. On the contrary, intangible assets such as good will can lose market value rapidly in the event of financial distress or bankruptcy. Firms with more tangible assets usually have a higher liquidation value although we are aware that assets specificity may play a role and result in some distortion, for example the airline industry falls in this category. In general, firms with a higher proportion of tangible assets are more likely to be in a mature industry thus less risky, which affords higher financial leverage.

Formally, the higher the tangibility the higher the debt equity ratio, other things being equal.

3.2.3 Market-to book-ratio

The growth potential of a firm can be measured by many different variables, market value per share divided by book value per share, P/E ratio or by R&D divided by total sales (see Ross, et al. (2002)).

The Market-to-book ratio is commonly calculated by dividing the book value of debt plus market capitalization by total assets (see Rajan and Zingales, 1995). We define the Market-to-book ratio as the ratio of book value of assets minus book value of equity, plus the market capitalization divided by book value of assets. This notion of market–to-book is built on the q-value namely the market value of a firm divided by the replacement value of its assets.

Since high growth potential corresponds to higher expected future cash flow and higher market capitalization, it enables the firm to have lower cost of equity financing. Leverage is expected to be negatively associated with the degree of growth opportunity (Jensen and Meckling (1976), Myers (1977)).

Formally, the higher the market-to-book, the lower the debt equity ratio, other things being equal.

3.2.4 Profitability

Do rich people borrow less? It depends. The issue here is the following: firms with poor financial performance are forced to borrow, while firms that have enjoyed financial success have less debt to serve, other things being equal. Profitability is a measure of earning power of a firm. The earning power of a firm is the basic concern of its shareholders. It can also forecast to some extent the firm's future earning ability. Myers (1977) states evidence that firms prefer raising capital from retained earnings, than from debt, than from issuing equity. This is the so-called "pecking order theory". If pecking order holds true, then, higher profitability will correspond to lower debt-equity ratio.

As a measure for profitability we use, as in Rajan and Zingales, the ratio of earnings before tax, interest payments, and depreciation (Ebitda) to the book value of assets. This measure is not influenced by different taxation of profits and different depreciation rules; especially those rules regarding goodwill amortization that vary a lot across countries.[5]

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[5] See Rajan and Zingales, (1996), goodwill can be depreciated over 40 years in the USA compared to five years in Germany.

Other measures of profitability often used are:

1. The ratio of operating cash flow to total assets that measures firms' internal cash generating ability.
2. The ratio of retained earnings to total assets, which represents firms' investment power after financial items.

We expect that the following holds:

The higher the profitability, the lower the debt equity ratios, other things being equal.

3.2.5 Size

We use the natural logarithm of total turnover as proxy for the size of a firm as in Rajan and Zingales. Total assets can be an alternate measure for firm size.

Size can serve as an indicator of riskiness of the firm in that:

1. Smaller firms have higher product market risk,
2. Small firms have a higher probability to be takeover targets.
3. According to Whited (1992) small firms cannot access long-term debt markets since their growth opportunities exceed their collateralizable assets. Titman and Wessels (1988) argue that larger firms have easier access to capital markets.

The first two points have different impact on firms' financing decision. The higher product risk corresponds to higher market risk and lower debt ratio. Being a potential takeover target corresponds to more inflated share prices, thus, lower market leverage. This is in accordance with the static trade off theory, riskier firm borrow less. The third points states that larger firms have lower cost of borrowing, better access to capital market. Another argument for this is the too big to fail doctrine. In the event of default, governments are prone to save larger firms than smaller firms, giving bigger firms incentives to borrow even more. Or put it another way, banks are more willing to lend to bigger firms.

We expect that

The larger the size of the firm the higher the leverage, other things being equal.

We also include a time variable into our model mainly to control the time trend in the panel analysis.

4 Data and estimation method

4.1 The data

The data we use are derived from the Financial Times Database Extel. Extel Financial contains two databases: Company Research and Equity Research. Company Research contains comprehensive information for over 11,000 publicly listed companies worldwide. It provides annual balance sheets, profit and loss accounts, cash flow and forecast and capital history, etc from 1990 to 1996. It has a direct link to Equity Research containing prime line share prices and graphics, etc for companies in Company Research. We chose 7 OECD countries, namely, Canada, Denmark, Germany, Italy, Sweden, UK, and USA. The selected countries partly overlap with the G-7 countries chosen by Rajan and Zingales; in addition, we choose Sweden and Denmark to place more weight on small countries related to continental Europe. All countries possess well-developed financial systems but differ in the degree of the bank- versus market- orientation of the financial system as well as other institutional characteristics

All firms fall into EXTEL category "C" where C stands for commercial, industrial and mining companies. Banks and insurance companies, investment companies, building societies as well as unit trust are excluded due to different accounting categories and rules. For example, banks are subject to special capital adequacy rules. For the time period from 1990 to 1996 we have compiled up to 5 consecutive observations for each firm. Since only listed firms but not all listed firms are to be found in the EXTEL database, sample selection bias exists.

In the data set, we have: 77 firms for Canada and a total observation of 409 observations; for Denmark, we have 92 firms and 427 observations; for Italy, 147 firms and 666 observations; for the US, 421 firms and 1968 observations; for the UK, we randomly choose 200 firms out of 2000 firms available, and have 689 observations s; for Germany, 345 firms and 836 observations; for Sweden, 115 firms and 371 observations.

4.2 Estimation method

We use the complete unbalanced panel estimate the parameters of interest using by GLS.[6] The panel data approach has several advantages when compared to the cross-section approach often used in empirical financial research:

1. Due to an increase in the number of data points, degrees of freedom are increased and collinearity among explanatory variables is reduced thus the efficiency of econometric estimates is improved. [7]
2. Panel data can control for individual heterogeneity due to hidden factors, which, if neglected in time-series or cross-section estimations leads to biased results.[8] Heterogeneity is captured by firm specific/random effects depending on the characteristics of the data set.

In matrix notation we can write (Baltagi (1995)):

(1) $y_{it} = b_o + b_1\, x'_{it} + u_{it}$,

Here u_{it} is a random term and $u_{it}=\mu_i+\nu_{it}$, where μ_i are firm specific effects and ν_{it} is a random term.

Depending on the underlying assumptions, the model(s) can be estimated as fixed effects or random effects. In fixed effects μ_i, the firm-specific effects, and $\nu_{it,}$ a random term, are fixed parameters and are estimated together with the other parameters. The explanatory variables x_{it} and μ_i are assumed to be uncorrelated $E(x_{it}|\mu_i) \neq 0$ and ν_{it}~iid $(0,\sigma_v^2)$. In the one-way error component random effects-model

[6] Baltagi and Chang (1994) show that it is more efficient to use the whole unbalanced dataset instead of making the dataset balanced by cutting of excess data.

[7] See Hsiao (1986).

chosen here, μ_i and ν_{it} are random with known distribution. An advantage of the random effects model is the inclusion of time invariant variables such as industry. We are interested in the parameters associated with the distribution, i. e. μ_i~iid $(0,\sigma_v^2)$, λ_t~$(0,\sigma_\lambda^2)$, ν_{it}~$(0,\sigma_v^2)$. The variance components, σ_v^2, σ_μ^2 are used to transform the data. The variance components σ_μ^2 and σ_v^2 have to be estimated. First, consistent estimates of the variance components are obtained. They are then used to transform the variables. The variance component σ_u^2 is obtained as the result of the pooled regression. $Var(u_i)= \sigma_u^2=T\sigma_\mu^2+\sigma_v^2$ and $\sigma_\mu^2 =(\sigma_u^2-\sigma_v^2)/T$

$$(2)\ y_{it}^* = y_{it} - \theta \bar{y}_i$$

and

$$(3)\ x_{it}^* = x_{it} - \theta \bar{x}_i$$

where

$$(4)\ \bar{y}_i = \frac{\sum_t y_{it}}{T}$$

$$(5)\ \bar{x}_i = \frac{\sum_t x_{it}}{T}$$

$$(6)\ \theta = \left[1 - \sqrt{\frac{\sigma_v^2}{T\sigma_\mu^2 + \sigma_v^2}}\right]$$

In a second step OLS on the transformed variables is applied, meaning the following model is estimated:

$$(6)\ y_{it}^* = \beta_0^* + \beta_1^*\ x_{it}^* + u_{it}^*,$$

Ordinary least-square on transformed data is feasible GLS, which does not rely on T going to infinity while the Least-Square Dummy Variables relies on T increasing for consistency.[9] In Random effects, $0<\theta<1$. If $\theta=0$ the model reduces to OLS, if $\theta=1$ to within fixed effects[10]. A simple test for the significance of μ_i and λ_t and the validity of the random effects or fixed effects model is checking the F value.

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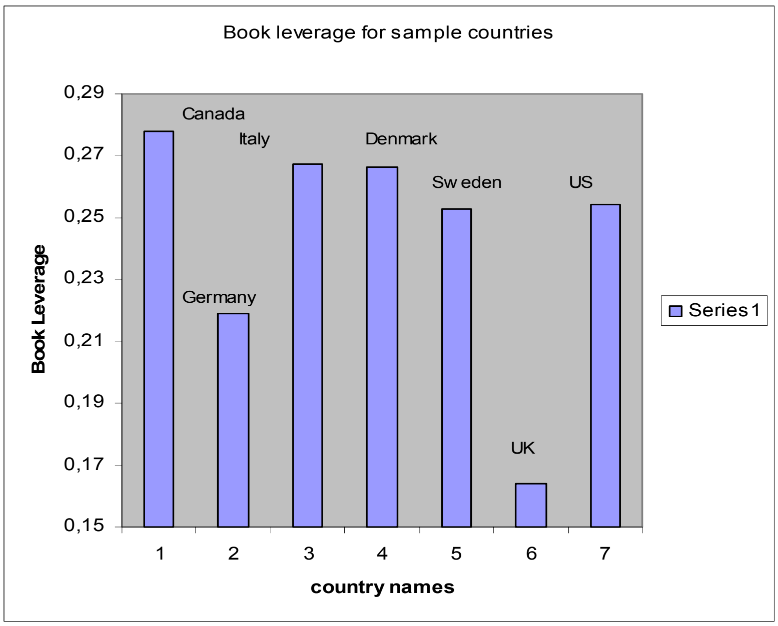
[8] See Baltagi (1995).
[9] See Greene (2000) pp.575.
[10] See Baltagi (1995) pp15.

5 A comparison of leverage of the sample countries

Average debt ratio and capital ratio are presented in Table 2. It is of interest to rank the leverage of the 7 countries and make a comparison.

Insert table 2

Figure 1 Book leverage (TD/TA) of the sample countries



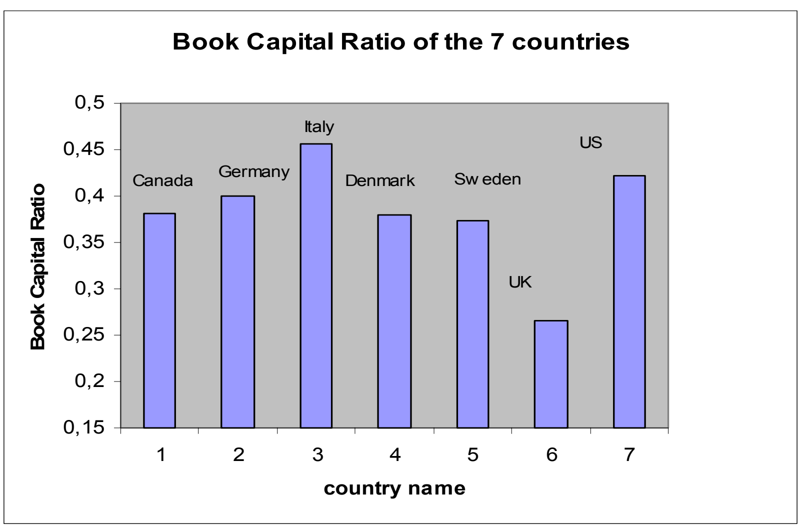
For the debt ratio (TD/TA) we find that Germany and UK have the lowest value. Canada scores the highest followed by Italy and Denmark, Sweden and US. It is not a surprising result compared to Rajan and Zingales (1995). It however does not separate continental Europe from Anglo-Saxon countries. Different tax codes *per se* do not explain the pattern either. The significantly lower leverage for the UK has to be due to the risk attitude of firms and banks together with other financial institutions, and the so called the social conventions within which firms conduct their business. We strongly believe that the choices made by firms in these relatively developed countries with good access to capital markets are rational and to the advantage of the parties involved. Other significant variables are either impossible to include because of a lack of proxy or there is no way to get hold of them for all these countries, for example the ownership structures.

Germany has a large amount of equity-like provisions that enables firms to borrow less. To reinforce our belief that this is indeed the case we show the structure of the balance sheet of 1994 in table 1 where we found little difference to the average value across 5 years. It shows that UK (46%) has the highest level of shareholder funds followed by Denmark (41%), Sweden (36,4%) and Canada (34%), US (28%), Germany (21,1%) and Italy (19%) rank the last. Noticeably, Germany (37,9%) and Italy (21%) followed by US (19%) have significant portions of other liabilities. Germany has a relative low debt ratio because of the large sum of other liabilities. For UK it is simply a fact that they borrow less relative to equity investment. It can be supported by the capital ratio data below.

Insert Table 1

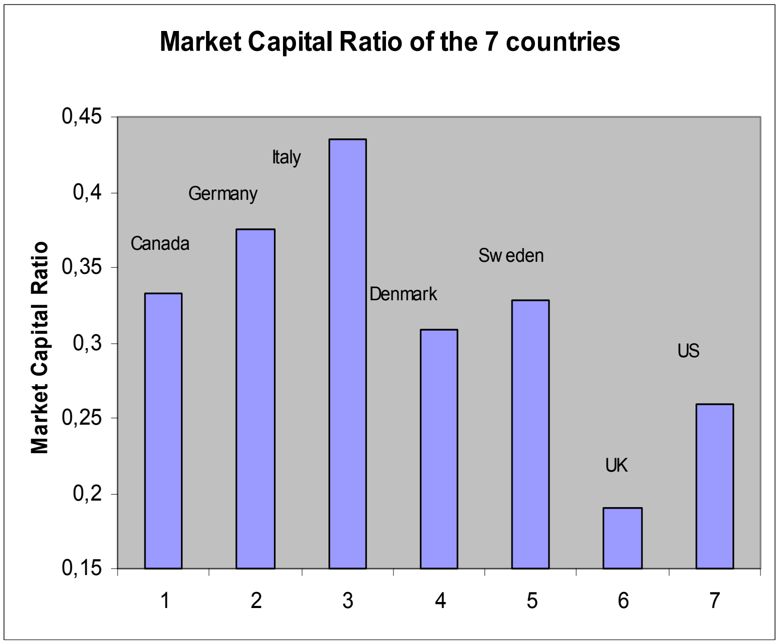
The capital ratios of the 7 countries exhibit a new pattern with UK standing the same, having the lowest capital ratio (see figure 2).

Figure 2 Book Capital Ratio of the sample countries



For the market capital ratio we find that the US and the UK are closer to Canada, Denmark and Sweden is quite close, and Germany and Italy being the highest on Market Capital Ratio (see figure 3).

Figure 3 Market Capital Ratio of the 7 countries



6 Empirical Results

Using GLS method we obtained remarkably significant results for Book debt ratio (see table 3).

Insert table 3

We find support for our hypothesis of size, tangibility and profitability with respect to leverage in all selected countries. The findings for MBR are inconclusive with Canada (0,021) and Italy (0,052) positively related to leverage and Germany (-0,012) and UK (-0,003) negatively related to leverage, Denmark, Sweden and US show insignificant parameter values.

We find strong support for our hypothesis that the higher the profitability the lower the leverage with Denmark (-0,38) and Sweden (-0,23) retain the highest parameter value indicating a large and strong negative relation with leverage, Germany (–0,06) and US (-0,04) have the lowest parameter value.

All the results of sample countries show a strong relation of tangibility to leverage. Again, Denmark (0,48) and Sweden (0,44) show a higher parameter value meaning on average one percentage increase of tangibility results in bigger change in Debt ratio.

Insert table 4

The result for the book capital ratios shown in table 4 shows consistent results comparing to the book debt ratios, except for the market-to-book ratio. Germany and UK have again negatively significant values. The difference shown from the two different measures of leverage is that Canada and Italy becomes insignificant in book capital ratio model. Our perception of MBR as the growth potential of a firm predicts a negative relation to leverage. The main reason we could think of is that the book values are historical value that need not be the best projection of real values.

The result for market leverage is shown in table 5: Market-to-book ratio turns out negative and significant for 6 countries except Denmark (0,0013). It says using market value of leverage we have found the relationship of MBR to leverage negative and significant on data of 6 out of 7 countries. All the other variables fall in line with our expectations! The results can be seen in Table 5.

Insert table 5

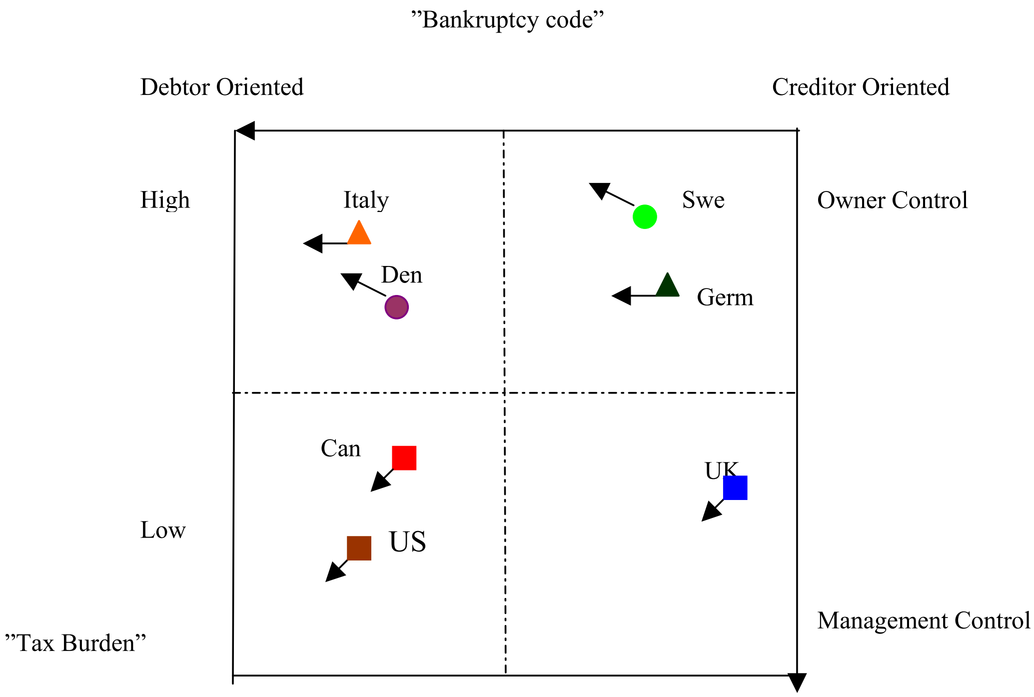
From the above-presented parameter estimates we can draw the conclusion that the variables proposed by Rajan and Zingales are of importance to the firms' capital structure choice.

It also shows that our results are more conclusive compared to Rajan and Zingales (1995, see tables 6&7). The GLS panel methods we use could have contributed to the quality of our analysis. Other reasons could be attributed to the data adjustment. We argue that the debt equity ratio is best studied with unadjusted values from accounting data and try to explain the difference we found using country specific accounting difference and institutional difference.

Insert table 6 and 7

7 An analysis of institutional difference

The models above have to a great extent explained the marginal relationship of the explanatory variables to the leverage measures. It nevertheless does not explain the seemingly different levels of capital structure of these 7 countries. The following framework attempts to categorize the countries using a 3 dimensional structure. The three dimensions are the overall ownership concentration, bankruptcy code orientation and tax burden of the country. Continental Europe would come out in one group as featuring owner control and creditor oriented bankruptcy code except Italy and Denmark, UK as one group and US and Canada as roughly one group, as the following graph indicates.



The two major dimensions namely the control type and bankruptcy code orientation jointly locates the countries. The tax burden, as the third dimension, is indicated by the arrow pointing to the vertical line on the left hand side scaled from low to high.

There are different tax rates that characterize the real tax burden of the firms incorporated in a particular country. The company tax rate does not adequately show the tax burden of a firm because there are other social security contributions that a firm has to comply with. In our opinion the highest personal marginal tax rate as used by R&Z can be very indicative. However, it does not reflect the average tax burden in one country. We choose the total tax revenue as percentage of GDP as the indicator of the tax burden carried by the firms in relevant countries in explaining the level of capital ratio. The rank of tax burden is as follows, in 1995, Denmark (49,4 %) and Sweden (47,6%) have the highest score, followed by Italy (41,2%), Germany (38,2%), then, Canada (35,6%), UK (34,8%), and US (27,6%). The absolute difference between the highest score and the lowest is 22,2 percentage points (OECD (2002)). The figures suggest firms in countries with higher tax burden also have higher borrowing, except Germany. The figures also suggest that countries with owner control as dominating feature also have higher tax burden.

Bankruptcy codes influence firms' financing decisions. Debtor oriented bankruptcy codes protect debtors and aims at maximizing the defaulter's assets thus benefiting the unsecured creditors. Creditor oriented bankruptcy codes allow a creditor to protect himself against insolvency by security or set off (Wood (1995)). This indicates that creditor oriented bankruptcy codes discourage borrowing while debtor oriented bankruptcy codes encourage borrowing in general. The resulting ranking of the countries is similar to Rajan and Zingales where it focuses on the status of management in the event of bankruptcy and rights of secured creditors. On one end is Germany and UK, on the other end is the US. In countries with debtor oriented bankruptcy codes the management often stays in control in reorganization and the creditors remain, which is the case in the US and in Canada. Management/debtors stay in control in bankruptcy is not an adequate measure of debtor/creditor orientation. The case in point is Italy. Italy code is highly debtor oriented but debtors are removed from control in the event of bankruptcy.

Owner controlled firms usually borrow more according to many studies conducted on continental European countries, such as Sweden, Italy, Germany, Denmark (see Holmén (1998) among others). Management controlled firms tend to borrow less especially if the dominating feature of the bankruptcy code is creditor oriented. The reason is that in the event of bankruptcy there are fewer leniencies towards debtor and management is likely to lose firm specific human capital thus the personal bankruptcy cost is high. This has given rise to the low debt ratio of UK. We have used the numerous sources mainly Rajan and Zingales (1995, Table 7: Salient Features of the Bankruptcy Code in Different Countries), Wihlborg, et al. (2001) and Wood (1995). We categorize US, Canada, Italy and Denmark as debtor oriented when in bankruptcy while UK, Germany and Sweden as creditor oriented. "Debtor orientation" in bankruptcy procedure is likely to be associated with more borrowing especially when owner control is the dominating feature. This phenomenon can be seen in the case of Italy and to a lesser extent Denmark (see table 2).

According to La Porta, et al. (1998), widely held firms in US, UK, and Canada are more common. Denmark, Germany, Sweden, and Italy have more family and owner controlled firms using, for example, pyramiding structure and differential voting rights as means of control.

As shown in the graph, Sweden, Denmark, Italy and Germany are categorized as owner controlled, while UK, Canada, and US as management controlled. This pattern does explain most that owner controlled countries have higher debt level, while Germany is the exception. Debtor oriented countries borrow more but less so if management control is the dominating feature. For example, firms in the US and Canada borrow less compared to firms in Italy. This leaves UK the only country with creditor oriented and management control as dominating feature, which explain the lower debt level (Rajan and Zingles, 1995).

There can be other dimensions that are crucial to the firms' choice of financial leverage. For example, bank based and stock market based financial system. Deeper and wider analyses are obviously warranted in order to deepen our understanding of firm behaviours and its policy environment.

Tax code is important in that it is related to the level of economic activity. But a neutral tax code should not influence firms' choices of financing. A tax code that favours borrowing through tax deduction would have the obvious bias towards a higher debt ratio, so does a bank oriented financial system. A finer decomposition of tax code is warranted in future studies.

8 Concluding remarks

Our study of the listed firms in the 7 selected countries has provided empirical evidence that, to the extent that average debt ratio differs across countries; the elements that influence capital structure are identical. Borrowing is significantly related to variables such as size, profitability, tangibility and Market to Book ratio. Country environment such as accounting rules and legal environment, such as bankruptcy laws and tax code are left to explain the marginal difference of the leverage. Stringent bankruptcy procedure or creditor oriented bankruptcy code facilitates more equity capital than debt. A high level of owner control facilitates higher debt ratio as indicated by other studies. If the global trend is towards a dispersed ownership and management control, chances are leverage is going to decrease over time. With the tax codes in Europe converging, the tax advantage of borrowing comparing to retained earnings in countries like Denmark and Sweden decreasing, make borrowing less attractive.

For future studies it might be interesting to include variables measuring flexibility, volatility and especially bankruptcy probability as measured by Altmans's z-score (Altman (1988)). Furthermore an extension of the data series is intended.

Appendix Statistics and empirical Results

Table 1 Balance sheet structure of the "C" firms selected from 7 countries

	UK 1994	USA 1994	Gem 1994	Sweden 1994	Canada 1994	Italy 1994	Denmar k 1994
TOTAL ASSETS*	1	1	1	1	1	1	1
Cash & equivalent	0,072	0,032	0,063	0,051	0,050	0,034	0,085
Debtors	0,165	0,075	0,136	0,1541	0,090	0,136	0,160
CURRENT ASSETS	**0,480**	**0,31**	**0,489**	**0,486**	**0,246**	**0,475**	**0,52**
Financial Assets	0,024	0,096	0,080	0,098	0,210	0,070	0,065
Tangible Assets	0,482	0,39	0,4068	0,3619	0,480	0,415	0,39
Intangible Assets	0,017	0,08	0,035	0,05	0,053	0,046	0,018
FIXED ASSETS	**0,520**	**0,572**	**0,521**	**0,51**	**0,740**	**0,530**	**0,478**
Misc. other assets	**0,000**	**0,118**	**0,000**	**0,004**	**0,014**	**0,000**	**0,000**
Creditors due after 1 yr	**0,152**	**0,250**	**0,196**	**0,1649**	**0,340**	**0,177**	**0,195**
Long term debt	0,132	0,232	0,1912	0,1646	0,250	0,156	0,188
Creditors due within 1 yr	**0,317**	**0,280**	**0,214**	**0,3528**	**0,230**	**0,420**	0,310
Short term debt	0,051	0,035	0,059	0,095	0,040	0,150	0,080
Trade Creditors	0,122	0,058	0,074	0,083	0,077	0,120	0,075
Other liabilities	**0,070**	**0,190**	**0,379**	**0,118**	**0,085**	**0,210**	**0,090**
SHAREHOLDER FUNDS	**0,460**	**0,280**	**0,211**	**0,364**	**0,340**	**0,190**	**0,410**
Total liabilities & shareholdes' funds	1	1	1	1	1	1	1

*(1=100%)

Table 2 Sample Statistics (Mean, Standard Deviation, Minimum, Maximum)

Means	Canada (409)	Germany (836)	Italy (666)	Denmark (427)	Sweden (371)	UK (689)	USA (1968)
Book Leverage(TD/TA)	0,2777 0,1655 0,0000 0,8185	0,2191 0,1944 0,0000 1,3429	0,2673 0,1597 0,0000 0,8956	0,2665 0,1583 0,0000 0,6886	0,2530 0,1812 0,0000 0,7109	0,1639 0,1447 0,0000 0,7245	0,2544 0,1401 0,0004 1,6359
Capital Ratio (TD/(TD+SHF))	0,3818 0,2027 0,0000 0,9419	0,4000 0,2850 0,0000 1,0000	0,4561 0,2470 0,0000 0,9974	0,3798 0,2110 0,0000 0,9148	0,3728 0,2410 0,0000 0,8938	0,2663 0,2127 0,0000 0,9918	0,4218 0,2198 0,0001 1,0000
Market Leverage TD/(TD+MCAP)	0,3326 0,2281 0,0000 0,9973	0,3755 0,3025 0,0000 0,9927	0,4356 0,2425 0,0000 0,9798	0,3090 0,2442 0,0000 0,9651	0,3284 0,2546 0,0000 0,9921	0,1907 0,2046 0,0000 0,9855	0,2587 0,1912 0,0002 0,9952
Size	7,2035 1,5473 -2,0715 10,2459	13,0322 1,8966 7,5549 19,5868	13,1914 1,9546 3,6889 23,1185	6,9249 1,5640 2,8007 10,0564	8,4492 1,4376 5,2734 11,9568	11,1070 2,0836 0,0000 16,1550	8,0970 1,3134 1,4670 11,9704
Market-to-Book Ratio ((MCAP+TD)/TA)	1,0605 0,7400 0,0030 8,4767	1,1095 3,3386 0,0007 54,7731	0,7018 0,4178 0,1016 3,8436	2,6839 8,9202 0,2780 102,3854	1,4214 5,2863 0,0440 66,5879	1,7729 5,5314 0,0430 129,3824	1,6547 4,1918 0,0343 94,5016
TANGIBILITY	0,5312 0,2359 0,0006 0,9892	0,3462 0,1795 0,0085 0,9612	0,3131 0,2018 0,0124 0,9335	0,3516 0,1642 0,0000 0,9084	0,3835 0,2060 0,0005 0,9034	0,3690 0,2196 0,0030 0,9599	0,4216 0,2239 0,0011 0,9720
EBITDAT	0,1080 0,1393 -1,4678 0,9780	0,1050 0,1672 -1,1557 1,9059	0,1145 0,2361 -0,6426 2,5032	0,1149 0,0831 -0,3399 0,6162	0,1041 0,0714 -0,1218 0,5973	0,1113 0,1704 -2,1888 0,6819	0,2010 0,2722 -0,3332 3,4175

Table 3 GLS Panel Results for Book Leverage (TD/TA) (Estimate, Standard Error, Prob>|T|)

BL	Canada	Denmark	Germany	Italy	Swedish	UK	USA
INTERCEPT	0,0055	0,0043	0,0064	-0,0075	0,0009	-0,0038	0,0028
	0,0062	0,0052	0,0044	0,0044	0,0050	0,0044	0,0024
	0,3803	0,3978	0,1534	0,086	0,8537	0,3812	0,2387
YEAR	-0,0072***	-0,0071***	0,0059***	-0,0044**	-0,0132***	-0,0039**	-0,0014
	0,0020	0,0019	0,0019	0,0019	0,0021	0,0016	0,0008
	0,0004	0,0003	0,0023	0,0189	<0,0001	0,0168	0,1057
Size	0,0261***	0,0211***	0,0084***	0,0178***	0,0187***	0,0109***	0,0202***
	0,0023	0,0022	0,0011	0,0010	0,0021	0,0011	0,0009
	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001
MBR	0,0213**	0,0004	-0,0123***	0,052***	-0,0023	-0,0026***	0,0005
	0,0086	0,0008	0,0016	0,0106	0,0013	0,0005	0,0007
	0,014	0,6011	<0,0001	<0,0001	0,0722	<0,0001	0,44
TANGIBILITY	0,1658***	0,4856***	0,2058***	0,1189***	0,4409***	0,193***	0,225***
	0,0254	0,0333	0,0258	0,0248	0,0282	0,0225	0,0102
	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001
EBITDA	-0,1688***	-0,3818***	-0,06131***	-0,1012***	-0,2317***	-0,1339***	-0,044***
	0,0431	0,0577	0,0219	0,0218	0,0597	0,0206	0,0089
	0,0001	<0,0001	0,0054	<0,0001	0,0001	<0,0001	<0,0001
R2	0,5932	0,6924	0,4238	0,6748	0,7270	0,4576	0,7232
R2-adj	0,5881	0,6888	0,4203	0,6723	0,7232	0,4536	0,7225

Table 4 GLS Panel Results for book Capital Ratio (Estimate, Error, Prob>|T|)

BL	Canada	Denmark	Germany	Italy	Swedish	UK	USA
INTERCEPT	0,0098	0,0073	0,0054	-0,0104	-0,0048	-0,0071	0,004
	0,0086	0,0071	0,0062	0,0062	0,0072	0,0066	0,0044
	0,2538	0,3071	0,3771	0,0939	0,5037	0,283	0,3648
YEAR	-0,0098***	-0,0092***	0,0099***	-0,0064**	-0,0235***	-0,0027	0,002
	0,0026	0,0026	0,0028	0,0027	0,0029	0,0025	0,0016
	0,0003	0,0005	0,0004	0,0177	<0,0001	0,286	0,2175
Size	0,0478***	0,0446***	0,0209***	0,0379***	0,0412***	0,025***	0,0389***
	0,0028	0,0035	0,0016	0,0015	0,0031	0,0017	0,0016
	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001
MBR	0,0131	-0,00002	-0,016***	-0,0053	-0,0005	-0,0054***	-0,0024
	0,0113	0,00124	0,0022	0,0155	0,0017	0,001	0,0016
	0,2459	0,9884	<0,0001	0,7310	0,7717	<0,0001	0,1483
TANGIBILITY	0,1144***	0,4404***	0,2674***	0,1122***	0,4676***	0,1196***	0,2372***
	0,0318	0,0403	0,0408	0,0372	0,0374	0,0304	0,0178
	0,0004	<0,0001	<0,0001	0,0026	<0,0001	<0,0001	<0,0001
EBITDA	-0,2639***	-0,6493***	-0,0808**	-0,2183***	-0,4429***	-0,275***	-0,0489***
	0,0565	0,0778	0,0334	0,0318	0,0821	0,0385	0,0153
	<0,0001	<0,0001	0,0159	<0,0001	<0,0001	<0,0001	0,0014
R2	0,6684	0,7012	0,5434	0,7345	0,7414	0,4886	0,6822
R2-adj	0,6643	0,6976	0,5407	0,7325	0,7379	0,4849	0,6814

Table 5 GLS Panel Results for Market Leverage (Estimate, Standard Error, Prob>|T|)

	Canada	Denmark	Germany	Italy	Sweden	UK	USA
INTERCEPT	0,0096	0,00008	-0,0048	-0,0009	-0,0069	0,0011	0,0018
	0,0083	0,007	0,0052	0,0071	0,0082	0,0059	0,0022
	0,2501	0,9913	0,3513	0,8946	0,4021	0,8535	0,406
YEAR	-0,0141***	-0,016***	0,0072***	-0,0066*	-0,0215***	-0,0057***	-0,0048***
	0,0026	0,003	0,0024	0,0028	0,0032	0,002	0,0008
	<0,0001	<0,0001	0,0031	0,0206	<0,0001	0,0045	<0,0001
Size	0,0487***	0,038***	0,0225***	0,0397***	0,0374***	0,0148***	0,0260***
	0,0032	0,0034	0,0017	0,0016	0,0029	0,0013	0,0011
	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001
MBR	-0,0632***	0,0013	-0,0059***	-0,1878***	-0,0074***	-0,0073***	-0,021***
	0,0104	0,00143	0,0019	0,0134	0,0018	0,001	0,0021
	<0,0001	0,362	0,0017	<0,0001	<0,0001	<0,0001	<0,0001
TANGIBILITY	0,1881***	0,501***	0,2379***	0,2838***	0,4496***	0,175***	0,195***
	0,0321	0,0503	0,0416	0,038	0,0418	0,0259	0,013
	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001
EBITDA	-0,3447***	-0,744***	-0,1153***	-0,2073***	-0,4297***	-0,346***	-0,056***
	0,0455	0,079	0,0297	0,0290	0,0897	0,032	0,0085
	<0,0001	<0,0001	0,0001	<0,0001	<0,0001	<0,0001	<0,0001
R2	0,5733	0,5666	0,5073	0,6787	0,6474	0,361	0,6306
R2-adj	0,568	0,5614	0,5043	0,6763	0,6426	0,3560	0,6297

Table 6 Parameter estimations by Rajan and Zingales (1995) Book Leverage

Book leverage	Canada	Germany	Italy	UK	USA
Tangibility	0,26**	0,42**	0,36	0,41***	0,50***
MBR	-0,11***	-0,20**	-0,19	-0,13	-0,17***
Sales	0,08***	-0,07***	0,02	0,026	0,06***
Profitability	-0,46***	-0,15	-0,16	-0,34	-0,41***
N	264	175	96	533	2079

Table 7 Parameter estimations by Rajan and Zingales (1995) Market Leverage

Market leverage	Canada	Germany	Italy	UK	USA
Tangibility	0,11	0,28*	0,48**	0,27***	0,33***
MBR	-0,13***	-0,21***	-0,18*	-0,06**	-0,08***
Sales	0,05***	-0,06***	0,04	0,01	0,03***
Profitability	- 0,48***	0,17	-0,95	-0,47**	-0,6***
N	275	176	98	544	2207

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Trade Credits in Transition Economies

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Abstract

In this paper the use of trade credits in two of the more advanced east European transition economies, Poland and Hungary, is analyzed. In both countries the use of trade credits by the firms in the sample declines over the period 1991-1997 while the extension of trade credits increases. The use of bank loans is small in Hungary while their use increase over time for Poland. The development for retained earnings is exactly the opposite. This might be an indicator of the improvement of the financial system in Poland while retained earnings seem to be the relatively cheapest source of financing in Hungary. A panel model is estimated to identify microeconomic factors that influence the use of trade credits. Our most important finding is -contrary to the findings of Petersen and Zingales (1996) for the USA and Deloof and Jegers (1999) for Belgian firms- a positive relation between bank loans and trade credits in both countries. Furthermore we find a positive size effect, while other variables shift in signs and significance level.

Keywords: Transition Economies, Trade Credits, Bank Loans, Panel Data

JEL Classifications: G32, G30, C23, O16

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1 Introduction

In a perfect world there would be no need for trade credit, since there would always be access to money to finance lucrative projects, but the world is not perfect and the world of transition economies is even less perfect

In transition economies, especially with a non-existing or newly established stock exchange the most important sources of financing investments are retained profits, short-term bank loans and trade credits. As Vensel and Wihlborg (1997) found trade credits and retained earnings are two of the most important sources of finance in Estonia. An important finding in an earlier paper Hammes (1998) is the positive relation between bank loans and trade credits in Poland, while this relation seems to be negative or insignificant in western market economies.

Poland and Hungary are the countries which have come farthest in their transition to market economies. In both countries firms experienced a credit crunch as a result of macroeconomic stabilization policies, policies of tight money. From Meltzer (1960) and Brechling and Lipsey (1963) we know that there is a link between monetary policy and trade credits.

In this paper I will compare the use and the extension of trade credits in Poland and Hungary. Furthermore I will look at micro factors influencing the use of trade credits in these two countries. I will especially focus on the relation between bank debt and trade debt.

The relative importance of trade credits compared to other sources of financing and the strength of this relation can serve as an indicator for the development of the banking system in a transition economy and for financial constraints experienced by companies.

As a first step I will give some descriptions of the countries in question, followed by a brief survey of different theories on trade credits. In the following empirical part I will present the model used, present some descriptive statistics and present my regression results.

2 Poland[2]

Poland is the transition economy that was among the first to start the way towards a market economy. Transition started in the beginning of the 1980's to accelerate after the fall of the iron curtain. In 1996 Poland became a member of the OECD and stands now first in line to join the European Union and the NATO.

An important milestone in this development is the foundation of the Warsaw Stock Exchange in April 1991. Today more than 200 firms and NIFs (National investment funds) are listed on the Warszawa stock exchange and the traded volume can be compared to a EU country like Portugal.[3] Since 1997 even options are traded at the WSE.

A serious problem of the Polish stock market is the small number of institutional investors; most investors are individuals and foreigner, which hold around 30%. This might explain the large volatility of the stock price and speculation affects surely our market to book ratio as one factor influencing the capital structure of Polish firms.

In 1989 a new banking law was passed which resulted in the spin off of nine regional banks from the NBP (National Bank of Poland) and in 1993 the rest of NBP's commercial activities became the Polish Investment Bank. Nowadays there exist more than 1600 banks in Poland; nearly 1400 of them are cooperatives, most of them in more ore less serious trouble. Of the existing 79 commercial banks 22 comprise about 63% of total banking assets, and most of them still have the state treasury as majority owner. Up to the bad debt crisis in 1993 crisis, which destroyed 25% of the combined balance sheets of commercial banks the Polish licensing regulation was quite liberal. Afterwards the attitude of the NBP became more restrictive.

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[2] See Paczynski (1997) for a description of the development in Poland.
[3] According to Tanmowicz and Dzierzanowski (2002) 21 non-financial companies where listed in 1995 and in 2002 190 non-financial companies.

One important result of the crisis of 1993 is that banks became reluctant to give long-term loans and concentrated instead on government bonds and short-term loans. A further obstacle to credit giving is that Polish banks are in general undercapitalized and that banks have higher costs than in western countries, costs are f ex two times the German costs. A low level of monetisation and financial intermediation as a result of the near hyperinflation in late 1989/90 characterizes Poland. Bank credit and money relative to trade credit were with around 20 to 30 % each around half the level of other transition economies such as Hungary or the Czech Republic.[4]

An important novelty for Poland is the establishment of the CERA (Central European Rating and Analysis Center) by Fitch, which might facilitate obtainment of bank loans and public loans for enterprises in Poland. It publishes the bi-weekly bulletin "Rating & Rynek" ("Rating & Market") that follows the Polish debt market and provides Information about planned issues, corporate bond issues, bank bond issues and municipal bond issues as well as some entities ratings and analyses prepared by Fitch Ratings

From firms point of view external finance is still very difficult due to the restrictive attitude of domestic banks, non-existence of a corporate bond market and a market for Certificates of deposit, which is still in its infancy.[5] Nevertheless, the CDs seem to become an alternative to bank loans since their interest rates are lower. Competitions through foreign banks is quite negligible due to the fact that foreign banks either serve home customers or restrict themselves to deals beyond a hundred million USD.

Investment banking is also in the very beginning since firms obviously dislike the costs associated with equity issues and entrepreneurs fear to lose control over their firms. From that to important sources of external financing can be identified, trade credits and bank loans. Both are associated with relatively high costs compared to western standards.

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[4] OECD (1994).
[5] The market for CDs opened in 1995 and was used first used in 1996.

An important point in the analysis of the capital structure of Polish firms is the fact that accounting rules are compliant with the relevant EU directives and IAS (International accounting standards). Differences only occur in the treatment of leases, many of them would be regarded as financial leases while they are considered operating leases in Poland, and deferred taxation and consolidation of capital groups. None of these points affects our empirical investigations. From 1994 onwards even these rules were adapted to international standards.

3 Hungary

Alongside Poland and the Czech Republic, Hungary is the country that has come farthest in transition to a market economy. Hungary introduced a mixed economy with partial privatizations already at the end of the 1960s. By the end of the 1980s the private sector accounted for around one third of the GDP.

The National Bank of Hungary (NBH) split its commercial banking activities into the Hungarian Credit Bank, National Commercial and Credit Bank, and the Budapest Bank+ Hungarian Foreign Trade Bank. Furthermore the General Banking and Trust Company were re-chartered as commercial banks[6]. By mid-1991 a total of 37 banks and financial institutions were operating in Hungary. [7]

However as the OECD (1997) observed Hungarian banks run a risk of disintermideation, since subsidiaries of foreign firms and joint ventures can easily and more advantageous borrow abroad. This becomes evident in the rapid growth of inter-firm credit; the stock of inter-company loans to bank loans increased from 12.8% to 17.4% in 1996.

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[6] Hersch, Kemme and Netter (1997).
[7] OECD (1993).

Assuming that the economy was sufficiently stabilized monetary policy was eased in early 1992, a decision which was soon to be reversed in mid-1993.[8] Before 1995 the monetary policy was slightly restrictive but by the stabilization program of March 1995 price stability became the official aim of monetary policy. Furthermore Hungary is characterized by very high interest rates partly as a result of monetary stabilization policy leading to a credit crunch.

Hungary experienced an increased riskiness of lending due to privatization. This increased riskiness resulted in two reactions by the commercial banks, lending was restricted and average lending rates were driven up. Average lending rates in 1996 were around 27% and deposit rates around 21%.[9]

Hersch, et al. (1997) find that firms whose owners had business experience or were past members of the nomenclature had easier access to bank loans.

The Hungarian stock exchange reopens in 1990, and represented a market capitalization of HU 3058.4 billion.[10]. The number of listed firms grew from 20 in 1991 to 49 in 1997. The stock exchange is quite well developed offering options and futures besides stocks.

Based on the above presentations we can identify the following problems for obtaining bank credits in both countries:

- Tight monetary policy leading to high interest rates and credit rationing
- Credit rationing due to increased riskiness of lenders[11]
- An underdeveloped banking system
- High interest rates to compensate for increased riskiness of lenders
- Competition from foreign subsidiaries and joint ventures, leaving bad risks to banks

[8] OECD (1995).
[9] OECD (1997).
[10] 1 HUF=USD 0.0049 (123199).
[11] More on that see Stiglitz and Weiss (1981).

4 Trade Credits[12]

Trade credit it is clearly of economic significance. In the United States vendor financing accounted for an average $1.5 trillion of the book value of all assets of US corporations during the 90s.[13] Trade credit usually is interest free for a certain time after delivery, but often suppliers offer a discount for early payment. Lets us assume there is a discount of 3% for payment within 10 days and otherwise payment has to happen 30 days after delivery. The interest rate in the case of not paying within 10 days would be 55,67%.[14] Thus trade credit can be a very expensive source of finance.
There are a three theories trying to explain the use of trade credits, the transaction view, trade credits as a financing device and financing advantage theories of trade credits (Schwartz and Whitcomb (1978)), the price discrimination theory (Brennan, et al. (1988)) and the transaction cost theory (Ferris (1981)).

4.1 Financing advantage of trade credits (Schwartz (1974))

This theory explains the provision trade credits with three possible advantages of the trade creditor compared to outside creditors.
One advantage might be that he is better at investigating the creditworthiness of the client due to excellent knowledge of the industry. The supplier is superior to a financial institution in information acquisition or he can obtain information faster and cheaper since it occurs from normal business.[15] In Smith (1987) "trade credit is viewed as a contractual device for dealing with informational asymmetries in intermediate goods markets". The buyer's actions reveal direct information about his financial status to the seller. One example is whether a buyer takes advantage of early paying discounts or not. A buyer using an early payment discount can be assumed to satisfy his financing needs from other low interest sources. If he pays late the buyer has implicitly borrowed at a higher rate (see example above) and therefore third party financing was probably not available. An empirical consequence of this would be negative relation between third-party finance such as bank loans and trade credits.

[12] Petersen and Rajan (1996) provide a useful survey of theories.
[13] See Ng, Smith and Smith (1999).
[14] Example taken from Drukarczyk (1991).
[15] See for example Smith (1987).

A second cost advantage is given if the seller is better at monitoring or enforcing repayment. If the good provided by the creditor is relatively unique he can always threaten to stop delivery in case of clients misbehavior. In that way the supplier has an advantage in controlling the buyer. The credibility of this threat is directly related to the relative importance of the buyer. If the buyer only stands for a small amount of the supplier's sales it is more credible than in the case of a large buyer. A financial institution has a far more limited set of available actions.

The third and last major advantage is the higher ability of the trade creditor to salvaging value in the case of bankruptcy. Banks seize firm's assets to pay of loans as well as the seller. The seller might have a widespread network within an industry, and therefore his costs of repossessing and resale might be lower. The advantage will vary across sections and across goods. The advantage of the seller over financial institution is the larger the less the good is transformed by the buyer.[16]

Against that story speaks the fact that trade credits are only short-term and that the interest rate is much higher than an ordinary bank loan. On the other hand repaying one credit and using the extended credit from the next delivery might revolve trade credits. In that way trade credit can be transformed into a cheap medium or long-run credit.

4.2 Trade credit as means of price discrimination

Schwartz and Whitcomb (1978) argue that trade credits are used when explicit price discrimination is not allowed due to legal restrictions. They suggest that if firms with higher cost of capital have a higher demand elasticity, it is profitable to charge them a lower price. Trade credit is a way to achieve this lower price in the presence of legal restrictions.

[16] See Petersen and Rajan (1996)

The model by Brennan, et al. (1988) relies primarily on a lack of competition in product markets combined with adverse selection. Hence price discrimination becomes possible and lucrative. In a first step they show how a monopolist uses credit terms to price discriminate between cash and credit customers by setting credit terms that are attractive to the latter but not the further. The only thing needed is a difference in the reservation price between the two groups. In the second step they show how adverse selection in credit market is sufficient for price discrimination and so for vendor financing to occur. This model also holds for the case of oligopolistic supply.

The supplier can use credit either as a way to subsidize its supply it could be used for clients that would otherwise not receive credit from a bank. Trade credit effectively reduces the price to low quality borrowers, since terms are normally independent of buyers' quality as opposed to bank debt. The latter's interest rate normally reflects the all the risk characteristics of the buyer. Risky buyers – as opposed to good risks – will prefer trade credit to other sources of financing. Thus trade credit is a way to reach customers that would otherwise not be able to buy a certain product. In the model by Brennan, et al. (1988) the profit with extension of trade credits dominates profits without extension.

Biais and Gollier (1997) develop a model of trade credit from which they conclude, that credit-constrained companies resort more to costly trade credit than others.

4.3 Transaction cost theories (Ferris (1981))

Trade credit is a way of separating delivery schedules from payment cycles. If there is strong seasonality in the demand for a firm's products the firm is forced to hold large inventories in order to smooth production, thus incurring costs of warehousing and the costs of producing the inventories while positive cash flows are delayed. By offering trade credits the producer might induce customers to buy earlier or more continuous maybe because they are better at managing inventory positions.

From the presentation of relevant theories we might consider the financing advantage of trade credits by Schwartz (1974) and the price discrimination hypothesis as especially relevant for emerging market economies. The superior expertise (as compared to banks) of the lender in the first case and the possibility to use trade credits as a strategic device to reach otherwise unreachable customers in the second theory are important determinants for the extension of trade credits to firms in transition economies.

From the above we can derive the following testable hypothesis:

Hypothesis: In or credit-rationed economies in general trade credits and bank loans are complements.

5 Description of Variables

The question posed here is, what is the relation between bank loans and trade debt. Are they substitutes as suggested by Smith (1987) and the findings of Deloof and Jegers (1999) or, not related at all as in Petersen and Rajan (1996), or do trade credits have an important function in alleviating limited access to external finance. Bank loans and trade credits are expected to be either complements or substitutes. In the first case a 1% change in bank loans would lead to a positive percentage change in trade credits and the second case this would be negative. Assuming that the following regressions include all relevant factors a positive sign on the bank loan variable would allow concluding substitutability and vice verse.

So the question is how do firms in transition economies acting in a system characterized by a restrictive monetary system, a developing banking sector and economic uncertainty circumvent this problem.

A positive sign would mean that firms that have a lot of bank loans also have a lot of trade credits. This may indicate that firms are rationed in the loan market and firms that want a lot of debt are rationed more.

The dependent variable in the first model is the balance sheet liabilities position trade creditors, which is explicitly provided by Extel. It would be desirable to include SIC-codes to see if there are differences in access/use of trade credits between different industries. Unfortunately both East European samples are too small for this.

In the first step I use the balance sheep position “trade creditors” which is provided by Extel directly. In doing so I follow most of the existing literature like Deloof and Jegers (1999) and Petersen and Rajan (1996). In the second step the net position of trade debt and trade credit is used as the dependent variable to check for the stability of the relations and since it is often claimed in the literature that companies try to match the maturity of credit and debit positions.[17]. Deloof and Jegers (1996) find that accounts payable in Belgian firms are almost completely used to finance accounts receivable and cash holdings. By running a regression on the net amount of trade credits used I try to eliminate the use of trade debt to finance the extension of trade credits.

In transition economies trade credits is expected to be an important source of finance in the absence of a well functioning financial system. Therefore a decline of this balance sheet position should be expected over time as well as a negative relation to bank loans, which should replace trade credits as the financial system develops.

5.1 Bank Loans

Bank loans are one of the most important financing devices in every economy. Petersen and Zingales (1996) find no relation between the amount of trade credit offered to a firm and the relationship with financial institutions for the United States. Deloof and Jegers (1999) find a negative relation between trade debts and short-term and long-term bank debt for Belgian firms. Following Smith (1987) a negative relation between trade credits and bank loans should be expected.[18]

[17] See Diamond (1991) for a model.
[18] Fisman and Love (2001) provide indirect evidence for the substitutability of bank loans and trade credits.

The important question is if this finding holds for emerging market economies suffering from tight monetary policy. Here in fact we might find a wide range were both trade credits and bank loans are used as financing devices since there exist more positive NPV projects than can be financed by bank loans alone.

Unfortunately our sample does not allow us to distinguish between short term and long-term bank debt. Therefore we cannot decide if trade credits are a substitute or complement for long term, short-term bank debt or both of them. The problem is alleviated that in the actual samples most of the debt carried by the firms is short term. Our focus for the later analysis will be on bank loans, while the following variables are mainly control variables covering various firm-specific aspects such as riskiness, self-financing ability.

5.2 Tangibility

Tangibility is defined as the ratio of fixed assets to total assets. Thus tangibility, in our model, measures the proportion of long-term assets of a firm. These assets can serve as a collateral for credits.

The Harris and Raviv model (Harris and Raviv (1990)) predicts that firm with higher liquidation value, in this case, those with more tangible assets as collateral will have more debt. The intuition is that firms with more tangible asset are more likely to be in a mature and slow growth industry thus stable, which leads to a higher leverage. In the presence of credit rationing high tangibility might facilitate the use of alternative sources of finance such as trade credits.

5.3 Market-to-book ratio

Market to book is the ratio of book value of assets minus book value of equity plus the market value equity divided by book value of assets. MBR is a proxy for a firm's growth opportunities. According to Petersen and Rajan (1994) firms could resort to larger amounts of trade debt not only when credit institutions limit their access to debt but also when they have better investment opportunities. I expect a positive relation between MBR and trade credits.

A serious problem with the MBR is the extreme volatility of both stock exchanges, so the question is, which MBR during a year – if any – is the right one.

5.4 Measures of internal financing ability

The second important source of finance in transition economies is retained earnings. [19] I expect retained earnings to be negatively correlated with trade credits because firms will probably not resort to expensive trade credits if they have access to positive profits available for investments, payments etc. On the other hand they might have so many lucrative investments available that trade credits might be used to finance marginal projects. Several measures of internal financing ability, retained earnings, retained profits, and ebitda, will be tested. High profitability is also related to creditworthiness, firms with higher profits – whether retained or not – increases credit worthiness and thus facilitates access to both bank loans and trade credits.

It could be argued that by including retained earnings or similar variables the following regression comes close to resembling an identity. Therefore the regressions will also be run without a measure of internal financing ability, even though the chosen panel data approach alleviates problems with multi-collinearity.

5.5 Size

The next variable I control for is firm size. Meltzer (1960) finds a positive relation between firm size and trade credit. I use the logarithm of total turnover as a proxy for size of a firm as, for example in Rajan and Zingales (1995). Another possibility would be the logarithm of the book value of assets as in Petersen and Rajan (1996), but that does not make sense since all the other variables are ratios containing total assets, so correlation between size and the other variables would be relatively high.

[19] See Vensel and Wihlborg (1997).

Size is expected to be positively correlated to trade credits since larger firms have lower cost of capital and lesser information asymmetry as they are better monitored. Another argument for this is the fact that the bankruptcy risk normally decreases with firm size since - at least in Europe - government will support large firms facing the risk of bankruptcy to avoid the associated increase in unemployment. This prediction is in line with findings by Petersen and Rajan (1996) that large firms both offer and receive more trade credit than small firms.

I include a time variable into the model to see how the debt-equity ratio develops over time, if it develops at all. If the time variable is insignificant I can conclude that firms in the respective countries are in some kind of equilibrium regarding their capital structure choice.

5.6 Age

For all countries I include the age of each company. The reasoning behind the use of age is that it can be a proxy for reputation in debt markets. Survival increases trust and thus facilitates debt financing.[20] Apart from the general reputation effect, older firms can knit closer ties - strengthening the relationship - to suppliers.

Which age to use is a difficult question; in Hungary with its longer history of privatization back to the 1960s, the year of foundation should probably be the adequate measure of reputation, while in Poland the year of the IPO might be more suitable. I argue for the original date of foundation since it is an indicator for the reputational capital of a firm even if it was socialized during the communist regime. Firms existed during that time and are represented in the minds of their suppliers and customers. Either good or bad experiences are connected to them. Nevertheless I will use both in the following model. In order to account for non-linearities I use firms' age as well as the square of it. Age can also be a proxy for growth opportunities; young firms have assumingly larger growth opportunities than old firms.

[20] See Diamond (1989).

6 Description of the dataset

The data stems from the Financial Times Database Extel and from its successor Discovery. It contains comprehensive information on over 12000 listed companies all over the world. Complete annual balance sheets, annual profit loss accounts and daily company news as well as share prices are provided. All chosen firms fall into EXTEL category "C" which stands for commercial, industrial and mining companies, which are comparable according to normal standard. The Polish sample contains 23 firms and for Hungary there are 35 firms. Price data was given by FT Prices.

The panel contains yearly firm level data from 1991 to 1997. A definite problem is the fact that only listed firms and not all listed firms are to be found in the EXTEL database. With regard to trade credits a bias is introduced since listed firms are normally the largest ones in a country.

A further problem is the small size of the Polish sample, 23 firms is not much even though there are up to seven consecutive observations per firm. Unfortunately market capitalization data does not exist for the whole time period, as the earliest data available starts in 1992. However, for the sample period almost all listed companies are covered. The comments above also hold for Hungary even though the Hungarian sample is larger with 35 firms.

7 Empirical Analysis

7.1 Descriptive Statistics

To begin with the sample is described using simple statistics presented in the appendix in table 1.

Insert table 1

Graphs illustrating similarities/ dissimilarities between the to countries are presented. As can be seen in figure 1, there is a clear decline in the balance sheet position "trade creditors" in both countries while figure 2 shows a simultaneous increase in the extension of trade credits by the firms in our sample.

Insert figures 1 and 2

This development might be an indicator for the improvement of the financial system; firms have easier access to other cheaper sources of finance. On the other hand they use excess liquidity to extend trade credits to firms, which do not have the same access to other sources of finance. This would be in line with findings by Brechling and Lipsey (1963, Meltzer (1960, Schwartz and Whitcomb (1978), that large firms extend trade credits to finance smaller newcomers as a kind of investment. Furthermore it would support the financing advantage of trade credits (Schwartz (1974)) and the price discrimination theories (Brennan, et al. (1988)). In Hungary the share of trade debt compared to the book value is in every year almost double the share in Poland, trade debt is obviously more common and more important in Hungary

A further interesting comparison can be made between bank loans and retained earnings.

Insert figures 3 and 4

The latter are relatively high in Hungary and increasing over time, while they are very low in Poland. The evidence for bank loans is exactly the other way round. Retained earnings seem to be the preferred source of financing in Hungary; in Poland bank loans are used and increasingly available. Relatively cheap retained earnings and bank loans seem to be substituting expensive trade debt in both countries. Furthermore the sample firms in both countries seem to use their improved financial situation to extend trade credits to other firms. These trade credits are either financed by retained earnings or by bank loans. This behavior would be compliant with both the financing advantage and the price discrimination theories. Firms extend credit to other firms that might not receive third-party finance due to low creditworthiness or other factors, or use trade credit as price discrimination device for high-risk buyers.

7.2 Model

The following models are estimated:

(1) $TC_{it}=\alpha+\beta_1 time+\beta_2 Tang+\beta_3 bl_{it}+\beta_4 \ln S_{it}+\beta_5 MBR_{it}+\beta_5 age_{it}+\beta_6 age^2_{it}$

(2) $TC_{it}=\alpha+\beta_1 time+\beta_2 Tang+\beta_3 bl_{it}+\beta_4 \ln S_{it}+\beta_5 MBR_{it}+\beta_5 IPO_{it}+\beta_6 IPO^2_{it}$,

where:

TC=Amount borrowed from Trade creditors

Tang=Tangibility,

S=logarithm turnover in local currency

MBR=market-to-book ratio

Age=years since foundation of firm

IPO=years since introduction to the stock exchange

$u_{it}=\mu_i+\nu_{it,}$ is an error term where μ_i are firm specific effects and ν_{it} is a random effect.[21]

All variables, except for size and age, are scaled by total assets.

In the second step we change the dependent variable to the net position of trade credits and trade debt, so the model becomes the following in order to account for the maturity-matching theroy and to test the robustness of the model-specification.

(3) $NTC_{it}=\alpha+\beta_1 time+\beta_2 Tang+\beta_3 bl_{it}+\beta_4 \ln S_{it}+\beta_5 MBR_{it}+\beta_5 age_{it}+\beta_6 age^2_{it}$

(4) $NTC_{it}=\alpha+\beta_1 time+\beta_2 Tang+\beta_3 bl_{it}+\beta_4 \ln S_{it}+\beta_5 MBR_{it}+\beta_5 IPO_{it}+\beta_6 IPO^2_{it}$

[21] See Mátyás and Sevestre (1992).

where:

NTC=Trade Creditors-Trade Debtors-Cash

Tang=Tangibility,

S=logarithm turnover in local currency

MBR=market-to-book ratio

Age=years since foundation of firm

IPO=years since introduction to the stock exchange

The models are estimated using a panel data approach. A heteroscedastic GLS-estimator for this unbalanced panel is used.[22]

8 Results

In interpreting our results we have to be quite careful due to the small number of firms observed and the unbalancedness of the panel. The sample for Hungary should be quite representative while our Polish sample is in the later years small compared to the total number of listed firms. Another caveat is the restriction to balance sheet data and market capitalization, thus ignoring macroeconomic variables, especially the change in money supply. In the following discussion I will refer to the model using the incorporation year as the age model, while the model using the IPO year is called the IPO-model.

Insert table 4

With these caveats in mind we find a positive relation between bank loans and trade credits as opposed to Petersen and Zingales (1996), which indicates that the firms in this sample really are financially constrained.

[22] Baltagi (1995).

In both countries MBR is insignificant, it has no obvious effect on trade credits, maybe due to the high volatility of both stock exchanges. Thus it is questionable whether the market-to-book ratio really is an indicator for anything or more a random value assigned to a firm in transition economies.

Tangibility seems to have an effect in both countries but only in the model using the year of incorporation is it significant and – as expected - positive. The negative sign for Poland is unexplainable in theoretical terms.

Retained earnings are only significant for the Hungarian age model and the sign is mostly negative as expected. Firms rather resort to relatively cheap internal finance than to trade credits. Even other variables measuring firms' ability of self-financing as discussed above like retained profits (not reported here) were tried. As predicted we find a positive and weakly significant size effect for both countries except for the Polish age-model. In both countries larger firms have more trade credits than smaller ones.

Both Age and Age^2 are significant in Hungary implying a non-linear relation between trade credits and age. The signs indicate a positive exponential relation. We find the same signs for the year of the IPO even though only the square of the year is significant. For Poland only the square of the IPO year is significant, while the IPO year is not. Both signs are nevertheless positive.

Thus findings regarding the reputation effect as proxied by years of survival are not consistent. Nevertheless the signs may be explained by fact that the real measure is neither the incorporation, which often dates back long before the World War II, nor the IPO. The later suffers from the problem that many firms are quite young so the basis is quite small for any significant effect. The alternative is that the date of the IPO is the correct proxy, since it is not disturbed by the communist interregnum.

The results of the second estimation using the net position as a dependent variable is quite consistent with the findings in the first step, in general the results even improve.

Insert table 5

The most important result is the stability of the relation between bank loans and trade credits. As opposed to earlier findings for developed countries the relation is strong and positive.

Tangibility is in all specifications highly significant, which matches the predictions on this variable.

In the second model specification size seems to lose its explanatory power, it is only significant at the 10% in the age model for Poland. Market-to-book is again insignificant in all estimations.

Retained earnings carries in all specifications the predicted negative and significant sign. Alternative regressions without retained earnings following the above argument on the variables to include lead to similar results for the other variables.

Surprising things are going on with regard to age and IPO. The age model works out neatly with a positive coefficient for age and a negative for the square of it, showing a decreasing effect of the firms' survival time for Poland. The results for Hungary are exactly the opposite.

Using the time since the IPO the unsquared variable is negative for both countries while the squared is positive in both indicating an accelerating effect of time since the IPO. In all regressions the coefficients of the age measures are very small, but significant.

9 Conclusions

An important finding is the positive and relatively strong relation between bank loans and trade credits in both countries, which is unpredicted in the theory. Earlier findings by Deloof and Jegers (1999) for Europe and Petersen and Rajan (1996) for the US find the opposite for companies in well-developed countries. A lot of other factors indicated by the literature on trade credits and capital structure are weakly significant or insignificant. This does not mean that they are but certain special factors like different accounting rules as compared to industrialized countries and permanent changes in rules, as well as volatile stock markets might be responsible for the relatively weak results.

Another interesting finding, which would be well in line with the above-mentioned findings, is the fact that the use of trade credits in this group of firms decreases in both countries over time while the extension increases. This development can be seen as an indicator for a positive development of the financial sector and in the long run we might get the same relation between bank loans and trade credits as in countries with more advanced financial sectors.

This article is a first step in investigating factors influencing trade credits use; a next step is to extend the analysis to a sample of industrialized countries and the inclusion of macroeconomic factors. A further interesting future project is to look at the other side of the balance sheet, namely the extension of trade credits. Furthermore an extension of the data series both in time as well as in the number of Polish companies is intended. In addition it might be very interesting to conduct firm level interviews in both countries to gain deeper insights into the use and conditions of trade credits.

Appendix 1 Sample Description and estimation Results

Figure 1 Trade Creditors by book value of assets

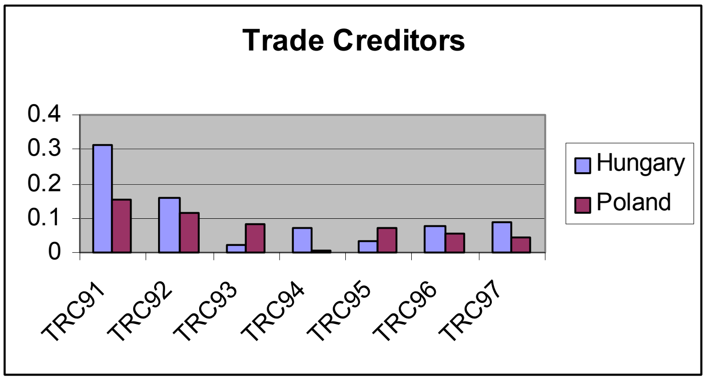

Figure 2 Trade Debtors by book value of assets

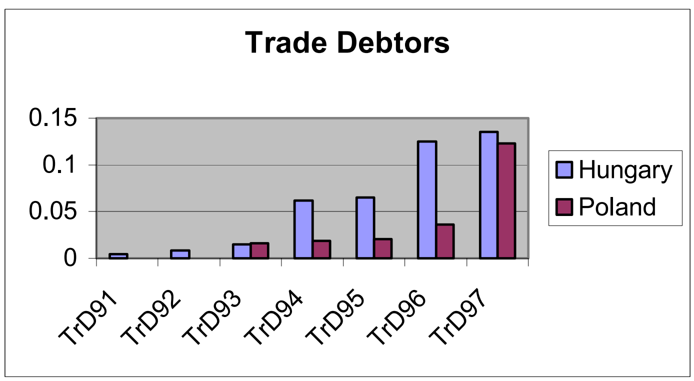

Figure 3 Bank Loans by book value of assets

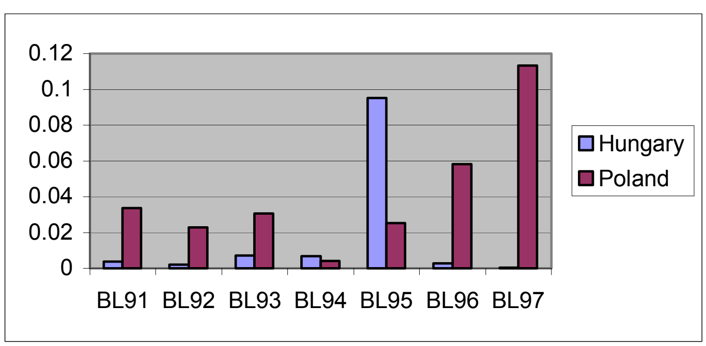

Figure 4 Retained Earnings by book value of assets

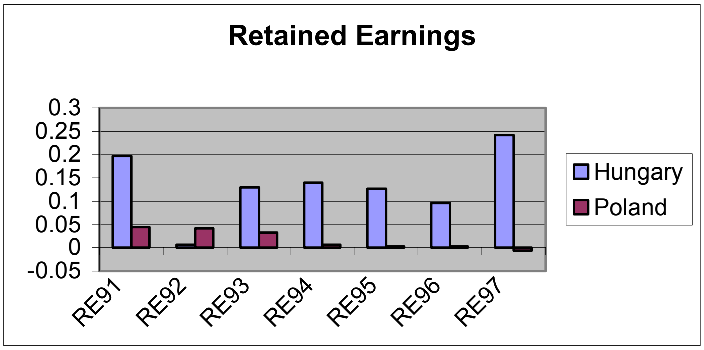

Figure 5 Retained Profits by book value of assets

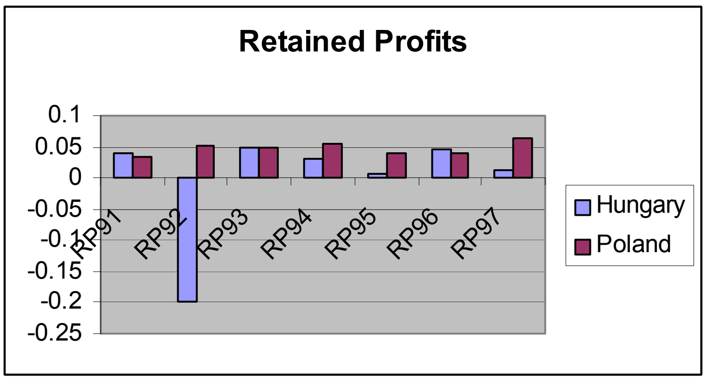

Figure 6 Profits before tax by book value of assets

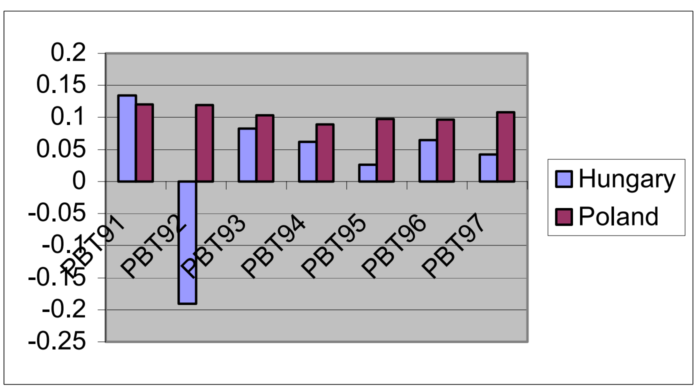

Table 1 Descriptive Statistics

Hungary/ Poland	1991	1992	1993	1994	1995	1996	1997
Trade Credits	0.314969	0.159039	0.022528	0.069303	0.031751	0.074223	0.086483
	0.154469	0.117536	0.083865	0.007061	0.072233	0.056797	0.045468
Trade Debtors	0.004372	0.008301	0.014692	0.06187	0.064797	0.125051	0.135366
	0	0	0.016305	0.018862	0.020372	0.036093	0.123206
Bank Loans	0.00373	0.002101	0.007153	0.006598	0.095143	0.002807	0.000359
	0.033526	0.022944	0.030613	0.003886	0.025172	0.05799	0.113297
Total Debt	0.332101	0.180353	0.054559	0.091098	0.196911	0.092547	0.096741
	0.285804	0.231163	0.177772	0.031424	0.248056	0.308024	0.498253
Financial Assets	0.097204	0.10637	0.10554	0.1101	0.141688	0.027337	0.058382
	0.03548	0.033905	0.068091	0.056846	0.165516	0.171426	0.068549
Fixed Assets	0.188437	0.326347	0.59569	0.594791	0.671905	0.505936	0.56601
	0.253352	0.256584	0.296719	0.292776	0.489734	0.503736	0.482173
Intangible Assets	0.005247	0.007739	0.00215	0.003831	0.002831	0.015327	0.012819
	0.00388	0.002645	0.002318	0.003783	0.008797	0.009719	0.021162
Profit before Tax	0.134628	-0.19052	0.082568	0.061891	0.026025	0.064646	0.042231
	0.119954	0.119552	0.103047	0.088781	0.097537	0.096794	0.108211
Retained Earnings	0.197073	0.006747	0.129699	0.139774	0.127466	0.095482	0.241975
	0.043817	0.042276	0.03316	0.007415	0.003164	0.003233	-0.00624
Tangible Assets	0.71528	0.086539	0.219172	0.488134	0.481231	0.527669	0.464805
	0.213992	0.220034	0.22631	0.232147	0.315421	0.331614	0.392461

Table 2 Estimation Results Trade Creditors

	Hungary	Poland	Hungary	Poland
Dependent	Estimate	Estimate	Estimate	Estimate
Variable TC	Error	Error	Error	Error
YEAR	0.002838	0.000745***	-0.006932*	0.000523
	0.00269389	0.00027677	0.00416497	0.00035541
Size	0.005831*	-0.009735	0.005734*	-0.014277**
	0.00331284	0.00622126	0.00346343	0.00666560
MBR	-0.000218	-0.000027423	-0.000266	0.000011912
	0.00059488	0.00008329	0.00061604	0.00007617
TANGIBILITY	0.016496*	-0.012109	0.007753	-0.037347
	0.00997361	0.02562730	0.01175219	0.02829312
Bank Loans	0.331485**	0.498841***	0.268236***	0.376597***
	0.06862416	0.14192590	0.07923716	0.13291343
Retained Earnings	-0.110166**	-0.020424	-0.000232	0.006784
	0.02858819	0.04889798	0.01090983	0.01161998
AGE	-0.000813*	0.000132		
	0.00048115	0.00080453		
AG2	0.000012748**	-0.000001780		
	0.00000337	0.00000515		
IPO			-0.000007016	0.000006717
			0.00000564	0.00003663
IPO22			0.002197***	0.002985***
			0.00066472	0.00076615
R^2	0.4640	0.2755	0.3621	0.3936
Adj R^2	0.4307	0.2039	0.3225	0.3337

Table 3 Estimation Results Net trade credits

	Hungary	Poland	Hungary	Poland
Dependent	Estimate	Estimate	Estimate	Estimate
Variable NTC	Error	Error	Error	Error
YEAR	0.001470***	0.002290***	-0.012576***	-0.007662*
	0.00022841	0.00040016	0.00386982	0.00389961
Size	-0.011005*	-0.002587	0.001609	0.004486
	0.00649043	0.00678369	0.00497233	0.00436510
MBR	-0.00003985	0.000002494	0.000236	0.000675
	0.00008173	0.00007842	0.00086389	0.00077720
TANGIBILITY	0.093005***	0.154071***	0.065622***	0.10502***
	0.01340263	0.03013291	0.01590177	0.01285742
Bank Loans	0.241513*	0.353714**	0.550598***	0.396210***
	0.14001631	0.14069896	0.11031910	0.10186704
Retained Earnings	-0.049431***	-0.069406***	-0.077790	-0.051585**
	0.00774447	0.01170612	0.04945900	0.0116741
AGE	0.001437*		-0.001330*	
	0.00075238		0.00072415	
AG2	-0.00000976**		0.0000169***	
	0.00000484		0.00000504	
IPO		-0.000142**		-0.000033***
		0.00005392		0.0000066
IPO22		0.000855		0.001423*
		0.00078965		0.00077315
R^2	0.4392	0.4873	0.4022	0.5406
Adj R^2	0.3831	0.4631	0.3651	0.5121

Appendix 2 Description of firms

Table 4 Description of Polish Firms

Name	Activities	Estd	IPO	SHAREHOLDINGS 31-12-95 (voting rights)
Agros-Holdings	Holding	1966	1994	
Korporacia Gospodarcza "Efekt" SA	Real estate consulting, food retailing	1990	1993	
Elektrim	Power Equipment, Electrical Machinery, TelecomEquipment	1945	1992	
Exbud	Construction building material	1977	1991	Robert Fleming & Co, 7.5%, Witold Zaraska, 6.3%, Pioneer First Mutual 5.7%, Barings Securities 5.4%, Creditanstalt Wien 5.2%
Huta Szkla	Glassware (luxury)	1924	1992	CEI Minex, 18% Pioneer 10%
Krosno S,A,	Glassware (luxury)	1923	1991	
Mostostal Export	Wholesale building, materials and household goods	1981	1991	
Mostostal Warszawa	civil engineering	1945	1993	Elektrim SA 37.3%, International Emerging Markets Fund 9.1%, Creditanstalt Bankverein Wien 6.5%
Okocimskie Zaklady	Brewery	1845	1991	State Treasury, 20%, Brau und Brunnen 25%
Polifarb Cieszyn	Paints, Plastic	1945	1993	Big SA 8.61%, Pioneer 5.60%, Templeton, 5.85%, Creditanstalt 10.37%.
Prochnik	Outerwear	1945	1990*	Zaktad Ubezpieczen 25.39%; , Pioneer over 10%
Przedsiebiorstwo Farmaneutyczne	Pharmaceuticals	1945	1994	State Treasury, 60.1%.
Rafako Boiler	Energy transmission	1949	1994	Rafako spolka 50%
Rolimpex	wholesale food	1951	1993	State Treasury 49.5%, Rolimpex-Pracownicy 15%, Rolimpex-Towarzystwo 10%.
Slaska Fabryka Kabli	Manufacturing of copper products	1928	1991	NKT Cables AS 25%, Investment Fund for Central and Eastern Europe 25%
Sokolowskie Zaklady Miesne	Meat Processing	1990	1993	
Swarzedz	Furniture	1945	1991	State Treasury, 6.14%, TUiR Warta, 11.4%, Paged/Westphalen/Warsaw/Hamburg 7.88%, Smith New Court Investment 6.21%
Tonsil	Electronic Consumer Goods		1990*	State Treasury 47.2%, Polski Bank Rozwoju 17.8%
Universal	Wholesale	1945	1992	State Treasury 17.52%, Servepart Ltd 6.62%
VISTULA S,A,	Outerwear	1945	1993	
Wedel S,A,	Snacks/Chocolate	1851	1991	PepsiCo Inc 40%
Wolczanka	Outerwear	1945	1990*	
Zywiec-Zaklady Piwowarskiew	Beverages	1856	1991	Heineken 24.9%; Bank Handlowo-Kredytowy 6.9% East Europe Development Fund 6.27%

Table 5 Description of Hungarian Firms

Name	Activities	Est	IPO	SHAREHOLDINGS 31-12-95 (voting rights)
Agrimpex Reszvenytarsasag	Wholesale distribution of agricultural raw materials, live animals, textile	1948	1991	Investor Rt, 56.13%, Peter Cremer and Partners London 25.8%
Aranypok Kereskedelmi Reszvenytarsasag	Retail distribution of clothing, footwear and leather goods	1950	1994	
Balaton Fuszert Trading Reszvenytarsasag	Retailing and Wholesale distribution of household goods, hardware and ironmongery, food, drink and tobacco		1994	Hungarian State Property Agency 55.37%, Local Authorities 14.58%, Hungarian individuals, 17.74%; Employees, 12.31%.
Bonbon Hemingway Reszvenytarsasag	Retail distribution of footwear and leather goods of clothing Food retailing	1954	1991	Hemingway Holding AG, 50.1%; Osterreichische Kontrollbank, 34.6%.
Csemege Julius Meinl RT	Food retailing, Owning and dealing in real estate	1952	1993	Julius Meinl International AG, 94.91%;
Csopak Reszvenytarsasag	Perfumes, cosmetics and toilet preparations, Grain milling,Catering contractors, Activities auxiliary to banking and finance real estate	1991	1994	Magyar Befektetesi es Fejlesztesi Bank Rt, 15%; Other, 78%
Danubius Hotel and Spa RT	Installation of fixtures and fittings Wholesale distribution of food, drink and tobacco, Licensed premises, Travel agents	1972	1992	
Domus Trading Reszvenytarsasag	Wholesale and Retail distribution of household goods, hardware and ironmongery, books, stationery and office supplies	1982	1993	Fotex, 51.1%; State Property Agency, 12.8%; Domestic retail investors, 18.5%; Local councils, 7.8%; Domestic institutions, 9.8%
Dunaholding Reszvenytarsasag	Activities auxiliary to banking and finance, business, real estate	1989	1991	Tarkus Kft, 19.8%; Fundamentum Rt, 11.9%; Gordiusholding Rt, 11.9%; Tranzinvest Rt, 24.3%; Korall Kft, 12%; Eptek Rt, 10.3%.
Fonix Holding Reszvenytarsasag	Retail distribution of clothing	1965	1992 (1996)	Foreign (including Osterreichische Kontrollbank AG), 54.2%; Hungarian Local Councils, 23.4%.
Fotex Reszvenytarsasag	Glassware, Spectacles and unmounted lenses, Photographic and cinematographic processing laboratories Wholesale and retail distribution of household goods, hardware and ironmongery, pharmaceutical, medical and other chemists' goods, Dispensing and other chemists	1984	1990	Blackburn International Inc (Panama) 37%.
GarAgent Reszvenytarsasag	Wholesale distribution of machinery, industrial equipment and transport equipment other than motor vehicles, Other specialised retail distribution (non-food)	1988	1991	Deutscher Auslandskassenverein (Germany), 41.3%; Balaton Ungarn Beteiligungen AG (Germany), 14.3%; Erte 18 Kft, 14.1%; D.B.B.H. Deutschland, 8.2%; Elso Magyarorszagi Nemet Ertekpapirkereskedelm Kft, 11.3%
Global Reszvenytarsasag	Food retailing	1989	1994	Chesnut Overseas Finance Ltd (member of the Tesco group) 72.14%; Hungarian Investment Co Ltd 5.22%; Osterreichische Kontrolbank 8.71%.
Globus Canning Industry Reszvenytarsasag	Other processed and preserved meats, Pickling and preserving in salt or oil, Broths, soups, sauces and other relishes, Fruit and vegetable juices	1924	1993	International portfolio investors, 61%; Domestic retail investors, 16.5%; Employees, 12.5%; Management, 10%.
Goldsun Reszvenytarsasag	Freezing of fruit and vegetables, all other foods, not elsewhere specified ,Storage and warehousing	1974	1994	Shamrock (35.9%); Sunfrost (35.9%).
Graboplast Reszvenytarsasag	Leather goods, footwear, Wall coverings, Ancillary printing services	1905	1994	Foreign investors, 48%; Management and employees, 30.5%; Domestic investors, 10%; Others, 11.5%

Hungagent Reszvenytarsasag	Wholesale distribution of machinery, industrial equipment and transport	1968	1991	Foreign (87.6%), Domestic (12.4%)
IBUSZ Reszvenytarsasag	Travel agents, Activities auxiliary to banking and finance, Self-drive car hire	1902	1990	Foreign Investors, 48.8%; Hungarian Investors, 51.2%.
Kontrax Office Automation Reszvenytarsasag	Wholesale distribution of machinery, industrial equipment and transport, Retail distribution of books, stationery and office supplies	1987	1991	Kontrax Trade Ltd, 58.5%; Arthur Andersen Co (trustee of shares), 30%; Banks, 7.6%; Other, 11.5%
Kontrax Telekom Reszvenytarsasag	Telecommunications	1987	1991	Kontrax Telecom, 19%; Arthur Andersen Co (trustee of shares), 30%; Kontrax Irodatechn, 26.4%; Others 11.5%.
Konzum Reszvenytarsasag	Metal cans and boxes, Wooden domestic furniture, Mixed retail businesses	1972	1990	FORLEV Ltd (30.4%); Osterreichische Kontrolbank (13.9%); Central European Growth Fund (9.5%); Deutscher Auslandkassenverein (9.4%); Smith New Court Investment Ltd (6.9%); Merill Lynch International (6.6%); Other Foreign Investors (15.1%); Hungarian Investors (6.6%)
Martfui Brewery Reszvenytarsasag	Beer and other brewing products and softdrinks	1981	1990 (1997)	Osterreichische Brau AG, 73,24%; Osterreichische Kontrollbank AG, 19.59%.
Mezogazdasagi Uzemszervezesi Szamitastechnikai es Informatikai	Wholesale distribution of agricultural raw materials, live animals, textile food, drink and tobacco, Miscellaneous business services	1969	1990	Agricultural Companies, 47.2%; Foreign Investors (OKB, Erste Osterreichische Sparkasse Bank, IMI London, Royal GmbH Vienna, CMA Stockholm), 33.7%; Hungarian Institutions, 12.9%; Others, 6.2%
Nitroil Reszvenytarsasag	Miscellaneous chemical products for industrial use, R&D	1989	1991	
Novotrade Reszvenytarsasag	Publishers not elsewhere specified, Wholesale and retail distribution including general wholesalers, Computer services	1983	1991	Novomann Ltd 5%; Georgetown-Lauder Company 16%; AKV 46%; Other 29%
Pannonflax Reszvenytarsasag	Spinning of cotton and silk and spinning of man-made staple fibre, Wholesale distribution of textiles, clothing, footwear and leather goods cotton system	1988	1991	MAGICTRADE Co Ltd, 49.65%; Osterreichische Kontrollbank AG, 17.9%; Banko Exterior, 9.38%.
Pannonplast Muanyagipari Reszvenytarsasag	Plastics semi-manufactures and plastic, floor coverings building products packaging products	1922	1994	
Pick Szeged RT	Arable farming and livestock productions, slaughterhouses, wholesale distribution of food, drink and tobacco	1869	1992	State Property Agency (SPA), 3.4% (incl. one preference share); Financial Investors, 89.4%; Hungarian Institutions, 3.3%; Employees, 3.9%.
Primagaz Hungaria Reszvenytarsasag	Wholesale distribution of fuels, ores, metals and industrial materials	1991	1993	Pam Gas BV, 64.7%; Other investors 35.3%
Skala-Coop Reszvenytarsasag	Electronic consumer goods, Beer and other brewing products, Retail distribution of clothing, Mixed retail businesses	1976	1994	Tengelmann Group, 53.8%.
Soproni Sorgyar	Beer and other brewing products, Wholesale distribution of food, drink and tobacco,	1991	1994	Brau Union AG, 53.2%; Other foreign investors, 11.2%; Domestic investors, 33.7%
Styl Garment Factory Reszvenytarsasag	Outerwear,shirts, underwear and nightwear	1952	1991	Baumler GmbH 66%; OKB 6.7%; Creditanstalt 10.1%; Deutscher Ausland Kass. 10.4%.
Sztrada-Skala Reszvenytarsasag	Retail distribution of motor vehicles and parts, mixed retail businesses	1983	1991	Skala-Coop RT, 76.2%; Hungarian Investors 22.2%.
Zalakeramia Reszvenytarsasag	Stone quarrying and mining, Extraction of clay, kaolin and marl, Structural clay products, Glazed earthenware	1950	1991	HICL, 31%.
Zwack Unicum RT.	Potable spirits, Wholesale distribution of food, drink and tobacco	1840	1993	Peter Zwack & Consorten HAG, 50% + 1 share; International Distillers & Vintners, 26%.

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Trade Credits in Industrialized Countries

A comparative study of twelve countries

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Abstract

In this paper I investigate the use of trade credits in the US, Canada and 10 European countries along the lines of Petersen and Rajan (1996) and Deloof and Jegers (1999) and Hammes (2000). Using panel data a total of 2081 firms is used in the regressions covering a time period from 1990 to1997. The use of trade credits is subject to large variations between the twelve countries ranging on average from 1% for US firms to 15.2% of total assets for Belgian firms. Bank loans are on average negative correlated to the use of trade credits as well as tangibility as a measure of collateral. Reputation as measured by age is also found to play a significant role. My findings are mostly consistent with the above.

Keywords: Trade Credits, Bank Loans, Industrialized Countries, Panel Data

JEL Classifications: G32, G30, C23

1 Introduction

Trade credits[1] appear to be an important source of external finance according to most studies performed. Nevertheless little research has been pursued in this area compared to other areas in corporate finance like capital structure or investment. This changed with some recent papers by Deloof and Jegers (1999) Deloof and Jegers (1996) and most important, Petersen and Rajan (1996) performing an extensive study of American firms, both on the supply as well as on the demand side. Mosts recently Fisman and Love (2001) relate trade credit, financial intermediary development and industry growth.

In Hammes (2000) we investigated the use of trade credits in Poland and Hungary. In these countries even the largest companies use large amounts of trade debt supposedly as a source of finance, as simultaneous increase of bank debt and trade debt indicate. In this paper we extend the analysis to industrialized countries. We employ a sample of firms from the USA, Canada and ten European countries resulting in a total sample size of 2081 firms. In the next chapter a short theoretical background on the use of trade debt will be provided excluding macroeconomic oriented models like Meltzer (1960) or Herbst (1974) who find that macroeconomic factors are less important for trade credits than firm and industry-specific factors. Chapter 3 will present the data used and the model estimated followed by chapter four where I present some sample statistics and regression results.

2 Trade Credits[2]

Trade credit is clearly of economic significance. In the United States vendor financing accounted for an average $1.5 trillion of the book value of all assets of US corporations during the 90s.[3] Trade credit usually is interest free for a certain time after delivery, but often suppliers offer a discount for early payment. Lets us assume there is a discount of 3% for payment within 10 days and otherwise payment has to happen 30 days after delivery. The interest rate in the case of not paying within 10 days would be 55,67%.[4] Thus trade credit can be a very expensive source of finance.

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[1] Throughout the paper I will refer to trade credit as the credits extended by suppliers to the firms in any sample.
[2] See Petersen and Rajan (1996) and Crawford (1992) for surveys of the literature.
[3] See Ng, Smith and Smith (1999).
[4] Example taken from Drukarczyk (1991) p.334.

Three major motives can be identified in connection with the use of trade credit, the financial motive, the transaction motive, and the price motive, represented by Schwartz (1974), Ferris (1981) and Schwartz and Whitcomb (1978) respectively. A fourth more general aspect is provided by the pecking order theory, which is not specific to trade credit but to the choice of the of financing by a company.

2.1 Financing advantage of trade credits (Schwartz (1974))

This theory explains the provision of trade credits with three possible advantages of the trade creditor compared to outside creditors as suppliers of trade credit are in a sense insiders since they are familiar with the industry and the customer, while banks or other financial intermediaries do not have this type of knowledge

One advantage might be that trade creditors are better at investigating the creditworthiness of the clients due to excellent knowledge of the industry. The supplier of trade credit is superior to a financial institution in information acquisition or the supplier can obtain information faster and cheaper since it occurs from normal business.[5] In Smith (1987) "trade credit is viewed as a contractual device for dealing with informational asymmetries in intermediate goods markets". The buyer's actions reveal direct information about his financial status to the seller. One example is whether a buyer takes advantage of early paying discounts or not. A buyer using an early payment discount can be assumed to satisfy his financing needs from other low interest sources. If he pays late the buyer has implicitly borrowed at a higher rate (see example above) and therefore third party financing was probably not available. An empirical consequence in a cross section of firms of this would be a negative relation between third-party finance such as bank loans and trade credits.

A second cost advantage is given if the seller is better at monitoring or enforcing repayment. If the article provided by the creditor is relatively unique he can always threaten to stop delivery in case of clients' misbehavior. In that way the supplier has an advantage in enforcing payment and controlling the buyer. The credibility of this threat is directly related to the relative importance of the buyer. If the buyer only stands for a small amount of the supplier's sales it is more credible than in the case of a large buyer. A financial institution has a more limited available set of actions.

The third and last major advantage is the higher ability of the trade creditor to salvaging value in the case of bankruptcy. Banks seize firm's assets to pay off loans as well as the seller. The seller might have a widespread network within an industry, and therefore his costs of repossessing and resale might be lower. The advantage will vary across sectors and across goods. The advantage of the seller over financial institution decreases the more the good is transformed by the buyer.[6]

Against that story speaks the fact that trade credits are only short-term and that the interest rate is much higher than an ordinary bank loan. On the other hand repaying one credit and using the extended credit from the next delivery might revolve trade credits. In that way trade credit can be transformed into a cheap medium or long-run credit. The model proposed by Biais and Gollier (1997) implies complementarity between trade credits and bank loans; trade credit should be used to a larger extent in industrialized countries with large and efficient financial systems than in other countries.

2.2 Trade credit as means of price discrimination

Schwartz and Whitcomb (1978) argue that trade credits are used when explicit price discrimination is not allowed due to legal restrictions. They suggest that, if firms with higher cost of capital have higher demand elasticity, it is profitable to charge them a lower price. Trade credit is a way to achieve this lower price in the presence of legal restrictions.

The model by Brennan, et al. (1988) relies primarily on a lack of competition in product markets combined with adverse selection. Hence price discrimination becomes possible and lucrative. In the first step they show how a monopolist uses credit terms to price discriminate between cash and credit customers by setting credit terms that are attractive to the latter but not the former. The only thing needed is a difference in the reservation price between the two groups. In the second step they show how adverse selection in credit market is sufficient for price discrimination and so for vendor financing to occur. Last they relax the assumption of a monopolistic supplier in favor of oligopolistic supply.

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[5] See for example Smith (1987).
[6] See Petersen and Rajan (1996).

The supplier can use credit either as a way to subsidize its supply or it could be used for clients that would otherwise not receive credit from a bank. Trade credit effectively reduces the price to low quality borrowers, since terms are normally independent of buyers' quality as opposed to bank debt. The latter's interest rate normally reflects all the risk characteristics of the buyer. Risky buyers – as opposed to good risks – will prefer trade credit to other sources of financing. Thus trade credit is a way to reach customers that would otherwise not be able to buy a certain product. In the model by Brennan, et al. (1988) the profit with extension of trade credits dominates profits without extension.

2.3 Transaction cost theories (Ferris (1981))

Trade credit is a way of separating delivery schedules from payment cycles. If there is strong seasonality in the demand for a firm's products the firm is forced to hold large inventories in order to smooth production, thus incurring costs of warehousing and the costs of producing the inventories while positive cash flows are delayed. By offering trade credits the producer might induce customers to buy earlier or more continuously, maybe because they are better at managing inventory positions.

From the presentation of relevant theories we might consider the financing advantage of trade credits by Schwartz (1974) and the price discrimination hypothesis as especially relevant for emerging market economies. The superior expertise (as compared to banks) of the lender in the first case and the possibility to use trade credits as a strategic device to reach otherwise unreachable customers in the second theory are important determinants for the extension of trade credits.

Hypothesis 1: The expected relation between bank loans and trade credits is negative for financially non-constrained firms.

2.4 The Pecking Order Theory[7]

Under this theory, firms are supposed to have a preference over a financial pecking order, that is, firms prefer internal finance to external finance, safe debt to risky debt or convertibles to common stock. It restrains itself for two reasons: first, to avoid any material cost of financial distress; and second, to maintain financial slack in the form of reserve borrowing power. The key points are:

The cost of relying on external financing. There are administrative and underwriting cost associated with it. Asymmetric information creates the possibility of a different sort of cost: the possibility that the firm will choose not to issue, and will therefore pass up a positive-NPV project. This cost can be avoided if the firm can retain enough internally generated cash to cover its positive-NPV opportunities.

The advantages of debt over equity issues. It is better to issue debt than equity if the firm does seek external funds. The general rule is "issue safe securities before risky ones".

From the pecking order theory we can derive the following two hypotheses:

Hypothesis 2: The higher the self-financing ability of the firm, the lower the use of trade credits.

Hypothesis 3: The more developed the financial system and thereby the cheaper the access to various sources of external finance the lower use of trade credits.

Under this theory regression results should give us an idea of what the hierarchy between trade credits, bank loans and internal finance looks like.

Adding the insights provided by Diamond (1991) we might further conclude:

Hypothesis 4: The better a firm's reputation, the better and cheaper the availability of credits in general and trade credit in particular.

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[7] Donaldson (1961), Myers and Majluf (1984).

3 Description of Variables

In the first step I use the balance sheet liabilities position "trade creditors" as dependent variable in our model, which is explicitly provided by Extel. In so far I follow most of the existing literature like Deloof and Jegers (1999) and Petersen and Rajan (1996). In the second step I use the net position of trade debt and trade credit as dependent variable to check for the stability of the relations and to account for the "maturity-matching hypothesis", which states that firms try to match the maturity of assets and liabilities. The selection of variables is also intended to match those selected in Hammes (2000) for reasons of comparability.

3.1 Bank Loans

Bank loans are one of the most important financing devices in every economy. Petersen and Zingales (1996) find a negative relation between trade credits and the relationship with financial institutions for the United States. Deloof and Jegers (1999) find a negative relation between trade debt and short-term bank debt for Belgian firms.[8]

Unfortunately our sample does not allow us to distinguish between short term and long-term bank debt. Therefore we cannot decide if trade credits are a substitute or complement for long-term bank debt, short-term bank debt or both of them.

3.2 Tangibility

Tangibility is defined as the ratio of fixed assets to total assets. Thus tangibility, in our model, measures the proportion of long-term assets of a firm. These assets cans serve as a collateral for credits.

The Harris and Raviv model (Harris and Raviv (1990)) predicts that firm with higher liquidation value carry more debt. The intuition is that firms with more tangible assets are more likely to be in a mature and slow growth industry and thus stable, which leads to a higher leverage. In the presence of credit rationing high tangibility might facilitate the use of alternative sources of finance such as trade credits. Firms with more tangible assets serving as collateral should have a higher liquidation value and might therefore carry more debt

[8] Fisman and Love (2001)provide indirect evidence for the substitutability of bank loans and trade credits.

3.3 Market-to-book ratio

Market to book is the ratio of book value of assets minus book value of equity plus the market value equity divided by book value of assets. MBR is a proxy for a firm's growth opportunities. According to Petersen and Rajan (1994) firms could resort to larger amounts of trade debt not only when credit institutions limit their access to debt but also when they have better investment opportunities which can be proxied by Tobin's q or as in this case the market–to-book ratio. Furthermore, MBR can be seen as an indicator for the availability of external finance, high MBR simply gives firms a chance to issue new stocks and obtain a larger amount of risk capital from the stock exchange.

3.4 Measures of internal financing ability

The second important source of finance is internally generated finance. Retained earnings, retained profits, or several measures of profitability such as profit after/before tax, earnings before interest, tax and depreciation can be thought of. Among the profitability measures after tax profits might be suitable to measure internal financing ability since it measures the profits that can be retained and use for new investments. In my view the more appropriate measures are "retained earnings" or "retained profits".

A serious problem with retained earnings is the fact that not all retained earnings show up directly in the balance sheet; they can be hidden in various balance sheet positions like provisions, pensions etc.[9] Therefore I settle for the profit loss account position "retained profits" which gives the share of profits retained in each period and not an accumulated position as retained earnings. I expect retained profits to be negatively correlated with trade credits because firms will probably not resort to expensive trade credits if they have access to positive profits available for investments, payments etc. On the other hand, they might have so many lucrative investments available so that trade credits might be used to finance marginal projects.

[9] See Rajan and Zingales (1995) on the problems of comparing balance sheet data in an international context.

3.5 Size

The next variable I control for is firm size, which is typically included in this kind of studies f ex Meltzer (1960), for example finds a positive relation between firm size and trade credit. I use the logarithm of total turnover as a proxy for size of a firm as for example in Rajan and Zingales (1995). I expect a positive relation between size and trade credits since larger firms usually face a lower cost of capital and less information asymmetry since they are better monitored.

Another argument for this is the fact that the bankruptcy risk normally decreases with firm size since - at least in Europe - governments will support large firms facing the risk of bankruptcy to avoid the associated increase in unemployment.

A third argument for a positive coefficient on size is that there seems to be evidence for larger firms using their market power to exploit smaller firms buy delaying the payment of bills and/or taking the normal cash-discount on deliveries even though they do not pay immediately.

3.6 Age

For all countries I include the age of each company. The reasoning behind the use of age is that it can be a proxy for reputation in debt markets. Survival increases trust and thus facilitates debt financing.[10] Apart from the general reputation effect, older firms can knit closer ties - strengthening the relationship - to suppliers. Age can also be a proxy for growth opportunities; young firms have assumingly larger growth opportunities than old firms.
In order to take care of non-linearities I use firms' age as well as the square of it.

[10] See Diamond (1989), Diamond (1991).

4 The Data

The data stems from the Financial Times Database Extel and from its successor Discovery. It contains comprehensive information on over 12000 listed companies all over the world. Complete balance sheets, profit loss accounts and daily company news as well as share prices etc are provided. All chosen firms fall into EXTEL category "C" which stands for commercial, industrial and mining companies, which are comparable according to normal standard. Price data was given by FT Prices. Some missing data was completed using Lexis Nexis, containing updated Extel data.

Our panel contains firm level data from in general 1990 (1992) to 1996(1997), in total 2081 firms from twelve countries.

Table 1 Time period per Country

Country	Number of Firms	Time Period
Belgium	107	1990-1997
Canada	84	1990-1996
Denmark	93	1990-1996
France[11]	200	1990-1997
Germany	345	1990-1996
Italy	164	1990-1996
Ireland	63	1990-1997
Netherlands	152	1990-1997
Spain	124	1990-1997
Sweden	115	1990-1996
UK[12]	200	1990-1996
USA	438	1990-1996

[11] 200 alphabetically selected out of 653.

[12]. In order not to have UK firms dominate cross section results, the number of UK firms is limited to a random sample of 200 out of a total of more than 2000 British firms contained in Extel.

A definite problem is the fact that only listed firms and not all listed firms are to be found in the EXTEL database. With regard to trade credits a sample selection bias is introduced since listed firms are normally the largest ones in a country and might therefore not be representative of the whole economy. However, if we find that the firms in our sample actively use trade credits as a financing device results for the size variable will help to infertrade credit use for smaller firms act in the same manner might not be too farfetched.

One problem with the data provided by Extel/Discovery is the entry of firms into the dataset. Some old firms are included into the data later than others without a reasonable explanation. At least the exit of firms is not a problem; it is well documented in Extel and Discovery and only a few firms leave the sample. Fortunately almost all exits of firm are due to mergers and not due to bankruptcy. The latter might have distorted our results otherwise.

5 Empirical Analysis

5.1 Descriptive Statistics

As table 1 shows there a large differences in the distribution of our variables among the countries.[13]

Insert table 2

With regard to bank loans the US represent – not unexpectedly – the lower end with a share of 0.01 or 1% of total assets while the other extreme is marked by Belgium with an average of 0.152 or 15.2%. The other countries lie somewhere in between with Canada (0.048) and Sweden (0.0366) close to the US while the United Kingdom (0.1405) lies surprisingly close to Belgium. Germany, as a well-known example of a bank-oriented system, lies close to the top with 14.65%.

[13] The Irish statistics are somewhat distorted due to one firm responsible for extreme outliers. Therefore statistics for Ireland are presented with and without the outlier.

Trade creditors (ranging from 4% to 30%(!) of total assets) and debtors (ranging from 7.9% to 22.59% of total assets) have in all countries a significant share of the balance sheet. Again in both positions the USA mark the lower bound, a finding consistent with the picture of a large and well-developed capital market. Firms in the United States seem to have other, cheaper sources of finance at hand.

A surprising finding is the fact that the firms in my sample have negative retained profits in half of the countries in spite of the fact that they generate positive earnings before interest, tax and depreciation (EBITDAT). For Germany this could be partly which might be due to the phenomenon that firm's refrain from reducing dividend payments in bad years. With regard to profitability as measured by EBITDAT the Netherlands and the USA take the top position with about 14% while we find Swedish firms at the lower end with only a little bit more than three percent. In the other countries profitability is around 10% on average.

5.2 Model

The following models are estimated:

(1) $TC_{it}=\alpha+\beta_1 Tang_{it}+\beta_2 bl_{it}+\beta_3 \log(Size)_{it}+\beta_4 MBR_{it}+\beta_5 \log(1+age)_{it}+\beta_6 \log(age)^2_{it}$

where

TC=Amount borrowed from Trade creditors divided by total assets
Tang=Tangibility, tangible assets divided by total assets
S=logarithm of turnover in local currency
MBR=market-to-book ratio, market value of assset divided by the book value of Assets.
Age=years since foundation of firm
u_{it} = a random term, $u_{it}=\mu_i+\nu_{it,}$ where μ_i are firm specific effects and ν_{it} is a random effect.[14]

The model is then estimated by GLS, which is appropriate for unbalanced panels.[15]

[14] Mátyás and Sevestre (1992).
[15] Baltagi (1995).

In a second step I change the dependent variable to the net position of trade credits, trade debt, and cash holdings as proposed by Deloof and Jegers (1999) so the model becomes the following:

(2) $NTC_{it}=\alpha+\beta_1 Tang_{it}+\beta_2 bl_{it}+\beta_3 \log(Size)_{it}+\beta_4 MBR_{it}+\beta_5 \log(1+age)_{it}+\beta_6 \log(age)^2_{it}$

where

NTC=Trade Creditors -Trade Debtors - cash holdings divided by total assets
Tang=Tangibility, tangible assets divided by total assets
S=logarithm of turnover in local currency
MBR=market-to-book ratio, market value of assset divided by the book value of Assets.
Age=years since foundation of firm
u_{it} = a random term, $u_{it}=\mu_i+\nu_{it}$, where μ_i are firm specific effects and ν_{it} is a random effect.
In both cases the age variable is transformed as in Petersen and Rajan (1997).

6 Results

First I will present the results of the regression of model 1 with trade credits used as dependent variable and in the second step I will analyze the results for the net position of trade credits (model 2).[16] In the discussion I will rather focus on the signs of the variables than the size of the coefficient. The interest of this study is more to explore the relationships between the variables in general, with a focus on the relationships between bank loans and trade credits. However, big size differences in the variables are to be discussed too.

Insert table 3

[16] The Irish results include the extreme outliers, without them the results do not change much.

The most important finding consistent with the predictions, and with findings of Petersen and Rajan (1996) for the United States and Deloof and Jegers (1999) for Belgium is that the relation between bank loans and trade credits is either negative or insignificant. In Hammes (2000) the result for some transition economies indicated a positive relation. The results for net trade credits are the same.

Age, here assumed to cover reputational effects, is in all countries a very important factor for the availability of trade credit, and as is the square of age. The estimates for age are positive and significant for all countries except for Italy where it is negative but highly insignificant. The squared age is – as expected – negative and significant, again except for Italy. Thus the age effect is non-linear, first rising and then - as the quadratic part increases - decreasing.

The tangibility of assets is also an important variable the coefficient is negative for all countries except Belgium, indicating that firms with assets that can be used as collateral do not use expensive trade credits. Firms are likely to have access to other (cheaper) sources – bank loans or retained profits– of finance. The only exception is Belgium where the coefficient is positive and in size equivalent to the coefficients for the other countries. If collateral does not strengthen the position oflenders much in bankruptcy, tanigbility of assets may instead increase the willingness of suppliers to provide credits.

The findings for size vary from negative and insignificant (Belgium) to positive and significant (Italy), so no general conclusions can be drawn from these findings.

The findings for retained profits are very mixed from positive and significant for Belgium, positive and insignificant for Canada, negative and insignificant in Germany to negative and significant for Italy. So for Belgium, Denmark, Netherlands, and the US, retained profits and trade credits seem to be complements while they are substitutes in other countries Germany, Italy, Spain (mentioning only countries with statistically significant estimates). In the former countries firms might be credit constrained and they use every available source of finance, while in the other countries firms have sufficient access to internal finance and do not need to use trade credit.

In general the fit of the model is good for most of the countries except for Canada. Although not really meaningful in GLS-estimations because the R^2 is redefined, the R^2 for Canada is much lower than for all the other countries. A reason for this is not evident.

The results for net trade credits (model 2) are in general even stronger than the above presented findings for model 1.

Insert table 4

The coefficients for bank loans are now negative for 9 out of 12 countries except for Denmark (insignificant) and Italy (significant at the 10% level) and Ireland, confirming findings by Deloof and Jegers (1999) and Petersen and Rajan (1996). In these thre countries the coefficient switch from a negativ value for model 1 to positive coefficients for model 2 indicating that model 1 neglects the impact of cash holdings as well as the matching of trade debt and trade credit by companies. There is strong indication that in industrialized countries with well functioning financial systems trade credits and bank loans are substitutes.

The findings on size and MBR are again very mixed and in general the coefficients on both variables are very small. Retained profits are now mostly negative and significant, findings clearly in line with the predictions. The coefficient are quite large and negative for Italy, NL, Spain and Sweden, ranging from –0.2147 to –0.1274, showing that the use of trade debt by companies is related to the absence of other sources of finance. These findings are much stronger for model 2 on the net position of trade credit then for model, again supporting the adjustment, subtracting trade credit extended and cash holdings from trade debt or trade credit received. A little surprising is the finding of an inversion of the coefficients on age indicating first a declining and then increasing effect of firm age.

7 Conclusions

In all countries both the use of as well as the extension of trade credits is an important part of the balance sheets. However, differences between countries are huge as demonstrated by a comparison of the United States with 1% trade credits and Belgium with 15.2% trade credits as percentage of total assets.

In general bank loans and trade credits are found to be substitutes for each other as would be expected in countries with well-developed banking systems. The use of trade credits and it's relation to the use of bank loans and other sources of external finance according to results in this study and in Hammes (2000) may indicate the quality of a country's financial system and capital markets. An important factor is reputation as measured by firm age. In almost all countries there is a positive relation between age and trade credits, a finding that is in line with most of the literature.

Descriptive Statistics and Regression Results

Table 2 Descriptive Statistics (mean, Standard deviation, minimum, maximum**)**

	Belgium	Canada	Denmark	France	Germany	Ireland	Ireland	Italy	NL	Spain	Sweden	Uk	US
Observations	406	421	432	699	851	240	237	678	716	718	384	740	2074
AGE	**68.0172**	**48.5914**	**66.3565**	**61.4206**	**92.2056**	**30.5458**	**30.8270**	**60.5310**	**66.6578**	**49.7869**	**62.0703**	**37.0311**	**47.3983**
	36.8254	28.6525	39.2233	51.3561	48.2509	25.0929	25.1234	34.0603	60.0536	26.1806	47.1354	32.2815	31.6251
	5.0000	2.0000	2.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	2.0000	1.0000	0.0000	0.0000
	220.0000	116.0000	204.0000	321.0000	292.0000	102.0000	102.0000	151.0000	344.0000	115.0000	359.0000	113.0000	153.0000
BL	**0.1520**	**0.0480**	**0.0599**	**0.0782**	**0.1465**	**0.1389**	**0.1406**	**0.1071**	**0.1042**	**0.1223**	**0.0366**	**0.1405**	**0.0107**
	0.1559	0.0984	0.0966	0.1033	0.1802	0.1565	0.1567	0.1386	0.1253	0.1327	0.0743	0.3836	0.0416
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.7502	0.6686	0.5625	0.7084	0.8861	0.9804	0.9804	0.9458	0.6108	0.7244	0.4823	7.5112	0.9115
CASH	**0.0311**	**0.0715**	**0.0919**	**0.0429**	**0.0453**	**0.1013**	**0.1026**	**0.0527**	**0.0550**	**0.0156**	**0.0620**	**0.0932**	**0.0486**
	0.0375	0.0962	0.0830	0.0466	0.0711	0.1208	0.1211	0.0639	0.0967	0.0252	0.0584	0.1184	0.0680
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0006	0.0000	0.0000
	0.4747	0.7313	0.5952	0.5356	0.5156	0.8493	0.8493	0.4168	0.8429	0.3160	0.4163	0.8278	0.6252
EBITDA	**0.0930**	**0.1093**	**0.0999**	**0.1048**	**0.1013**	**-3.6980**	**0.0442**	**0.1106**	**0.1425**	**0.1001**	**0.0231**	**0.1138**	**0.1428**
	0.1107	0.1396	0.3123	0.1049	0.1399	57.9686	0.1383	0.2421	0.0905	0.0928	0.0719	0.2571	0.0843
	-0.9120	-1.4678	-6.2170	-0.3697	-0.6226	-898.0000	-0.8100	-1.0324	-0.3675	-0.4721	-0.5229	-2.1888	-0.4636
	0.3929	0.9780	0.6162	0.9730	0.9320	0.2867	0.2867	2.5464	0.6062	0.9138	0.3456	4.5837	0.6755
LAGE	**4.0301**	**3.6545**	**3.9870**	**3.7802**	**4.3454**	**3.0922**	**3.1039**	**3.9008**	**3.7386**	**3.7685**	**3.7978**	**3.1449**	**3.5736**
	0.7265	0.8092	0.7697	0.9563	0.7218	0.9104	0.9090	0.7576	1.1036	0.6089	0.9628	1.1160	0.8804
	1.7918	1.0986	1.0986	0.0000	0.6931	0.6931	0.6931	0.0000	0.0000	1.0986	0.6931	0.0000	0.0000
	5.3982	4.7622	5.3230	5.7746	5.6802	4.6347	4.6347	5.0239	5.8435	4.7536	5.8861	4.7362	5.0370
LAGE2	**16.7686**	**14.0084**	**16.5039**	**15.2029**	**19.4030**	**10.3869**	**10.4572**	**15.7896**	**15.1933**	**14.5720**	**15.3476**	**11.1341**	13.5457
	5.3394	5.3183	5.3871	6.4495	5.5013	5.4460	5.4412	5.2880	7.6284	4.3293	6.5321	6.5662	5.7958
	3.2104	1.2069	1.2069	0.0000	0.4805	0.4805	0.4805	0.0000	0.0000	1.2069	0.4805	0.0000	0.0000
	29.1402	22.6783	28.3344	33.3454	32.2644	21.4807	21.4807	25.2394	34.1470	22.5966	34.6462	22.4316	25.3709
MBR	**64.0714**	**0.7747**	**2.5286**	**1.8205**	**0.8397**	**9.6152**	**2.5527**	**0.4425**	**26.7575**	**0.6276**	**1.1544**	**1.6708**	**1.4148**
	251.5844	0.7722	9.0090	11.6110	2.5794	106.6507	11.8799	0.4415	290.7331	0.5513	5.1899	5.5984	4.1036
	0.0000	0.0013	0.0196	0.0458	0.0005	0.0359	0.0359	0.0102	0.0014	0.0004	0.0026	0.0079	0.0002
	2136.5850	8.2973	102.3762	158.6076	32.0644	1644.0232	130.8349	3.8422	4483.2848	6.1575	66.4777	129.3754	94.2320

Table 2 continued

	Belgium	Canada	Denmark	France	Germany	Ireland	Ireland	Italy	NL	Spain	Sweden	Uk	US
NTRC	**-0.0842**	**-0.1026**	**-0.1812**	**-0.1153**	**-0.1263**	**0.1040**	**-0.0975**	**-0.1083**	**-0.1435**	**-0.0858**	**-0.1469**	**-0.1476**	**-0.0695**
	0.1337	0.1323	0.1136	0.1606	0.1209	3.1092	0.1690	0.1288	0.1673	0.1389	0.0989	0.1652	0.1266
	-0.8190	-0.7444	-0.7295	-0.6015	-0.6291	-0.8650	-0.8650	-0.5606	-1.4802	-0.7071	-0.5887	-0.8417	-0.6932
	0.3834	0.3504	0.2459	0.4415	0.2873	48.0000	0.9343	0.4895	0.3206	0.6121	0.0429	0.3825	0.6965
RP	**-0.0008**	**0.0185**	**-0.0386**	**-0.1256**	**-0.0140**	**-3.8214**	**-0.0199**	**-0.0073**	**0.0216**	**0.0025**	**0.0277**	**0.0009**	**0.0142**
	0.0829	0.1335	1.2483	2.9735	0.0841	58.4155	0.1608	0.1013	0.0740	0.0786	0.0560	0.2304	0.0660
	-0.9240	-1.8042	-25.8902	-76.7268	-0.6140	-905.0000	-0.9428	-1.0939	-0.8010	-0.6577	-0.2215	-2.2890	-0.7121
	0.1441	0.7415	0.2529	0.4754	0.4955	0.1578	0.1578	0.4789	0.5637	0.8004	0.3033	3.7988	0.4306
S	**12.7047**	**7.1662**	**6.9032**	**14.1945**	**13.0361**	**10.3158**	**10.3838**	**13.1220**	**13.1889**	**10.5570**	**8.3964**	**11.0270**	**8.0711**
	2.4229	1.5830	1.5685	2.3949	1.9275	2.7003	2.6434	1.9462	2.0173	1.6266	1.4463	2.1705	1.3197
	4.5901	-2.0715	2.8007	5.3279	7.2903	0.6931	0.6931	3.6889	4.0604	2.8034	5.2734	0.0000	1.4670
	16.7557	10.2459	10.0564	19.2653	19.5325	14.9250	14.9250	19.5240	18.3651	14.9559	11.9568	16.1550	11.9704
TANG	**0.2708**	**0.5221**	**0.3496**	**0.2348**	**0.3437**	**0.3278**	**0.3320**	**0.3115**	**0.3641**	**0.4337**	**0.3856**	**0.3684**	**0.4179**
	0.1988	0.2395	0.1644	0.1539	0.1800	0.2789	0.2782	0.2015	0.2056	0.2385	0.2118	0.2238	0.2245
	0.0000	0.0000	0.0000	0.0000	0.0085	0.0000	0.0000	0.0001	0.0000	0.0000	0.0005	0.0030	0.0000
	0.8403	0.9892	0.9084	0.7617	0.9612	0.9514	0.9514	0.9335	0.9490	0.9926	0.9306	0.9671	0.9720
TRC	**0.1019**	**0.0440**	**0.0881**	**0.1534**	**0.0822**	**0.3077**	**0.1024**	**0.1433**	**0.1257**	**0.1253**	**0.0848**	**0.1588**	**0.0581**
	0.0875	0.0690	0.0572	0.1046	0.0580	3.1902	0.1005	0.0892	0.0947	0.1200	0.0574	0.1569	0.0611
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.4313	0.4270	0.3561	0.4986	0.3818	49.5000	0.9343	0.5601	0.7065	0.7084	0.3836	0.9190	0.8451
TRD	**0.1549**	**0.0750**	**0.1775**	**0.2259**	**0.1608**	**0.1024**	**0.0973**	**0.1989**	**0.2142**	**0.1955**	**0.1698**	**0.2132**	**0.0791**
	0.1456	0.0843	0.0973	0.1351	0.1153	0.1353	0.1008	0.1235	0.1463	0.1555	0.0966	0.1614	0.0953
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.8332	0.4498	0.5768	0.6373	0.6302	1.5000	0.4031	0.6127	0.7535	0.7350	0.5408	0.8425	0.6915

RP=Retained Profits, TRD=Trade Debtors, TRC=Trade Creditors, NTRC=net trade credit=TRC-TRD-Cash, S=Size (log(turnover in local currency)), Tangib=Tangibility, EBITDAT=Earnings before interest, taxes, depreciations, Age=Firm age, Lage=ln(1+Age) LAge2= LAge squared.

Table 3 Regression results for trade credits used as dependent variable (Estimate, Standard Error)

	Belgium	Canada	Denmark	France	Germany	Ireland	Italy	NL	Spain	Sweden	Uk	US
INT	**-0.002605**	**0.002429**	**-0.002950**	**-0.017517*****	**-0.032644*****	**0.013148**	**0.000405**	**-0.048102*****	**-0.037414***	**-0.000846**	**-0.005809**	**-0.020748*****
	0.002714	0.015976	0.00210828	0.003789	0.006368	0.010046	0.013495	0.009846	0.019607	0.003043	0.00872031	0.002697
SIZE	**-0.000067**	**0.004670****	**0.001258*****	**0.003958*****	**0.006698*****	**-0.004491*****	**0.012543*****	**0.004334*****	**0.011201*****	**0.000163**	**0.000594**	**0.006225*****
	0.000053	0.001922	0.00043458	0.000557	0.000786	0.001137	0.001268	0.000758	0.001836	0.000646	0.000977	0.000575
MBR	**-0.000039**	**0.004380***	**0.000538***	**0.002625*****	**0.003977*****	**-0.003026*****	**0.012777*****	**-0.000018*****	**0.007143*****	**0.000178**	**-0.000731**	**0.003296*****
	0.000042	0.002466	0.000315	0.000386	0.00068	0.000903	0.001647	0.000006	0.002688	0.000404	0.000556	0.000349
TANG	**0.056380*****	**-0.054447*****	**-0.035983*****	**-0.015643**	**-0.043340*****	**0.203961*****	**-0.091295*****	**-0.046407*****	**-0.170529*****	**-0.066544*****	**-0.220386*****	**-0.031375*****
	0.018848	0.015248	0.010509	0.01906	0.008726	0.01779	0.011902	0.012927	0.013797	0.008576	0.016095	0.004538
BL	**-0.099237*****	**0.028183**	**-0.018913**	**-0.005133**	**-0.015069***	**-0.001097*****	**-0.045810*****	**-0.017707**	**0.004927**	**-0.015620**	**0.008823**	**0.018856**
	0.01599781	0.034916	0.018508	0.020689	0.008496	0.000320	0.015221	0.018130	0.019514	0.024427	0.011421	0.021299
RP	**0.062986*****	**0.016914**	**0.003698*****	**0.000416**	**-0.015601**	**0.007738**	**-0.075379*****	**0.105984*****	**-0.107200*****	**-0.001288**	**0.003223**	**0.020857***
	0.023567	0.022209	0.001062	0.00057160	0.01582117	0.011803	0.018804	0.02689	0.03039	0.023778	0.013183	0.012144
LAGE	**0.036961*****	**0.005861**	**0.045661*****	**0.052332*****	**0.028533*****	**-0.068185*****	**-0.009489**	**0.056659*****	**0.063066*****	**0.065295*****	**0.183132*****	**0.013626*****
	0.009434	0.015195	0.004885	0.00562398	0.00682133	0.011099	0.012879	0.00507	0.017758	0.004419	0.010893	0.003034
$LAGE^2$	**-0.002921**	**-0.000086**	**-0.005604*****	**-0.005867*****	**-0.004465*****	**0.008025*****	**0.002390**	**-0.006089*****	**-0.009741*****	**-0.009097*****	**-0.031636*****	**-0.001217****
	0.001961	0.002501	0.000966	0.001145	0.001084	0.001886	0.001942	0.000909	0.002604	0.000811	0.002129	0.000559
F Value	64.352	3.729	92.526	156.811	80.431	56.646	141.057	84.252	45.558	106.589	59.100	105.392
Prob>F	0.0001	0.0006	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
R2	0.5309	0.0595	0.6044	0.6137	0.4004	0.3101	0.5958	0.4544	0.3099	0.6649	0.3611	0.2631
Adj R2	0.5227	0.0435	0.5978	0.6098	0.3955	0.3047	0.5915	0.4491	0.3031	0.6587	0.3550	0.2606

INT=intecept, RP=Retained Profits, TRD=Trade Debtors, TRC=Trade Creditors, NTRC=net trade credit=TRC-TRD-Cash, S=Size (log(turnover in local currency)), Tangib=Tangibility, EBITDAT=Earnings before interest, taxes, depreciations, Age=Firm age, Lage=ln(1+Age) LAge2= LAge squared.

*** significant at the 1% level, ** significant at the 5% level, *significant at the 10% level

Table 4 Regression results for net trade credits (Trc-trd-cash) used as dependent variable (Estimate, Standard Error)

	Belgium	Canada	Denmark	France	Germany	Ireland	Italy	NL	Spain	Sweden	Uk	US
INT	**-0.001355**	**-0.070505*****	**0.003207**	**-0.058686*****	**0.013148**	**0.034849**	**-0.021893**	**-0.028921**	**-0.034232**	**-0.015368****	**-0.039924*****	**-0.047053*****
	0.008714	0.017585	0.00661139	0.01373927	0.010046	0.036638	0.022302	0.02212	0.022992	0.006262	0.010842	0.006248
SIZE	**0.000186****	**-0.001963**	**-0.003891*****	**0.002955*****	**-0.004491*****	**-0.005465***	**0.007609 *****	**0.000707**	**0.003314**	**0.000604**	**-0.002567****	**0.007242*****
	0.000088	0.003208	0.00125218	0.00101447	0.001137	0.003264	0.001676	0.001753	0.002283	0.000931	0.001218	0.001081
MBR	**0.000127*****	**-0.012375*****	**-0.001628****	**-0.000997*****	**-0.003026*****	**-0.000563**	**0.006091****	**0.0000386*****	**0.000099**	**-0.000777**	**-0.005663*****	**0.001036****
	0.000022	0.003609	0.00079564	0.00019852	0.000903	0.000768	0.002534	0.000014	0.003294	0.00052642	0.000703	0.000452
TANG	**0.135283*****	**0.165213*****	**0.120697*****	**0.153645*****	**0.203961*****	**-0.206273*****	**0.193966*****	**0.183022*****	**0.158093*****	**0.105109*****	**0.187649*****	**0.132767*****
	0.02556	0.024744	0.02781261	0.02813485	0.017789	0.037989	0.016219	0.024069	0.015035	0.014927	0.020497	0.009812
BL	**-0.151578*****	**-0.045662**	**0.038388**	**-0.212233*****	**-0.001097*****	**0.224360*****	**0.039444***	**-0.002716**	**-0.085099*****	**-0.033429**	**-0.019341**	**-0.012939**
	0.030536	0.047828	0.04855051	0.03288108	0.00032	0.063204	0.020258	0.037996	0.022924	0.04734	0.012535	0.040415
RP	**-0.071675**	**0.056779***	**0.021649*****	**-0.000178**	**0.007738**	**-0.054073*****	**-0.127486*****	**-0.214730*****	**-0.106405*****	**-0.173127*****	**-0.039217****	**-0.073571*****
	0.047102	0.030537	0.002934	0.00096794	0.011803	0.00139	0.0307	0.067948	0.036631	0.047555	0.016635	0.025969
LAGE	**-0.050819*****	**-0.053298****	**-0.110164*****	**-0.074910*****	**-0.068185*****	**-0.017925**	**0.144569*****	**-0.114702*****	**-0.083690*****	**-0.100215*****	**-0.084103*****	**-0.080408*****
	0.012257	0.024237	0.011596	0.00806685	0.011099	0.028293	0.019612	0.011366	0.020777	0.007528	0.013403	0.006654
LAGE2	**0.006187*****	**0.008109****	**0.014834*****	**0.011391*****	**0.008025*****	**0.003058**	**0.020163*****	**0.017213*****	**0.011796*****	**0.014665**	**0.012765**	**0.011950**
	0.002395	0.003957	0.002225	0.001551	0.001886	0.005792	0.00289	0.001991	0.003052	0.001343	0.002626	0.001254
										0.0001	0.0001	0.0001
F Value	15.865	15.255	65.201	44.007	56.646	18361.337	50.031	20.754	26.655	65.245	34.648	40.766
Prob>F	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
R2	0.2182	0.2054	0.5184	0.3083	0.3101	0.9982	0.3433	0.1703	0.2081	0.5485	0.2489	0.1214
Adj R2	0.2044	0.1920	0.5105	0.3013	0.3047	0.9981	0.3364	0.1621	0.2003	0.5401	0.2417	0.1184

INT=Intercept, RP=Retained Profits, TRD=Trade Debtors, TRC=Trade Creditors, NTRC=net trade credit=TRC-TRD-Cash, S=Size (log(turnover in local currency)), Tangib=Tangibility, EBITDA=Earnings before interest, taxes, depreciations, Age=Firm age, Lage=ln(1+Age) LAge2= LAge square

*** significant at the 1% level, ** significant at the 5% level, *significant at the 10% level

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Firm Performance, Debt, Bank Loans and Trade Credits

An empirical study

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Abstract

This paper examines the relation between capital structure and firm performance comparing a sample of Polish and Hungarian firms to a large sample of firms originating in Industrialized countries; a total of 2143 firms are included. Panel data analysis is used to investigate the relation between total debt and performance as well as between different sources of debt, namely bank loans and trade debt, and firms' performance measured by their profitability. A positive relation between debt and performance is expected, a significant and negative relation is found for most of the countries. However, the type of debt, bank loans or trade debt, is not of major importance, what matters is debt in general.

Keywords: Firm Performance, Debt, Bank Loans, Trade Debt, Panel Data

JEL Classifications: G332, G30, C32, C33

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1 Introduction

The impact of financial structure on firm performance has been an issue even before Modigliani and Miller (1958). Their first answer was that financial structure does not matter. Subsequently theories based on taxes, bankruptcy cost and, most recently, asymmetric information or signaling have been developed connecting firm performance and capital structure. However, most tests (see Short (1994) for a survey) have been on finding determinants of capitals structure instead of analyzing the effect of debt on performance as many of the theories predict a positive relation between debt and firm value or profitability.

Few studies analyze the effect of leverage on firm performance. Majumdar and Chibber (1999) analyze the effect of leverage on the performance of Indian firms and find that leverage has a negative impact, while Krishnan and Moyer (1987) connect capital structure and performance to the country of origin. Gleason, et al. (2000) link capital structure, national culture, and firm performance to each other and find a negative impact of leverage on firms' profitability. Hammes (1998) finds a negative relation between bank debt and profitability for a sample of Polish firms.

While the above mentioned articles analyze the effects of total debt, another strain of literature is concerned with the effect of bank loans as one special type of debt. The benefits of the borrower-bank relationship are for example modeled in Boot and Thakor (1994), Berglöf and von Thadden (1994), Chemmamur and Fulghieri (1994) and von Thadden (1995), while Rajan (1992) analyzes the possibility of a lock-in effect advantageous for banks and costly to companies.

After investigating the use of trade debt especially in relation to bank loans in Hammes (1998, Hammes (2000), the natural question to ask is the effect of different sources of financing on firms profitability. On the margin the costs of different sources should be equal and thus no sources should have an outstanding effect.
This paper is aimed at studying both the effect of debt in general as well as the effect of different types of debt, trade credits and bank loans on firms performance.

2 Theoretical Background

In this section I will give a brief survey of the relevant literature on capital structure as well as on bank loans and trade credit. The discussion of the literature on capital structure is necessary, since most of the models link firm's debt or equity choice directly to firms' performance in either profitability or value terms. Capital structure is in the end only a side effect of the firm's maximization problem. The presentation of theories does not claim to be complete, but is rather a small selection of the theories that provide a direct or indirect link between capital structure and performance.[2]There are different theories based on different assumptions in capital structure area. Those relevant to firms performance are presented in the following sub-chapters. The capital structure irrelevance proposition by Modigliani and Miller (1958) is a milestone from which several relevant theories have been developed by relaxing the assumptions (see for example Myers (1984)).

2.1 The "irrelevance" of capital structure theory

Modigliani and Miller (1958) demonstrated in their seminal paper "The cost of capital, corporation finance, and the theory of investment" that in the absence of bankruptcy cost and tax subsidies on the payment of interest, the value of firm is independent of its financial structure. A firm cannot increase its value by using debt as part of its capital structure. This argument was based on the premise that investors could assume personal debt to help finance the purchase of unlevered shares, if the value of the levered shares is greater than the unlevered ones. There is no reason for leverage to increase value in the presence of perfect arbitrage opportunity. Their theory was based on a framework which starts with the idealized assumption of perfect competition in factor and product markets. As a result, the cost of capital and therefore the firm value could not be affected by leverage or dividend changes. Following Modigliani-Miller the observation of a wide variety of capital structures can be interpreted as the result of neutral mutation.

Including tax subsidies on interest payments into their model Modigliani and Miller (1963) showed that borrowing would only cause the value of the firm to rise by the

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[2] See Harris and Raviv (1991) for a comprehensive but slightly outdated survey of the literature.

amount of the capitalized value of the tax shield. Relaxing these assumptions where there is imperfect competition, bankruptcy costs, asymmetric information, signaling effects and monopoly power it turns out leverage decisions are relevant for companies' value.

2.2 Models based on agency costs between owners and managers

Inefficiencies due to the separation of ownership and control between stockholders and managers are mitigated by giving managers a fraction of the firm; the larger the fraction given to the manager the larger the reduction of these inefficiencies. Increasing the amount of debt, keeping managers' investment constant, increases managers' share of equity and reduces the inefficiencies due to agency conflicts.

As Jensen (1986) points out, debt has to be paid back in cash; therefore the amount of free cash flow that could be diverted by the manager is reduced. The view that debt might serve to restrict managers from disposing of free cash flow for their own benefits is also the basis for models by Grossman and Hart (1982), Stulz (1990), Hart (1993), and Hart and Moore (1995). According to Harris and Raviv (1990), debt may even force managers to abandon inefficient operations reducing the probabilty of bankruptcy and increasong the value of a company.

In the agency theoretic approach free-cash flow is reduced and managers can divert less of the firm's productive capital. Assuming that manager's are stakeholders in their company, debt helps to align the interest of the managers with those of the shareholders. Given that fewer of the firm's means are diverted and instead used for productive purposes, the overall profitability of the firm should increase as well the value of the firm.

2.3 Asymmetric Information between outsiders and insiders

One of the most famous results here is the underinvestment proposition made by Myers and Majluf (1984). New shareholders might require severe underpricing of new shares so that even projects with a positive NPV are not carried out since the costs of new equity exceed the benefit of the project to the incumbent shareholders; underinvestment can be avoided by using debt instead of equity. If we assume that underinvestment is avoided or at least reduced by the use of debt, so no or fewer positive net present value projects are forgone, the market value of the firm as a function of its future discounted cash flows should increase.

Heinkel and Zechner (1990) and Narayanan (1988) both show in slightly different settings that in the case of informational asymmetry with respect to new projects, overinvestment can be the result. Negative NPV projects might be undertaken, thus reducing the value of the firm. New debt (Narayanan) or debt already in place (Heinkel and Zechner) reduces overinvestment and thus increases firm value. Narayanan (1988) shows that new debt issues are good news and are rewarded with an increase in share price.

Brennan and Kraus (1987) conclude that the underinvestment result might disappear as soon as the firm can use instruments different from straight debt or equity. Noe (1988) reaches a similar conclusion, noting however, that firms issuing debt are on average of higher quality than firms issuing equity.

Proposition 1: Debt alleviates both the underinvestment problem and the overinvestment problem and thus increases firm value.

2.4 Signaling with debt

The most important contribution in this area is Ross (1977). He shows that if managers know the true distribution of firm returns, while investors don't, investors take larger debt levels as a signal for higher quality. In Heinkel (1982) high quality firms issue more debt than low quality firms. A firm of one type trying to imitate the other type profits on the overpricing of one security but looses on the overpricing of the other, and the costs and benefits are balanced on the margin. Zwiebel (1996) shows in a dynamic setting that entrenched managers choose debt to credibly constrain their future empire building.

Proposition 2: Debt serves as a signal and constrains entrenched managers from diverting capital for non-productive means, increasing a company's future cash flows and thus its value.

An important caveat to all the above theories is that none of them explicitly considers different forms of debt. Implicit to all seems to be some notion of marketable debt, but they do not distinguish between different types of debt. Some of the papers discussed above link debt to the value of the firm others link debt to profist as defined by revenue minus costs. This difference has strong repercussions on the choice of the dependent variable, as we will see later on.

2.5 The static tradeoff hypotheses[3]

This hypothesis assumes that a firm's optimal debt ratio is determined by a tradeoff between the cost and benefits of borrowing, holding the firm's assets and investment plans constant. When facing a financing decision, firms make tradeoffs between the value of interest tax shields and cost of bankruptcy or financial distress. The costs of financial distress, agency costs of debt and equity as well as tax shields are balanced in such a way that the value of the firm is maximized. The one factor leading to reduced market value with incresing debt is probably bankruptcy costs. However, this should show up in market value not in profits.

2.6 Bank Loans[4]

2.6.1 Model based on monitoring and Information Cost

According to Fama (1985), the costs of producing information required for public debt financing are to high for small firms; therefore, they prefer bank loans with lower information costs because fewer lenders have to be informed. Small firms lower their information costs by borrowing from banks that can collect comprehensive information from their transaction accounts (Nakamura (1993)).

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[3] See Ross, Westerfield and Jaffe (2002) p 431. This hypothesis or approach is also found under the name "Static theory of capital structure" in standard corporate finance textbooks such as Ross, Westerfield and Jaffe (2002) p 931.

[4] The following exposition is largely based on Johnson (1997).

2.6.2 Models based on borrower's incentives

In Diamond (1991) firms borrow and repay bank loans and build up a reputation. Benefits are created by banks refusing to rollover short-term loans for unprofitable projects, this leads to an increase in firm value. In this theory of bank loan demand, reputation effects are important. Banks monitor managers to discourage unprofitable incentives (Hoshi, et al. (1993)). The benefits of the borrower-bank relationship are for example modeled in Boot and Thakor (1994), Berglöf and von Thadden (1994), Chemmamur and Fulghieri (1994) and von Thadden (1995).

However, bank monitoring can distort incentives. This can happen if the bank demands a share of surplus for continued short-term financing of profitable projects (Rajan (1992)). This "lock-in" story is supported by Greenbaum, et al. (1989), and Sharpe (1990). According to Rajan (1992) we have to evaluate the advantages of bank financing vs. the disadvantages of the firm being held hostage giving banks the possibility to extract higher interest rates. If this story were true, we should expect a negative impact of bank loans on firms' profitability, which is consistent with findings in Hammes (1998).

Mikkelson and Partch (1986), James (1987), Lummer and McConnell (1989), James and Wier (1990) as well as Best and Zhang (1993) are examples of studies in which positive abnormal returns on the borrowing firm's shares on announcements of new bank loans are found. Thus bank loans increase firm value. In a competitive environment banks should not be able to extract all advantages from the extension of loans, thus we can formulate the following hypothesis:

Proposition 3: The relation between bank loans and profitability as well as firm value is expected to be positive.

This should hold for all countries, however the relation might be weaker in transition economies where the banking system is less competitive than in industrialized countries. The relation will probably also be weaker in bank-oriented countries like Germany compared to market-oriented countries such as the USA or the UK In the former case following the arguments of Rajan (1992) a lock in effect appears more likely than in the latter, resulting in a weaker positive effect on profitability or even a decrease in profitability.

2.7 Trade Credits

Three major motives can be identified in connection with the use of trade credits, the transaction motive, the price motive, and the financial motive represented by Ferris (1981), (Schwartz (1974), Schwartz and Whitcomb (1978) respectively. However, all these theories are concerned with the extension of trade credit, none considers the borrower of trade credit.

2.7.1 Financing advantage of trade credits

Schwartz (1974) explains the provision of trade credits with three possible advantages to the provider of trade credit (trade creditor) as compared to outside lenders. One advantage might be that the trade creditor is better at investigating the creditworthiness of the client due to excellent knowledge of the industry. The supplier is superior to a financial institution in information acquisition or he can obtain information faster and cheaper since it occurs from normal business.[5]

In Smith (1987) trade credit is viewed as a contractual device for dealing with informational asymmetries in intermediate goods markets. The buyer's actions reveal direct information about his financial status to the seller. One example is whether a buyer takes advantage of early paying discounts or not. A buyer using an early payment discount can be assumed to satisfy his financing needs from other low interest sources. If he pays late the buyer has implicitly borrowed at a higher rate and therefore third party financing was probably not available. An empirical consequence of this would be a negative relation between third-party finance, such as bank loans and trade credits.

A second cost advantage is given if the seller is better at monitoring or enforcing repayment. If the good provided by the creditor is relatively unique he can always threaten to stop delivery in case of clients' misbehavior. In this way the supplier has an advantage in controlling the buyer. The credibility of his threat is directly related to the relative importance of the buyer. If the buyer only stands for a small amount of the supplier's sales it is more credible than in the case of a large buyer.

The third and last major advantage is the higher ability of the trade creditor to salvage value in the case of bankruptcy. Banks seize firms' assets to pay of loans as well as the seller. The seller might have a widespread network within an industry, and therefore his costs of repossessing and resale might be lower. The advantage will vary across sections and across goods. The advantage of the seller over financial institution increases with the transformation of the good by the buyer.[6] If the good remains unchanged there is no advantage for the seller.

Against that story speaks the fact that trade credits are only short-term and that the interest rate is much higher than on an ordinary bank loan. On the other hand repaying one credit and using the extended credit from the next delivery might revolve trade credits. In that way trade credit can be transformed into a cheap medium or long-run credit.

The fact that trade debt is broadly used by companies indicates that there should be some advantage for the borrowing firm from trade credit otherwise borrowing firm's would destroy value by using trade credit.

Proposition 4: Trade debt is expected to have a positive impact on firm performance. Trade creditors extend credit to firms with risky but positive NPV projects due to their superior knowledge, and higher ability to salvage value as compared to banks and their ability to discipline debtors by withholding future deliveries.

2.7.2 Trade credit as a means of price discrimination

Schwartz and Whitcomb (1978) argue that trade credits are used when explicit price discrimination is not allowed due to legal restrictions. They suggest that if firms with higher cost of capital have higher demand elasticity, it is profitable to charge them a

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[5] See for example Smith (1987).
[6] See Petersen and Rajan (1996).

lower price. Trade credit is a way to achieve this lower price in the presence of legal restrictions.

The model by Brennan, et al. (1988) relies primarily on a lack of competition in product markets combined with adverse selection. Hence price discrimination becomes possible and lucrative. In the first step they show how a monopolist uses credit terms to price discriminate between cash and credit customers by setting credit terms that are attractive to the latter but not the former. The only thing needed is a difference in the reservation price between the two groups. In the second step they show how adverse selection in the credit market is sufficient for price discrimination and so for vendor financing to occur. Lastly they relax the assumption of a monopolistic supplier in favor of oligopolistic supply.

The supplier can use credit either as a way to subsidize its supply or it could be used for clients that would otherwise not receive credit from a bank. Trade credit effectively reduces the price to low quality borrowers, since terms are normally independent of buyers' quality as opposed to bank debt. The low quality borrower's interest rate normally reflects the all the risk characteristics of the buyer. High risk buyers – as opposed to low risk buyer – will prefer trade credit to other sources of financing. Thus trade credit is a way to reach customers that would otherwise not be able to buy a certain product. In the model by Brennan, et al. (1988) the profit with extension of trade credits dominates profits without extension.

Following the theories above the effect of trade debt on a companies' performance is not really clear, however weighing together everything it seems more likely that trade credits in general should have a positive impact on firms' performance.

Proposition 5: Ceteris paribus., trade credit is expected to be positively related to firm performance following the price discrimination theory, since the creditors cannot price-discriminate perfectly between the debtors.

Looking at the issue from another side, we could even assume a monopsonistic market structure as an extreme case. In this case the creditor might extract all the extra profit generated by the extension of trade credit and we should find no effect of trade financing on the borrowing firm's performance.

2.7.3 Transaction cost theories

According to Ferris (1981) trade credit is a way of separating delivery schedules from payment cycles. If there is strong seasonality in the demand for a firm's products the firm is forced to hold large inventories in order to smooth production, thus incurring costs of warehousing and the costs of producing the inventories while positive cash flows are delayed. By offering trade credits the producer might induce customers to buy earlier or more continuously maybe because they are better at managing inventory positions.

From the presentation of relevant theories we might consider the financing advantage of trade credits by Schwartz (1974) and the price discrimination hypothesis as especially relevant for emerging market economies. The superior expertise (as compared to banks) of the lender in the first case and the possibility to use trade credits as a strategic device to reach otherwise unreachable customers in the second theory are important determinants for the extension of trade credits to firms in transition economies.

The model and hypotheses presented do not include all variables affecting capital structure. Taken to the extreme companies would finance themselves entirely by issuing debt to maximize profits. Of course, there are limits to the use of credits. The theory predicts that an individual firm ceteris paribus should obtain better performance by taking more loans, but it does not follow that firms, which use more credit automatically perform better.

Many factors affect profitabilty and the link between profiability and debt. Increasing the amount of debt will increase borrowers' risk of bankruptcy and the cost of financing. In addition, borrowers only have a limited amount of profitable projects to be financed by either debt or equity. Therefore, the demand for credit is limited by the availability of these profitable projects. The number of profitable projects might vary between industries; older industries might have fewer new and profitable projects compared to young industries. Another point is risk. We expect higher risk firms to have a higher required rate of return as well as a lower equilibrium debt equity ratio.

Furthermore, the probability of default on the lenders' side will increase with the increasing extension of credit and the probability of credit losses and would thus affect the propensity of the lender to extend more credit negatively above a certain optimum. The availability of credits will depend on the type and size of the industry. Thus, total borrowing is limited from both the supply and the demand side.

In the case of trade credit the effect within a certain industry will also depend on the ability of the supplier to price discriminate and to vary credit terms. The greater the degree of price discrimination the larger the profit from trade credit through price discrimination. However, even here exists a certain optimum from the lender's point of view, if price discrimination is impossible the lender will not discriminate by providing vendor financing.

The hypothesis for the relation between debt/equity structure, trade credits, bank loans and performance must be thought of as a relation between optimal capital structure and profitability. The firms with higher optimal debt would have higher profits if higher debt is caused by lower bankruptcy cost but higher debt ratios caused by lower risk should be associated with lower profits. In the following we control for industry to for different ability to price discriminate and the level of riskiness under the first hypothesis that within an industry profitability increases with the debt ratio. Firms in different industries have different optima and therefore we need to control for industry in the empirical tests. Somewhere there is an optimal degree of credits in a cross-section of firms, as a result of differences in terms of bankruptcy costs, availability of profitable projects, availability of loans and other industry differences. In a cross section of firms we expect firms carrying more debt to be relatively more profitable, when controlling for industry differences.

3 Measuring Firm Performance[7]

The first problem to be solved is the choice of profitability measure. Several decisions have to be made. The first decision to be made is whether to use a market based performance measure such as Tobin's Q or related measures or measures derived from accounting data such as operating profits, return on investment, etc.

One possible measure would be the return on sales or simply the profit margin. But as Majumdar and Chibber (1999) point out, this measure lacks a link with either agency or governance influences, since this measure neglects the investment dimension present in the agency literature. They therefore settle for return on net worth[8] as the appropriate measure of profitability.

However, in most of the capital structure studies including Chen and Hammes (1997) and Rajan and Zingales (1995) as well as Gleason, et al. (2000), some measure of return on assets, either based on pre- or after tax-profits, usually adjusted by depreciations and tax, is used as the appropriate measure, which seems to provide the above-mentioned link as well. In this study I will use the pre-tax profit as the balance sheet based performance measure.

Several of the theories presented above, especially those on capital structure, are formulated not in terms of profit but in terms of value. To further comply with these theories additionally the market-to-book ratio, which can also be seen as a proxy for Tobin's q, is employed as an alternative measure for the firms' performance.

4 Estimation

The model is estimated using a panel data approach which is superior to the standard cross-sectional approach since, due to an increase in the number of data points degrees of freedom are increased and collinearity among explanatory variables is reduced (an important feature when using accounting data) and thus the efficiency of

[7] See Mehran (1995) among others for a discussion.
[8] Net Worth=Total Assets-Total Liabilities.

econometric estimates is improved.[9] Furthermore panel data can control for individual heterogeneity due to hidden factors, which, if neglected in time-series or cross section estimations leads to biased results.[10]

The following models are estimated using two different measures of performance profit before tax and market-to-book [11]:

(1) $\mathbf{Profit_{it}=\alpha+\beta_1 TD+\beta_2 lnS_{it}+\beta_3 age_{it}+\gamma_i industry_i+u_{it,}}$; $u_{it}=\mu_i+\nu_{it}$

(2) $\mathbf{MBR_{it}=\alpha+\beta_1 TD+\beta_2 lnS_{it}+\beta_3 age_{it}+\gamma_i industry_i+u_{it,}}$; $u_{it}=\mu_i+\nu_{it}$

In the second step we separate total debt into two components, bank loans and trade creditors.

(3) $\mathbf{Profit_{it}=\alpha+\beta_1 TrD+\beta_2\, bl+\beta_3 lnS_{it}+\beta_3 age_{it}+\gamma_i\, industry_i+u_{it,}}$; $u_{it}=\mu_i+\nu_{it}$

(4) $\mathbf{MBR_{it}=\alpha+\beta_1 TrD+\beta_2 bl+\beta_3\, lnS_{it}\ \beta_4 age_{it}++\gamma_i\, industry_i+u_{it,}}$; $u_{it}=\mu_i+\nu_{it}$

where

TrD=trade debt[12]

TD=total debt

S=turnover

Age=years since foundation of firm

Industry=a set of dummy variables base on 1-digit SIC-codes

BL=bank loans

u_{it}=random error

The random term u_{it} is the sum of μ_i, firm specific effects and ν_{it}, a random effect.[13] All variables, except for size and age, are divided by total assets. The model is estimated by GLS. The GLS-estimator can be presented as OLS on transformed variables with the OLS and Between-estimator as lower and upper bounds.

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[9] See Hsiao (1986).

[10] See Baltagi (1995).

[11] Besides profit before tax /total assets other common measures of profitability were tested with essentially the same results. In addition the models where estimated wit and without industry effects since Poland and Hungary have quite small samples. In the MBR-regression we exclude Poland and Hungary since the market-to-book ratios seem quite unreliable as discussed in Hammes (2000).

[12] Trade debt is in this estimation gross, in addition the difference between trade debt and trade credit could have been used as in Deloof and Jegers (1999) or Hammes (2000) could have been used but was omitted.

[13] Mátyás and Sevestre (1992).

The complete unbalanced sample for each country is used. As Baltagi, et al. (1998) show, it is more efficient to use the whole unbalanced sample instead of using a balanced sub sample.

Since the chosen direct approach to measure impact of debt on firms' profitability and value is conflicting with the standard analysis of capital structure such as Rajan and Zingales (1995) or Chen and Hammes (1997) a simultaneous equations model for the impact of total debt on profitability and firm value is estimated by EC3SLS (see Baltagi and Chang (2000) combining the two streams of the literature.

5 Description of Variables

5.1 Debt-Equity

Looking into a standard corporate finance book such as Ross, et al. (1988) leverage is defined as either debt ratio, the quotient of total debt and total assets, or debt-equity ratio given by total debt to total assets. In a first step we simply use the ratio of total debt by total assets. In a second step we break down total debt into its components, mostly bank loans and trade credits.

5.2 Trade Debt

We use the balance sheet liabilities positions "trade creditors" or " accounts payable", which is explicitly provided by Extel as a position within "short-term debt".

5.3 Bank Loans

Bank loans are one of the most important financing devices in every economy. Petersen and Rajan (1996) find no relation between trade credits and the relationship with financial institutions for the United States. Deloof and Jegers (1999) find a negative relation between trade debts and short-term and long-term bank debt for Belgian firms. Following Smith (1987) a negative relation between trade credits and bank loans should be expected.

The important question is if this finding holds for emerging market economies suffering from tight monetary policy. Here in fact we might find a wide range where both trade credits and bank loans are used as financing devices since there exist more positive NPV projects than can be financed by bank loans alone.

Unfortunately our sample does not allow us to distinguish between short-term bank debt and long-term bank debt. Therefore we cannot decide if trade credits are a substitute or complement for long-term, bank debt or short-term bank debt or both of them. However, due to the short-term nature of trade financing it seems resonable to assume that trade debt is a substitute for short-term bank loans.

5.4 Size

Size as measured by the logarithm of turnover is one of the few variables relatively immune to different accounting standards. Size is one of the standard control variables employed. Large firms might have higher profitability due to economies of scale or increased market power, but on the other hand firms' complexity increases with size and thus the cost of coordinating economic activity, information and transaction costs increase. So size might actually be detrimental to profits.

5.5 Age

Age is an important determinant of firm performance even though it is not entirely clear what the relation really is. A standard finding is that very young and very old firms tend show inferior performance, the young firms due to the fact that enormous amounts of money are needed to grow and to establish in the markets, while old firms simply run out of ideas and are additionally selling in mature markets with tough competition. One the other hand older firms might be more profitable due to economies of scope.

5.6 Industry

In order to capture industry specific effects single digit SIC-codes are included in the regressions. The SIC codes are obtained from Extel/Discovery. In cases of multiple SIC codes, the code determined as the main code by the database Amadeus is chosen. Of course restricting the analysis to the first-digit is quite coarse, but going to deeper levels and/ or including secondary SIC-codes would lead to results impossible for interpretation and an extreme loss of degrees of freedom.

Besides having industry, size and age as control variables, Majumdar and Chibber (1999) include inventory, capital intensity, liquidity, and sales growth to account for industry specific and business cycle effects, as well as excise taxes paid and imports. By including industry dummies and a panel data approach I take care of the first; the second set of control variables is not available in my data set and is therefore excluded. Since both samples are relatively small, no industry dummies are included for Poland and Hungary. For Poland and Hungary only profitability is used as a measure of performance since the stock prices and thus marketcapitalization in both countries show extreme volatility during the analysed period.

The variables measuring firm performance are discussed in chapter 3.

6 Description of the dataset

The data stems from the Financial Times Database Extel and from its successor Discovery, a part of the Lexis Nexis database. It contains comprehensive information for over 12000 listed companies all over the world. Complete balance sheets, profit loss accounts and daily company news as well as share prices etc are provided. All chosen firms fall into EXTEL category “C”, which stands for commercial, industrial and mining companies that are comparable according to normal standard. Price data was taken fromFT Prices.

The panel contains firm level data from, in general, 1990 to 1997 from in total 2143 firms from twelve countries. The choice of country is the result of following aspects: the size of the country, membership in the EU, the availability of the data and a slight home bias, which leads to the final selection of Belgium, Canada, Denmark, France, Germany, Ireland, Italy, Netherlands, Spain, Sweden, United Kingdom, United States, and in order to include transition economies, Hungary and Poland.

A definite problem is the fact that only listed firms and not even all listed firms are to be found in the EXTEL database. With regard to trade credits a sample selection bias is introduced since listed firms are normally the largest ones in a country and might therefore not be representative for the whole economy. However, if we find that the firms in our sample actively use trade credits as a financing device, to conclude that smaller firms act in the same manner might not be too farfetched.

A further problem is the small size of the Polish sample, 23 firms is not much even though there are up to seven consecutive observations per firm. This comments holds for Hungary even though the Hungarian sample is larger with 35 firms.

One additional problem with the data provided by Extel/Discovery is the entry of firms into the dataset. Some old firms are included into the data later than others without a reasonable explanation.

At least the exit of firms is not a problem; it is well documented in Extel and Discovery. Fortunately almost all exits of firm are due to mergers and not due to bankruptcy. The later might otherwise distort our results.

7 Empirical Analysis

7.1 Descriptive Statistics

The sample is presented in table 1

Insert table 1

As can be seen the samples do not all have the same length of time, ending either in 1996 or 1997, which results in between five and seven observations per company. Thus, all samples are unbalanced. Sample statistics are to be found in table 2.

Insert table 2

With regard to bank loans the US represents – not unexpectedly – the lower end with a share of 0.01 or 1% of total assets while the other extreme is marked by Belgium with an average of 0.152 or 15.2%. The other countries lie somewhere in between with Canada (0.048) and Sweden (0.0366) close to the US while the United Kingdom (0.1405) lies surprisingly close to Belgium. Germany as a well-known example for a bank-oriented system, for large firms lies close to the top with 14.65%.

Trade creditors (ranging from 4% to 30%(!) of total assets) and debtors (ranging from 7.9% to 22.59% of total assets) have in all countries a significant share of the balance sheet.

Again in both positions the USA mark the lower bound, a finding consistent with the picture of a large and well-developed capital market. Firms in the United States seem to have other, cheaper sources of finance at hand.

With regard to profitability the Netherlands and the USA take the top position with about 14% while we find Swedish firms are at the lower end with slightly more than three percent, whereas the average in the other countries is around 10%.

The variation for (unadjusted) total debt is quite small between the different countries, ranging from a lowest level of 0.2099 to a maximum of 0.3057, ignoring Irelands 1.1991, which is a real value but distorted by one outlier.

7.2 Estimation Results

Marginal effects for dummy variables will not be calculated since the dummies are only included for control purposes. Industry effects are not the main targets of my analysis. For reasons of comparability we will estimate both models with and without industry dummies since both the Polish and the Hungarian sample are too small, (see tables 3 and 4 in the appendix).

Insert table 3, 4

The effect of total debt is negative and significant for all countries, except the UK. The effects vary in size from –0.05045 for Belgium to –0.49823 for Denmark and the extreme Ireland with –2.94649. In all cases the effects are far from negligible. This finding is incompatible with the predictions of most of the above-presented theories.

Size is also found to have a significant and positive effect in most of the countries except for Germany and the UK. However the coefficients on size are quite small varying from 0.0048 for Belgium to a maximum of 0.05522 for Ireland.

The findings for age are inconclusive, with small and insignificant coefficients for all of the countries except for the Netherlands, and France with small but negative and significant effects and for the US and with Denmark with small but positive effects.

Turning now to Hungary and Poland we find no exceptional values for the effect of total debt on profitability with values of –0.0702 for Hungary, and –0.117877 for Poland. However, the impact of total debt is not significant for Poland. The size-effect is slightly positive in Hungary while again Poland deviates with a slightly negative value. Effect of age is positive and highly significant, which might be explained by a non-linearity in age which we have not covered in our regressions, indicating that firms' in both countries have left the state of infancy with fast growth and little focus on profits, while they are still too young by western standards to be called mature. All these findings together indicate that at least Hungary has developed towards other industrialized countries.

Next the analysis turns to the regressions including industry effects. For results se table 5.

Insert table 5

The findings above are mostly confirmed except for three countries, the US, the UK and Germany, where the effect of total debt on profitability turns to a positive and relatively sizable with a value of 0.16827 for the US and 0.8468 for Germany. However the value for the UK is positive but insignificant. Controlling for industry, size assumes positive small and significant coefficients for all countries. This indicates that it is important to include industry dummies to cover branch-specific effects.

A market based approach, as explained in the presentation of the variables, was used as an alternative to profitability measured as profit before taxes, profitability in the finance literature is quite often associated with the notion of value, which usually is captured by the market capitalization of the firm or Tobin's q. For results see table 6.

Insert table 6

Again we find a negative effect of total debt in most countries except for Denmark, Ireland and the Netherlands. Especially the value for Denmark, at 1.29833, seems unreasonably high. Already the effect of total debt on pre-tax profits was extremely high at –0.49823. Otherwise the results are mostly the opposite of what most of the current theories predict.

Assuming that all firms chose optimal capital structures, then controlling for country and industry and other relevant control variables, firm's profitability and market value decreases in the relative amount of debt kept on the balance sheet.

After analyzing the effects of total debt on profitability I now turn to the effect of different kinds of debt on profitability. Tables 7 and 8 summarize the results.

Insert tables 7, 8

When controlling for industry we find no significant effect of the use of credits on firms' profitability except for Ireland, Italy and Spain with a negative coefficient and Sweden with a positive coefficient. The insignificance could be due to the fact that the trade creditor succeeds in price discrimination, extracting the surplus generated from the provision of additional finance to the debt. The results for Poland and Hungary are consistent with the majority of the countries.

Analyzing the results for bank loans we find qualitatively no difference between the results including industry dummies and without. Bank loans is found to have a negative impact on profitability in all countries except for Germany and Denmark, however, these findings are not statistically significant. Finding no impact for Germany, a heavily bank centered system might be the result of the positive effects (close monitoring) and negative effects (higher interest rates, "lock-in"-effect) balancing each other.

The coefficients of bank loans in the other countries (except for the UK, Ireland, and Canada) are significant at least at the five percent level and with regard to their size, ranging from – 0.04884 for Belgium to –0.27998 for Ireland, are everything but negligible. In all these countries bank relations as measured by the relative amount of bank loans on the firms' balance sheets have a negative and significant impact and the profitability of the firms, give credibility to Rajan's and other's presumption that banks might hold firms hostage and charge higher interest rates than the market would. Looking at the two transition economies in our sample we find a negative effect of bank loans for Poland while the effect is insignificant for Hungary.

When looking at the MBR as the market based performance measure the findings are quite mixed. They can be found in table 9.

Insert table 9

The effect of bank loans on the companies' value is negative in all countries except for France and Germany. However these positive estimates are highly insignificant, while the negative estimates are significant at least at the 10% level in six out of 10 cases ranging from –0,25544 for the Netherlands to –0.000508 in Spain. The findings on trade credit do not reveal any obvious pattern ranging from insignificant –5.72864 for Denmark to an astonishing and significant 0.5054 for Belgium. Again we find at least some support for the "lock-in" story promoted by Greenbaum, et al. (1989), Sharpe (1990) and Rajan (1992).

Looking at the effect of trade credits on the firm's value reveals a very mixed picture, in seven out of twelve cases the impact of trade credit is in fact negative, which is quite unexpected, especially the –5,72864 coefficient for Denmark especially is inexplicable, as well as the high 0.5045 in Belgium.

Size is as expected negative in most countries except for France, Germany, Spain and the US. However, in these four cases the estimates are very close to zero ranging from 0.000009 to 0.000734. The age-effect is – as expected – mostly negative, again Denmark appears as an outlier with a high 0.44476 on the log of age.

In addition to the regressions above a simultaneous equations model for the impact of total debt on profitability and firm value is estimated by EC3SLS (see Baltagi and Chang (2000) combining the two streams of the literature. The results are presented in tables 10 and 11. The results mostly support the findings of the single equation estimations. The effect of total debt on profitability is negative for all countries but the Belgium and the US. The signs for the capital structure equation are comparable to those obtained by Rajan and Zingales (1995) and the estimates in Chen and Hammes (2003), even though the fit is not as good as in the single equation models, hinting at a causality from debt to performance and not the other way round. However, the effects of debt on firm value are not as clear cut. In seven countries the effect is negative and significant, in Spain, Germany, and Sweden the effect is positive and significant. This leaves Italy, Belgium, and the UK with postive but insignificant estimates.

Insert tables 10 and 11

8 Conclusion

As we can see from the above reported findings the source of finance indeed matters for a firm. Debt is in almost all cases found to have a negative impact on firms' profitability, while most of the theories would lead us to expect a positive relation since for example manager's are disciplined by debt thus avoiding either under- or overinvestment. Assuming that all firms chose optimal capital structures, then controlling for country, industry and other relevant control variables, firm's profitability and market value decreases in the relative amount of debt kept on the balance sheet.

When breaking down debt into some of its major parts, namely bank loans and trade debt the findings are no longer as consistent as on the aggregate level. Controlling for country, size industry and age we again expected a positive impact of trade credits and bank loans on profitability and firm value.

The inconclusive findings with regard to trade credits at least seem to indicate that trade credits does not solve the firms' financing problem or if it does the costs, are too high. The findings are also consistent with the price discrimination theory, where the trade creditor might extract the benefits of trade finance from the debtor. An alternative explanation could be that the companies have not achieved their optimal capital structure or that the set of control variables is not sufficient.

Bank loans seem to mostly negatively impact on firms profitability indicating that the benefits of bank supervision might be more than balanced by banks ability to extract higher interest rates in close relationships as pointed out by Rajan (1992). However, our dataset limits the analysis since we do not know about the number of bank relations each firm has. A dispersed number might reduce bank power and thus limit the adverse effects of bank lending.

Appendix Descriptive statistics and Regression Results

Table 1 Number of firms and time periods per country

Country	Number of Firms	Time Period
Belgium	107	1990-1997
Canada	84	1990-1997
Denmark	93	1990-1996
France[14]	200	1990-1997
Germany	345	1990-1996
Hungary	35	1991-1997
Italy	164	1990-1996
Ireland	63	1990-1997
Netherlands	152	1990-1997
Poland	23	1991-1997
Spain	124	1990-1997
Sweden	115	1990-1996
UK[15]	200	1990-1996
USA	438	1990-1996

[14] 200 alphabetically selected out of 653.
[15] 200 out of a total of more than 2000 British firms contained in Excel.

Table 2 Sample Statistics (Mean, Standard deviation, Minimum, Maximum)

	Belgium	Canada	Denmark	France	Germany	Ireland	Italy	NL	Spain	Sweden	UK	US	Hungary	Poland
Size	12.6485	7.1852	6.8931	14.2016	13.4639	10.3994	12.7173	13.2788	10.5288	8.4904	10.8811	8.1087	9.9943	4.6588
	2.5715	1.7177	1.5788	2.3369	2.1842	2.6097	2.4190	2.0078	1.6531	1.7661	2.3023	1.4303	2.9915	1.3627
	2.5572	-2.8134	2.8007	5.3279	5.8319	0.6931	-0.2472	4.0604	2.7147	-0.5108	0.0000	1.4670	4.4796	0.2963
	17.2156	10.4100	10.0564	19.2653	20.6633	14.9827	19.5240	18.3651	14.9559	14.9827	16.1550	14.9827	16.9509	7.7107
EBITDA	0.0935	0.1071	0.0999	0.1035	0.1094	-2.8482	0.1029	0.1450	0.2373	0.0144	0.5883	0.1398	0.0915	0.1726
	0.1100	0.1500	0.3123	0.1016	0.1998	50.9236	0.3143	0.0898	3.2001	0.1658	6.9284	0.1074	0.1057	0.1666
	-0.9120	-1.4678	-6.2170	-0.3697	-2.9052	-898.0000	-5.8910	-0.3675	-0.5489	-2.9052	-2.9052	-2.9052	-0.3864	-0.1950
	0.4455	0.9780	0.6162	0.9730	1.9059	0.2957	2.5032	0.6062	87.3067	0.3456	132.8956	0.6755	0.6573	1.2692
Bank	0.1521	0.0463	0.0605	0.0784	0.0692	0.1371	0.0997	0.1034	0.1203	0.0448	0.1351	0.0128	0.0584	0.0277
	0.1547	0.0942	0.0987	0.1012	0.0817	0.1540	0.1359	0.1245	0.1351	0.0884	0.2566	0.0487	0.1044	0.0698
Loans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.7502	0.6686	0.5625	0.7084	0.5426	0.9804	0.9458	0.6108	0.9139	0.5276	3.5641	0.9115	0.5206	0.5354
Trade	0.1044	0.0478	0.0891	0.1578	0.0867	0.2632	0.1411	0.1281	0.1273	0.0901	0.1561	0.0598	0.0942	0.0542
	0.0915	0.0705	0.0588	0.1065	0.0638	2.8026	0.0879	0.0959	0.1210	0.0604	0.1508	0.0654	0.0952	0.0805
Creditors	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.5181	0.4270	0.3561	0.5944	0.4305	49.5000	0.5601	0.7065	0.7533	0.3836	0.9190	0.8451	0.5341	0.3979
Trade	0.1519	0.0784	0.1781	0.2291	0.1653	0.1072	0.1948	0.2150	0.1960	0.1726	0.2074	0.0803	0.1051	0.0458
	0.1399	0.0825	0.0981	0.1370	0.1207	0.1275	0.1226	0.1452	0.1579	0.1007	0.1607	0.0972	0.1304	0.0956
Debtors	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.8332	0.4498	0.5768	0.6373	1.1639	1.5000	0.6127	0.7535	0.7372	0.5520	0.8425	0.7462	0.9946	0.4475
Log (AGE)	4.0747	3.6780	3.9870	3.7465	4.2557	3.0908	3.8928	3.7852	3.7709	3.6960	3.0202	3.5578	3.3987	3.5824
	0.7161	0.8162	0.7697	0.9658	0.8057	0.8892	0.7606	1.0958	0.6011	1.0018	1.1964	0.8872	1.1687	1.0279
	1.7918	1.0986	1.0986	0.0000	0.0000	0.6931	0.0000	0.0000	1.0986	0.0000	0.0000	0.0000	0.0000	0.6931
	5.4027	4.7707	5.3230	5.7746	5.6802	4.6347	5.0239	5.8435	4.7536	5.8861	4.7362	5.0370	5.6664	5.0039
Total	0.2344	0.2764	0.3057	0.2099	0.1999	1.1991	0.2720	0.2200	0.2134	0.2523	0.2034	0.2570	0.1589	0.0377
	0.1756	0.1672	0.8765	0.1389	0.1849	17.4265	0.1671	0.3557	0.1658	0.2097	0.3140	0.1691	0.1757	0.0787
Debt	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.8136	0.9083	18.4070	0.7787	1.3429	307.5000	0.9458	6.4734	0.9139	2.4190	4.1306	2.9131	1.8928	0.5354
Pre-tax	0.0355	0.0316	0.0300	0.0463	0.0766	-2.9079	0.0133	0.0777	0.0340	0.0366	0.0759	0.0731	0.0528	0.1290
	0.0946	0.1468	0.4456	0.0916	0.1587	51.3185	0.2910	0.0841	0.1022	0.1529	2.3241	0.1078	0.0972	0.1056
Profit	-0.9240	-1.4399	-9.1632	-0.5624	0.0000	-905.0000	-7.0112	-0.4525	-0.6636	-2.9865	-34.7853	-2.9865	-0.3908	-0.1950
	0.3181	0.5126	0.4853	0.6856	3.5828	0.2292	1.5026	0.4876	0.8237	0.3547	36.9714	0.5144	0.5833	0.5438

Table 3 Sample statistics sub sample (Mean, Standard Deviation, Minimum, Maximum)

	Belgium	Canada	Denmark	France	Germany	Ireland	Italy	NL	Spain	Sweden	UK	USA
NT	456	452	434	702	1505	273	704	674	664	446	769	2074
N	107	83	93	199	345	63	164	153	124	115	200	437
Year	3.5044	3.1615	3.6452	3.6239	3.2086	3.5165	2.9645	3.8368	3.3434	3.8767	3.4915	3.3857
	1.6428	1.7839	1.5523	1.6750	1.5317	1.6674	1.5624	1.5959	1.7609	1.4628	1.6057	1.6526
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000
Size	12.6118	7.1458	6.9072	14.2118	13.5085	10.2776	13.0945	13.2278	10.4787	8.2697	11.0694	8.0711
	2.6163	1.7158	1.5659	2.3500	2.1614	2.6456	1.9289	2.0029	1.6570	1.5263	2.1683	1.3197
	2.5572	-2.8134	2.8007	5.3279	6.0186	0.6931	3.6889	4.0604	2.7147	-0.5108	0.0000	1.4670
	17.2156	10.2459	10.0564	19.2653	20.6633	14.9250	19.5240	18.2905	14.8093	12.0524	16.1550	11.9704
EBITDA	0.0912	0.1053	0.1004	0.1059	0.1090	-3.2476	0.1028	0.1413	0.2539	0.0151	0.6708	0.1428
	0.1117	0.1471	0.3151	0.0972	0.1771	54.3522	0.3279	0.0889	3.4167	0.1004	7.4364	0.0843
	-0.9120	-1.4678	-6.2170	-0.2931	-1.6483	-898.0000	-5.8910	-0.3675	-0.5489	-1.2876	-2.1888	-0.4636
	0.4455	0.9780	0.6162	0.6674	1.9059	0.2867	2.5032	0.5604	87.3067	0.3456	132.8956	0.6755
Cash	0.0320	0.0705	0.0916	0.0516	0.0677	0.0972	0.0515	1.5292	0.0201	0.0633	0.0915	0.0486
	0.0380	0.0991	0.0829	0.0545	0.0805	0.1193	0.0631	26.8212	0.0311	0.0616	0.1174	0.0680
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0006	0.0000	0.0000
	0.4747	0.7313	0.5952	0.5356	0.5426	0.8493	0.4168	541.0799	0.3434	0.4670	0.8278	0.6252
Bank Loans	0.1524	0.0461	0.0596	0.0780	0.6140	0.1378	0.1034	0.1021	0.1218	0.0381	0.1321	0.0107
	0.1581	0.0956	0.0964	0.1012	5.9853	0.1540	0.1374	0.1253	0.1373	0.0768	0.2639	0.0416
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.7502	0.6686	0.5625	0.7084	106.6028	0.9804	0.9458	0.6108	0.9139	0.4823	3.5641	0.9115
Trade Creditors	0.1039	0.0418	0.0884	0.1560	0.0855	0.2836	0.1441	0.1256	0.1278	0.0863	0.1575	0.0581
	0.0902	0.0673	0.0573	0.1062	0.0629	2.9913	0.0883	0.0952	0.1210	0.0568	0.1550	0.0611
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.4313	0.4270	0.3561	0.5944	0.4305	49.5000	0.5601	0.7065	0.7533	0.3836	0.9190	0.8451
Trade Debtors	0.1531	0.0741	0.1777	0.2271	0.1645	0.1030	0.2012	0.2113	0.1968	0.1707	0.2122	0.0791
	0.1431	0.0828	0.0971	0.1353	0.1200	0.1317	0.1243	0.1437	0.1591	0.0974	0.1609	0.0953
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.8332	0.4498	0.5768	0.6373	1.1639	1.5000	0.6127	0.7535	0.7372	0.5408	0.8425	0.6915
Log (AGE)	4.0647	3.6539	3.9950	3.7387	4.2898	3.0601	3.8817	3.7715	3.7586	3.7364	3.1519	3.5736
	0.7259	0.8326	0.7502	0.9741	0.7788	0.9065	0.7748	1.1101	0.6069	1.0222	1.1134	0.8804
	1.7918	1.0986	1.0986	0.0000	0.0000	0.6931	0.0000	0.0000	1.0986	0.0000	0.0000	0.0000
	5.3982	4.7622	5.3230	5.7714	5.6802	4.6347	5.0239	5.8406	4.7449	5.8861	4.7362	5.0370

Table 4 continued Sample statistics sub sample (Mean, Standard Deviation, Minimum, Maximum)

Total	0.2376	0.2794	0.3067	0.2113	0.1973	1.3301	0.2715	0.2228	0.2201	0.2517	0.1938	0.2582
	0.1791	0.1665	0.8853	0.1397	0.1846	18.6001	0.1669	0.3808	0.1679	0.2150	0.3211	0.1691
Debt	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.8136	0.8185	18.4070	0.7787	1.3429	307.5000	0.9458	6.4734	0.9139	2.4190	4.1306	2.9131
Pre-tax	0.0326	0.0285	0.0303	0.0469	0.0051	-3.3100	0.0109	0.0738	0.0298	0.0419	0.0888	0.0754
	0.0957	0.1426	0.4501	0.0886	0.1344	54.7736	0.3024	0.0834	0.1062	0.0692	2.4907	0.0849
Profit	-0.9240	-1.4399	-9.1632	-0.5624	-2.2348	-905.0000	-7.0112	-0.4525	-0.6636	-0.2650	-34.7853	-0.4741
	0.3181	0.5126	0.4853	0.5906	1.8385	0.2200	1.5026	0.4876	0.8237	0.3547	36.9714	0.5144
MBR	0.0574	0.0007	2.5169	0.0016	0.0016	0.0085	0.0004	0.0215	0.0006	0.0010	0.0016	0.0014
	0.2382	0.0008	8.9898	0.0105	0.0064	0.1000	0.0004	0.2454	0.0006	0.0048	0.0055	0.0041
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	2.1366	0.0083	102.3762	0.1586	0.1185	1.6440	0.0038	3.7985	0.0062	0.0665	0.1294	0.0942
D1	0.0680	0.2412	0.0115	0.0670	0.0233	0.1905	0.0313	0.0237	0.1642	0.0112	0.0351	0.1037
	0.2520	0.4283	0.1068	0.2501	0.1508	0.3934	0.1741	0.1523	0.3707	0.1054	0.1842	0.3049
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
D2	0.2105	0.2212	0.1267	0.0855	0.1322	0.1319	0.1903	0.1009	0.1777	0.1211	0.0715	0.1196
	0.4081	0.4155	0.3331	0.2798	0.3388	0.3390	0.3928	0.3014	0.3826	0.3266	0.2579	0.3245
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
D3	0.0702	0.0973	0.2051	0.2393	0.1276	0.0366	0.1278	0.1602	0.1792	0.1996	0.1300	0.1514
	0.2557	0.2968	0.4042	0.4270	0.3337	0.1882	0.3341	0.3671	0.3838	0.4001	0.3366	0.3585
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
D4	0.1601	0.1482	0.1935	0.2208	0.0551	0.0549	0.0668	0.1068	0.1627	0.0381	0.0572	0.0516
	0.3671	0.3557	0.3955	0.4151	0.2283	0.2283	0.2498	0.3091	0.3693	0.1917	0.2324	0.2213
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
D5	0.0461	0.0133	0.0806	0.0556	0.0286	0.0183	0.0781	0.0757	0.1160	0.0650	0.0468	0.0063
	0.2098	0.1146	0.2726	0.2292	0.1667	0.1343	0.2686	0.2647	0.3204	0.2468	0.2114	0.0789
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
D6	0.1294	0.0863	0.2189	0.1282	0.0970	0.1722	0.0341	0.1766	0.0602	0.0583	0.1938	0.0979
	0.3360	0.2811	0.4140	0.3346	0.2961	0.3782	0.1816	0.3816	0.2381	0.2346	0.3955	0.2972
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
D7	0.0461	0.1040	0.0876	0.0228	0.0053	0.0220	0.0355	0.0267	0.0482	0.0314	0.0143	0.0579
	0.2098	0.3056	0.2830	0.1493	0.0727	0.1469	0.1852	0.1613	0.2143	0.1746	0.1188	0.2335
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Table 5 Regression Results Profitability (Estimate, Standard Error)

	Belgium	Canada	Denmark	France	Germany	Ireland	Italy	NL	Spain	Sweden	UK	US	Hungary	Poland
NT	519	508	443	793	1579	311	784	792	757	498	887	2145	261	134
Intercept	**0.0023** 0.0072	**0.0063** 0.0105	**0.0052** 0.0061	**0.0107**** 0.0048	**0.0033** 0.012	**0.0090** 0.0683	**0.0218** 0.0394	**0.0019** 0.0032	**-0.0112** 0.0078	**0.0051** 0.0058	**-0.1780** 0.3693	**0.0068** 0.0052	**0.0140** 0.0085	**0.0073** 0.0146
Total Debt	**-0.0505***** 0.0194	**-0.1649***** 0.0292	**-0.4982***** 0.0039	**-0.1506**** 0.0202	**-0.0579**** 0.0178	**-2.9465**** 0.0019	**-0.3364***** 0.0532	**-0.0196**** 0.0063	**-0.1960***** 0.0205	**-0.135**** 0.0132	**0.0099** 0.2446	**-0.1496***** 0.0127	**-0.0702**** 0.023	**-0.1188** 0.1025
Size	**0.0048***** 0.0011	**0.0078**** 0.0033	**0.0177***** 0.002	**0.0056***** 0.0008	**-0.0003** 0.0012	**0.0552***** 0.0116	**0.0077**** 0.0033	**0.007**** 0.0007	**0.0085**** 0.0016	**0.0072***** 0.0015	**0.0204** 0.0331	**0.0079***** 0.0011	**0.0029*** 0.0016	**-0.01298**** 0.0057
Log(Age)	**-0.0027** 0.0034	**0.0055** 0.0061	**0.0133**** 0.0037	**-0.0052*** 0.0026	**0.0049** 0.0036	**-0.0125** 0.0401	**-0.0016** 0.01	**-0.0048**** 0.0021	**0.0031** 0.0044	**0.002** 0.0029	**-0.000017** 0.0660	**0.0110***** 0.0021	**0.0044** 0.0047	**0.05235***** 0.0092
R2	0.0613	0.0806	0.9740	0.0982	0.0075	0.9999	0.0492	0.2654	0.1733	0.2181	0.0005	0.1156	0.062	0.2610
R2-adj	0.0558	0.0751	0.9739	0.0948	0.0056	0.9999	0.0456	0.2626	0.1700	0.2134	-0.0029	0.1143	0.0514	0.2439

*** significant at the 1% level, ** significant at the 5% level, *significant at the 10% level

Table 6 Regression Results Profitability including industry dummies (Estimate, Standard Error)

	Belgium	Canada	Denmark	France	Germany	Ireland	Italy	NL	Spain	Sweden	UK	US
Intercept	-0.02821	0.02874	0.05855*	0.10496***	0.07249*	-.69045***	0.04587	-0.00940	0.10629***	0.07423***	-0.23670	0.03932***
	0.03154	0.04079	0.03027	02063	0.02519	21532	0.07007	0.02096	03027	01781	0.3892	0.01243
Total Debt	-0.05127**	-0.18444***	-0.49843***	-0.17513***	0.08468***	-2.94652***	-0.38875***	-0.01863***	-0.21147***	-0.15681***	0.01396	0.16827***
	0.02084	0.03173	0.00391	0.02168	0.01664	0.00184	0.05786	0.00642	0.02066	0.01427	0.24885	0.01017
Size	0.00607***	0.00570	0.01496***	0.00215*	0.00363***	0.09302***	0.01113**	0.00758***	0.00338	0.00411**	0.02758**	0.00795***
	0.00151	0.00435	00255	0.00120	0.00138	01652	0.00474	0.00153	0.00214	.00209	0.03434	0.00131
Log(AGE)	0.00106	0.00354	0.00559	-0.01383***	0.000051	0.09663**	-0.01545	-0.00498**	-0.00998*	-0.00374	0.000489*	0.00416**
	0.00527	0.0072	0.00531	0.00318	0.00386	.04891	0.01208	0.00219	0.00573	0.00355	0.06586	0.00186
D1	0.01501	0.00733	0.03203	0.00999	0.01780	0.00959	0.00707	0.00487	0.00554	0.00764	-0.09619	-0.01508***
	0.01266	0.01401	0.02864	0.00920	0.01912	0.08276	0.04985	0.01146	0.01157	0.02622	0.46484	0.00428
D2	0.00119	0.00418	0.00974	0.00693	0.00869	0.14863	0.01549	0.00457	0.01066	-0.00368	-0.10299	0.00746
	0.00832	0.01189	0.01052	0.00804	0.00844	0.08849	0.02499	0.00582	0.00956	0.00848	0.32030	0.00402
D3	-0.01355	-0.00086	0.00347	0.00408	0.00366	-0.24655	-0.00916	0.00302	-0.01311	-0.01781**	-0.02355	-0.000453
	0.01266	0.01659	0.0089	0.00559	0.00859	0.16281	0.02968	0.00481	0.00927	0.00692	0.24590	0.00377
D4	0.000525	0.00463	0.00148	0.00223	0.00148	-0.04886	-0.00332	0.00889	-0.01591	-0.01962	-0.000764	0.00781
	0.00928	0.01394	0.00856	0.00579	0.01232	0.13019	0.03767	0.00585	0.01081	0.01441	0.35007	0.00593
D5	-0.02707*	0.03206	0.01440	0.02964***	0.00928	0.31722	-0.00616	0.00420	-0.02617**	-0.02806***	-0.02931	-0.01625
	0.01615	0.03838	0.01156	0.01017	0.01743	0.23267	0.03434	0.00657	0.01161	0.01045	0.36807	0.01456
D6	-0.00247	0.00426	0.00012777	0.00608	0.00626	-0.13913	0.01648	0.00210	-0.01515	-0.01147	-0.000584	0.00327
	0.01050	0.01719	0.00856	0.00734	0.00989	0.08765	0.05098	0.00462	0.01322	0.01172	0.21278	0.00441
D7	0.01719	0.02642	0.00933	0.02281	0.01991	0.01164	0.01382	0.01468	0.00058	0.01160	0.01558	-0.01085*
	0.01556	0.01582	0.01103	0.01519	0.03709	0.19639	0.05127	0.01060	0.01590	0.01410	0.66797	0.00587
R2	0.2181	0.1741	0.9738	0.3113	0.0269	0.9999	0.0687	0.5627	0.3248	0.4220	0.0013	0.5339
R2-adj	0.2012	0.1558	0.9731	0.3017	0.0199	0.9999	0.0547	0.5565	0.3148	0.4094	-0.0110	0.5315

*** significant at the 1% level, ** significant at the 5% level, *significant at the 10% level

Table 7 Regression Results MBR including industry dummies (Estimate, Standard Error)

	Belgium	Canada	Denmark	France	Germany	Ireland	Italy	NL	Spain	Sweden	UK	USA
Intercept	**0.32657*** **	**0.00151*** **	**-0.72105**	**0.000034**	**0.00357** **	**-0.000407**	**0.00111*** **	**0.51750*** **	**0.00100*** **	**0.00152***	**0.00686*** **	**0.00299*** **
	0.08238	0.000233	1.43575	0.00246	0.00153	0.00323	0.000106	0.06784	0.000189	0.00092	0.000817	0.00092
Total Debt	**-0.07886**	**-0.00120*** **	**1.29833*** **	**-0.00465**	**-0.000473**	**0.00533*** **	**-0.000633*** **	**0.03304**	**-0.00062*** **	**-0.00137***	**-0.000809**	**-0.000968**
	0.05377	0.000223	0.18756	0.0025	0.000966	0.000022	0.000077	0.02764	0.000124	0.000808	0.000695	0.000722
Size	**-0.00790** **	**-0.000062*** **	**-0.21113**	**0.000714*** **	**0.000137***	**-0.000223**	**-0.000045*** **	**-0.03150*** **	**-0.000004**	**0.000009**	**-0.000447*** **	**0.000101**
	0.00401	0.000023	0.13063	0.000161	0.000083	0.000229	0.000007	0.00476	0.000013	0.000117	0.000076	0.000096
Log(Age)	**-0.05024*** **	**-0.000002**	**0.44071***	**-0.00208*** **	**-0.000979*** **	**0.000694**	**0.000014**	**-0.01149**	**-0.000034**	**-0.000169**	**-0.000145**	**-0.000548*** **
	0.01446	0.000046	0.25287	0.000349	0.000223	0.000807	0.000017	0.00871	0.000036	0.000181	0.000138	0.000135
d1	**-0.01035**	**-0.000073**	**0.85440**	**-0.00193**	**-0.000099**	**0.00327*** **	**0.000522*** **	**-0.06102**	**-0.000068**	**-0.000181**	**-0.000405**	**-0.000636** **
	0.03574	0.000096	1.94226	0.00146	0.00107	0.00112	0.000071	0.06270	0.000071	0.00140	0.000755	0.000290
d2	**0.02487**	**0.000254** **	**1.25988** **	**-0.000755**	**0.000604**	**0.000524**	**-0.000041**	**-0.04578**	**0.000008**	**0.000289**	**0.000832**	**0.000017**
	0.02372	0.000102	0.72387	0.00127	0.000478	0.00103	0.000035	0.03052	0.000066	0.000477	0.000533	0.000265
d3	**0.02706**	**-0.000003**	**0.97513**	**0.00249*** **	**0.000233**	**0.000131**	**-0.00001**	**-0.06689** **	**-0.000211*** **	**0.000156**	**0.000257**	**-0.000435***
	0.03561	0.000134	0.63416	0.000839	0.000482	0.00198	0.000041	0.02626	0.000068	0.000396	0.00043	0.000252
d4	**0.01347**	**-0.000109**	**1.57381** **	**0.000433**	**0.000479**	**0.000906**	**-0.000094**	**-0.01977**	**-0.000019**	**-0.000331**	**-0.000216**	**-0.000281**
	0.02675	0.00001	0.61161	0.00094	0.00069	0.00166	0.000052	0.03108	0.00007	0.000720	0.000562	0.0003928
d5	**0.13949*** **	**-0.000003**	**0.57702**	**-0.00138**	**0.00113**	**-0.00029**	**-0.00013*** **	**-0.03831**	**-0.000238*** **	**-0.00022**	**-0.000417**	**-0.00082**
	0.04406	0.00029	0.82032	0.00156	0.000977	0.00267	0.00005	0.03312	0.000076	0.000609	0.000678	0.00110
d6	**0.17538*** **	**-0.000113**	**1.18446** **	**-0.00163**	**0.00399*** **	**0.000434**	**0.000135***	**-0.06646** **	**0.000121**	**0.000133**	**0.000316**	**-0.000222**
	0.02891	0.000133	0.60282	0.00108	0.000554	0.00107	0.000072	0.02525	0.000093	0.000593	0.000361	0.000295
d7	**0.08381***	**-0.000074**	**6.30626*** **	**-0.00179**	**-0.00129**	**-0.000126**	**0.000168** **	**-0.06177**	**-0.000236** **	**-0.000142**	**0.000434**	**-0.000951** **
	0.04662	0.000134	0.80262	0.00211	0.00219	0.00267	0.000076	0.05445	0.000099	0.000868	0.40	0.000393
R2	0.1470	0.5141	0.2696	0.1001	0.1130	0.9950	0.5738	0.0778	0.5472	0.0411	0.1365	0.0691
Adj R2	0.1287	0.5032	0.2534	0.0889	0.1066	0.9948	0.5683	0.0654	0.5402	0.0213	0.1270	0.0642

*** significant at the 1% level, ** significant at the 5% level, *significant at the 10% level

Table 8 Regression Results Bank Loans and Trade Credits on Profitability (Estimate, Standard Error)

	Belgium	Canada	Denmark	France	Germany	Ireland	Italy
Intercept	**0.00142** 0.00722	**0.000728** 0.01085	**-0.02707** 0.03776	**0.01152**** 0.00497	**-0.000463** 0.01196	**-0.26507** 0.20356	**0.00373** 0.03993
Trade Creditors	**-0.08474**** 0.04083	**0.10131** 0.07362	**0.50347** 0.45798	**0.01666** 0.02492	**0.01785** 0.05667	**-18.26970***** 0.03499	**-0.13897** 0.10950
Bank Loan	**-0.05084**** 0.02201	**-0.02657** 0.0554	**0.38267** 0.28768	**-** **0.09596**** * 0.02596	**0.000229** 0.00057	**-0.24326** 0.70496	**-0.26481***** 0.06610
Size	**0.00510***** 0.00115	**-0.000574** 0.00304	**0.00669** 0.01271	**0.00288**** * 0.000816	**-0.000707** 0.00129	**0.24184***** 0.03506	**0.00517** 0.00346
Log(Age)	**-0.00208** 0.00341	**0.01080*** 0.00622	**-0.00490** 0.02371	**-0.00237** 0.00266	**0.00399** 0.00368	**-0.02103** 0.11907	**-0.000315** 0.01013
R2	0.0645	0.0263	0.0145	0.0516	0.0010	0.9989	0.0214
R2-adj	0.0572	0.0185	0.0055	0.0468	-0.0016	0.9989	0.0163

	NL	Spain	Sweden	UK	US	Hungary	Poland
Intercept	**0.00234** 0.00321	**-0.01432*** 0.00798	**-0.00126** 0.00646	**-0.16661** 0.37216	**0.00323** 0.00532	**0.01234** 0.00861	**0.00836** 0.01460
Trade Creditors	**-0.00810** 0.02401	**-** **0.08436***** 0.02621	**0.10968*** 0.05817	**0.07459** 0.51208	**-0.04343** 0.03165	**-0.03319** 0.05668	**-0.04596** 0.10510
Bank Loan	**-0.07579***** 0.01665	**-** **0.18581***** 0.02576	**-0.03993** 0.03515	**-0.08484** 0.30048	**-0.12438** 0.03976	**-0.05621** 0.04828	**-0.19110*** 0.11400
Size	**0.00741***** 0.000694	**0.00806***** 0.00161	**0.00237** 0.00170	**0.01926** 0.03334	**0.00519***** 0.00108	**0.00299** 0.00175	**-0.01279**** 0.00568 0.0259
Log(Age)	**-0.00507** 0.00212	**0.00320** 0.00453	**0.00393** 0.00321	**0.000924** 0.06612	**0.00856***** 0.00218	**0.00347** 0.00471	**0.05263***** 0.00915
R2	0.2756	0.1391	0.0615	0.0006	0.0635	0.0481	0.2711
R2-adj	0.2719	0.1345	0.0539	-0.0039	0.0618	0.0332	0.2485

*** significant at the 1% level, ** significant at the 5% level, *significant at the 10% level

Table 9 Regression Results Bank Loans and Trade Credits on Profitability including industry dummies (estimate, standard error, prob-value,

	Belgium	Canada	Denmark	France	Germany	Ireland	Italy	NL	Spain	Sweden	UK	US
Intercept	-0.03091	-0.02487	0.05498	0.10545***	0.04072**	1.86713	0.03156	0.02304	0.07214	0.01646	-0.22044	-0.00324
	0.03133	0.04164	0.18744	0.02143	0.02470	0.61284	0.07137	0.02237	0.03122	0.01933	0.38902	0.01288
Trade	-0.07139	0.10349	0.41815	0.01932	0.04672	-18.27163***	-0.20380*	-0.01217	-0.07346**	0.15753**	0.06228	0.03242
	0.04603	0.07663	0.44247	0.02631	0.05108	0.03292	0.12179	0.02463	0.02900	0.06101	0.52384	0.02511
Creditors												
Bank Loans	-0.04884**	-0.02381	0.33479	-0.10949***	0.000181	-0.29475	-0.27998***	-0.08215***	-0.18883***	-0.08123**	-0.08160	-0.10549***
	0.02325	0.05721	0.27128	0.02642	0.000482	0.67481	0.06815	0.01842	0.02602	0.03931	0.30598	0.03262
				<.0001	0.7079							
Size	0.00611***	0.00064	0.00278	-0.00103	-0.00324**	0.10796**	0.00612	0.00598***	0.00404*	0.00035	0.02626	0.0073***1
	0.00152	0.00447	0.01633	0.00122	0.00143	0.04762	0.00481	0.00158	0.00227	0.0023	0.03466	0.00141
Log(Age)	0.00162	0.01199	-0.00912	-0.01022***	0.00127	-0.37061***	-0.00859	-0.00574***	-0.00704	0.00585	0.000731	0.00402**
	0.00525	0.00731	0.03261	0.00326	0.00390	0.13924	0.01228	0.00219	0.00590	0.00379	0.06597	0.00197
D1	0.01452	0.01378	-0.02468	0.00119	0.02897	-0.49399**	0.01693	-0.00801	0.00134	0.00812	-0.09159	-0.01634***
	0.01273	0.01449	0.17521	0.00944	0.01922	0.23695	0.05145	0.01140	0.01208	0.02894	0.46937	0.00455
D2	0.00364	0.00812	0.00061	0.00697	0.01281	-0.01567	-0.01115	0.00471	-0.00507	0.00273	-0.09837	0.01287***
	0.00848	0.01226	0.06475	0.00830	0.00847	0.25449	0.02550	0.00578	0.00987	0.00935	0.32171	0.00425
D3	-0.00962	0.01267	-0.02583	-0.00248	-0.00423	1.81948***	0.02116	0.00268	-0.01068	-0.00655	-0.03037	0.00722**
	0.01294	0.01699	0.05446	-0.43	0.00867	0.46486	0.03013	0.00478	0.00963	0.00762	0.24539	0.00396
D4	0.00485	0.01711	-0.05025	-0.00423	-0.00570	0.75819**	-0.01633	0.00693	-0.01046	-0.03046**	-0.00314	0.01305**
	0.00945	0.01425	0.05259	0.00591	0.01244	0.37063	0.03832	0.00586	0.01115	0.01592	0.34991	0.00627
D5	-0.01809	0.02697	-0.02190	-0.01816*	-0.00361	1.46571**	-0.00629	0.00301	-0.01177	-0.03147***	-0.03643	-0.00187
	0.01658	0.03979	0.07136	0.01059	0.01771	0.66439	0.03501	0.00656	0.01204	0.01154	0.37124	0.0153
D6	0.00315	0.00800	-0.04009	0.00175	0.00106	1.17742***	0.01952	0.00343	-0.00480	-0.01870	0.00832	0.00568
	0.01146	0.01807	0.0528	0.00778	0.01028	0.25090	0.05401	0.00465	0.01399	0.01381	0.21429	0.00471
D7	0.01985	0.00820	-0.00664	-0.04304***	0.00595	-0.49791	0.02229	0.01223	0.00333	-0.02408	0.02074	-0.01602**
	0.01564	0.01605	0.0680	0.01537	0.03732	0.55977	0.05259	0.01063	0.01648	0.01561	0.66851	0.00623
R2	0.2181	0.1213	0.0229	0.2703	0.0111	0.9991	0.0349	0.5690	0.2846	0.2990	0.0014	0.4775
R2-adj	0.1996	0.1000	-0.0035	0.2591	0.0034	0.9990	0.0191	0.5624	0.2731	0.2823	-0.0120	0.4746

*** significant at the 1% level, ** significant at the 5% level, *significant at the 10% level

Table 10 Regression Results Bank Loans and Trade Credits on MBR including industry dummies (estimate, standard error, prob-value)

	Belgium	Canada	Denmark	France	Germany	Ireland	Italy	NL	Spain	Sweden	UK	USA
Intercept	**0.33641***** 0.08045	**0.00129***** 0.00022987	**0.03924** 1.54940	**0.00107** 0.00249	**0.00338**** 0.00147	**-0.000513** 0.00335	**0.000953***** 0.000106	**0.56836***** 0.06979	**0.00083***** 0.000188	**0.00113** 0.000928	**0.00726***** 0.00083	**0.00278***** 0.000901
Trade Creditors	**0.50450***** 0.12085	**0.000909**** 0.000536	**-5.72864** 4.58740	**-0.01198***** 0.00334	**-0.00717**** 0.00287	**0.03311***** 0.000138	**-0.000392**** 0.000181	**-0.04792** 0.10598	**-0.00061***** 0.000195	**0.00106** 0.00362	**-0.00165*** 0.000986	**0.00101** 0.00179
Bank Loans	**-0.05991** 0.05749	**-0.00152***** 0.000386	**-1.17361** 2.29316	**0.00167** 0.00313	**0.000005** 0.000027	**-0.00245** 0.00337	**-0.000444***** 0.000095	**-0.25544***** 0.08168	**-0.000508***** 0.000152	**-0.000648** 0.00204	**-0.00227**** 0.00099	**-0.00188** 0.00219
Size	**-0.01205***** 0.00406	**-0.000103***** 0.000023	**-0.20945** 0.13851	**0.000734***** 0.000157	**0.000194**** 0.000084	**-0.000545**** 0.000235	**-0.000044***** 0.000007	**-0.03198***** 0.00489	**0.000009** 0.000013	**-0.000029** 0.000118	**-0.000451***** 0.000076	**0.000088** 0.000098
Log(Age)	**-0.04967***** 0.01421	**0.000058** 0.00004488	**0.44476*** 0.26515	**-0.00226***** 0.000352	**-0.00101***** 0.000223	**0.00150*** 0.00082879	**0.000029*** 0.000017	**-0.01399** 0.00873	**-0.00003** 0.000036	**-0.000089** 0.000175	**-0.000135** 0.000137	**-0.000547***** 0.000136
d1	**-0.01138** 0.03535	**-0.000095** 0.000098	**1.05578** 2.04305	**-0.00222** 0.00145	**-0.00018** 0.00107	**0.00316***** 0.00115	**0.000542***** 0.000074	**-0.06952** 0.0626	**-0.000107** 0.000073	**-0.00011** 0.00141	**-0.000623** 0.000758	**-0.000641**** 0.000292
d2	**0.00728** 0.02375	**0.000254***** 0.000103	**1.23163** 0.77149	-0.000759 0.00126	**0.000649** 0.000475	**0.000389** 0.00106	**-0.000035** 0.000036	**-0.04391** 0.03039	**0.000024** 0.000066	**0.000341** 0.000478	**0.00072** 0.000533	**0.000055** 0.000266
d3	**-0.00363** 0.03533	**0.000045** 0.000135	**1.11047*** 0.66495	**0.00266***** 0.000842	**0.000235** 0.000481	**-0.000721** 0.00202	**0.000039** 0.000042	**-0.06214*** 0.02624	**-0.000173**** 0.000069	**0.000262** 0.0004	**0.000186** 0.00043	**-0.0004** 0.000251
d4	**-0.01444** 0.02720	**-0.000039** 0.0001	**1.85100***** 0.64495	**0.000212** 0.000933	**0.000585** 0.000691	**-0.00103** 0.00170	**-0.000119**** 0.000053	**-0.02491** 0.03096	**-0.000009** 0.00007	**-0.000349** 0.000724	**-0.00022** 0.00056	**-0.000251** 0.000392
d5	**0.09943**** 0.0443	**-0.000051** 0.000294	**1.03409** 0.90939	**0.000172** 0.00158	**0.00155** 0.000983	**-0.00106** 0.00273	**-0.000132***** 0.000051	**-0.04082** 0.03309	**-0.000162**** 0.000078	**-0.000271** 0.00061	**-0.00023** 0.00068	**-0.000780** 0.00110
d6	**0.12317***** 0.03085	**-0.000217** 0.000139	**1.38133**** 0.63027	**-0.000944** 0.00110	**0.00434***** 0.000571	**-0.00095** 0.00111	**0.00019***** 0.000076	**-0.04962***** 0.02602	**0.000186*** 0.000096	**0.000091** 0.000659	**0.00035** 0.00036	**-0.000229** 0.000298
d7	**0.0623**1 0.04644	**-0.000249** 0.000133	**6.25105** 0.86762	**-0.00289** 0.00208	**-0.00157** 0.00218	**-0.000092** 0.00273	**0.000174** 0.000079	**-0.06383** 0.05502	**-0.000266** 0.00001	**-0.000323** 0.000869	**0.000544** 0.00109	**-0.000968** 0.000394
R2	0.1747	0.5025	0.2017	0.1098	0.1165	0.9947	0.5524	0.0872	0.5447	0.0363	0.1418	0.0688
AdjR2	0.1554	0.4903	0.1823	0.0977	0.1095	0.9945	0.5461	0.0738	0.5370	0.0146	0.1315	0.0634

*** significant at the 1% level, ** significant at the 5% level, *significant at the 10% level

Table 11 Results Simultaneous Equations EC3SLS (Estimate, Standard Error, Pr>|t|), Dependent variables Profit before tax and total debt

	Italy	NL	Belgium	Sweden	Denmark	UK	USA	Spain	Canada	Germany	France	Ireland
System Weighted R-Square	0.022	0.5814	0.2902	0.5435	0.2685	0.1255	0.0907	0.5365	0.2192	0.2723	0.3809	0.4988
Dependent Variable Profitability												
Intercept	**0.184805**	**0.039103**	**-0.25351*****	**-0.09716**	**0.068816***	**1.15493**	**-0.03379**	**0.068459***	**-0.10672**	**0.045128**	**-0.16954****	**0.023885**
	0.388112	0.04206	0.080432	0.06487	0.036153	3.679388	0.046359	0.035852	0.066953	0.051314	0.075761	0.0216
Total Debt	**-0.73788**	**-0.53314*****	**0.345757*****	**-0.33853*****	**-0.34955*****	**-16.9141****	**0.032575**	**-0.56299*****	**-0.43764*****	**-0.51192*****	**-0.50842*****	**-0.2938*****
	0.732865	0.037275	0.093138	0.065335	0.088579	8.336933	0.102733	0.039781	0.085637	0.071137	0.095513	0.071628
Size	**0.005663**	**0.011097*****	**0.009168***	**0.028635**	**0.006494**	**0.253071**	**0.002629**	**0.013253*****	**0.036842*****	**0.00946****	**0.02594*****	**0.00601****
	0.029974	0.003572	0.005488	0.00969	0.005587	0.395003	0.007336	0.004221	0.011105	0.004686	0.006991	0.003133
Age	**-0.02938**	**0.001141**	**0.021228****	**-0.00379**	**0.002442**	**-0.46446**	**0.017755*****	**-0.01942*****	**0.011453**	**-0.01571*****	**-0.00582**	**-0.00113**
	0.034045	0.002924	0.009745	0.004029	0.004669	0.341397	0.004542	0.002858	0.007833	0.005755	0.004176	0.008248
Dependent Variable Total Debt												
Intercept	**0.17272**	**0.058296**	**0.158338****	**-0.30886**	**0.097189**	**-0.16794****	**1.052355**	**0.061598**	**-0.05027**	**0.020299**	**-0.37938*****	**-0.03646**
	0.295688	0.075639	0.07003	0.209531	0.088699	0.083607	0.895888	0.061979	0.090691	0.090558	0.115539	0.046206
Tangibility	**0.594676**	**0.027376**	**0.521284*****	**-0.05494**	**0.271835**	**0.117774****	**-0.1936**	**-0.01081**	**0.091166**	**-0.04389**	**0.099073**	**0.388214*****
	0.769745	0.038978	0.077424	0.251062	0.173125	0.053745	0.267031	0.031635	0.070619	0.160367	0.183176	0.056522
MBR	**0.518203**	**-0.0087**	**0.000024**	**-0.00015**	**-9.41E-08**	**0.002371**	**-0.45123**	**0.028223**	**-0.04999***	**0.018217**	**-0.02917**	**-0.02568**
	0.984479	0.024995	0.000091	0.004988	1.02E-06	0.001938	0.37474	0.020223	0.029506	0.012941	0.068671	0.024258
Size	**-0.02115**	**0.020831*****	**-0.00476**	**0.084954*****	**0.018988***	**0.0243*****	**-0.11631**	**0.016584****	**0.0527*****	**0.014883****	**0.050502*****	**0.012246****
	0.042602	0.006026	0.006087	0.033645	0.010551	0.007946	0.099501	0.007069	0.016509	0.00683	0.008925	0.005532
Profitability	**-0.83598**	**-1.63205*****	**0.823656*****	**-2.90169*****	**-2.09233*****	**-0.02118*****	**9.725999****	**-1.65006*****	**-0.7493*****	**-1.5528*****	**-1.48948*****	**-0.44264**
	0.585453	0.143913	0.174522	0.923012	0.452445	0.007407	4.214601	0.124981	0.218709	0.257097	0.368284	0.614844

***** significant at the 1% level, ** significant at the 5% level, *significant at the 10% level**

Table 12 Results Simultaneous Equations EC3SLS (Estimate, Standard Error, Pr>|t|), Dependent variables MBR and total debt

	Italy	Belgium	Sweden	Denmark	UK	USA	Spain	Canada	Germany	France	Nl	Ireland
System Weighted R-Square	0.0577	0.2706	0.2308	0.3351	0.3074	0.1733	0.277	0.2425	0.3263	0.4445	0.3019	0.3923
Dependent Variable MBR												
Intercept	**-0.2031**	**0.209631*****	**1.263423**	**9.82032*****	**6.982917**	**2.513592*****	**0.27023**	**0.645565**	**1.563014****	**-0.91678***	**0.644317****	**-3.17985*****
	0.253606	0.078023	2.408578	2.540645	4.536511	0.459049	0.223807	0.41064	0.620632	0.501991	0.320014	1.136516
Total Debt	**0.218569**	**0.006955**	**5.033250****	**-4.43274****	**40.20909*****	**-1.51044***	**1.00607*****	**-2.53709*****	**7.028393*****	**-3.49952*****	**-1.932*****	**-4.35076****
	0.457588	0.097699	2.028078	2.079443	8.83766	0.811169	0.381801	0.528633	0.927797	0.595338	0.356918	1.694369
Size	**0.024684**	**-0.00897**	**-0.20057**	**-0.83614*****	**-0.99299****	**-0.19994*****	**-0.0374**	**0.137835****	**-0.10427****	**0.178858*****	**0.019285**	**0.517543*****
	0.01973	0.005507	0.262983	0.313712	0.465465	0.06751	0.028153	0.068162	0.058127	0.045716	0.02768	0.153337
Age	**0.044575****	**-0.01439**	**0.035783**	**-0.33048**	**-0.02196**	**0.048714**	**0.096412****	**-0.0831***	**-0.29822*****	**-0.00324**	**0.035596**	**0.058431**
	0.019894	0.009970	0.208029	0.391118	0.395134	0.05621	0.04313	0.048393	0.085783	0.024502	0.032131	0.046422
Dependent Variable Total Debt												
Intercept	**0.27167**	**0.156767*****	**0.422334****	**0.155377***	**-0.19792*****	**1.16198**	**-0.00177**	**0.01814**	**-0.16044****	**-0.29284****	**0.063596**	**-0.75811****
	0.29165	0.037484	0.209507	0.080412	0.081488	1.035639	0.065952	0.090781	0.072969	0.113499	0.078665	0.301522
Tangibility	**0.767659**	**0.512535*****	**0.085884**	**0.159904**	**0.068682**	**0.004424**	**-0.0337**	**0.076563**	**0.34198****	**0.057255**	**0.078282**	**0.092764**
	0.710124	0.038014	0.137197	0.115885	0.059593	0.372028	0.079546	0.071181	0.181348	0.155346	0.056335	0.165245
MBR	**1.509722***	**-0.05398**	**-0.00469**	**0.009685*****	**0.013369*****	**-0.42671**	**0.15306****	**-0.11908*****	**0.091563*****	**-0.24221*****	**-0.09544*****	**-0.24468****
	0.885704	0.032869	0.008748	0.002971	0.001819	0.347527	0.049272	0.029736	0.012102	0.058141	0.036225	0.103241
Size	**-0.05678**	**0.00538***	**-0.00400**	**0.022449****	**0.026564*****	**-0.09933**	**0.018041****	**0.046664*****	**0.017238*****	**0.050747*****	**0.019082*****	**0.122857*****
	0.039671	0.003194	0.016983	0.010458	0.007692	0.128852	0.007902	0.016557	0.006379	0.008826	0.006044	0.036172
Profitability	**-0.46208**	**-0.33609*****	**-3.86412*****	**-2.55070*****	**0.002447**	**3.215541**	**-1.36204*****	**-0.33609**	**-0.0407**	**-0.12337**	**-0.9198*****	**0.463211**
	0.532492	0.126905	1.086996	0.196922	0.006705	6.359668	0.206368	0.220365	0.237616	0.312463	0.196321	1.247853

*** significant at the 1% level, ** significant at the 5% level, *significant at the 10% level

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Profits and the provision of trade credit

An empirical note

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Abstract

The theoretical model by Brennan, Maksimovic and Zechner (1988) predicts that, ceteris paribus, the extension of trade credit in situations with a variety of market structure increases profits compared to a situation without extension of trade credit. Using a large panel data set of both European and American companies, this paper tests whether there is a positive relation between the extension of trade credit and the firm's profitability as measured in market values and book values. The findings are that the relation is indeed positive in most of the countries corroborating the price-discrimination theory of trade credit.

Keywords: Provision of Trade Credit, Firm Performance, Panel Data

JEL Classifications: G332, G30, C23

1 Introduction

After a series of articles Hammes (1998), Hammes (2000a), Hammes (2000b) dealing with the use of trade credit as a financing device we turn in this article to the extension of trade credit, that is lending by the vendor, and its effect on the vendors profitability.

Here we focus on the theory developed by Brennan, et al. (1988) henceforth BMZ, according to which trade credit is a means of price discrimination. An important feature of this model is the integration of the supply side as well as the demand side by modeling both market structure and asymmetric information. An important prediction of this model is that the profit of a firm without vendor financing is less than the profit with vendor financing. This hypothesis is easily testable empirically.

We employ a sample of 2143 firms covering 12 industrialized countries to test the prediction made by BMZ; do firms that extend more trade credit have higher profits than firms that extend little or no trade credit? An important feature of this study is the use of a panel data approach employing up to eight years of data per firm as opposed the still very common cross-sectional approach

In the next chapter, the BMZ-model and it's basic assumption will be presented. Chapters 3, 4 and 5 will present the data set employed, present the variables used and give some descriptive statistics. The results of the regressions will be presented in chapter 6 followed by some conclusions.

2 Trade credit as means of price discrimination

Schwartz and Whitcomb (1978) argue that trade credits are used when explicit price discrimination is not allowed due to legal restrictions. They suggest that if firms with higher cost of capital have higher demand elasticity, it is profitable for a supplier to charge them a lower price. Trade credit is a way to achieve this lower price in the presence of legal restrictions. Kiholm Smith (1987) develops a model of informational asymmetry where trade credit works as a screening device for default probability.

BMZ extend both Schwartz and Whitcomb (1978) and Kiholm Smith (1987) by incorporating both different market structures on the supply side of trade credit as well as asymmetric information on the demand side with different types of buyers with different probabilities of default. Other theories on trade credits were for example developed by Ferris (1981). Those theories (see for example Hammes (2000a) for a brief survey) are however not the subject of this paper.

The model by BMZ relies primarily on a lack of competition in product markets combined with adverse selection. Hence, price discrimination becomes possible and lucrative. In a first step they show how a monopolist uses credit terms to price discriminate between cash and credit customers by setting credit terms that are attractive to the latter but not the former. The important difference between the groups is their reservation price.

In the following, the basic features of this model with a monopolist supplier, a bank, and two classes of buyers, will be presented.

2.1 A model with two Farmers, a Bank and a Manufacturer

2.1.1 Farmers

There are two classes of farmers, poor and rich distinguished by their reservation prices R_r, R_p respectively with $R_r > R_p$. Both types of farmers can buy a tractor, but the tractor is more productive in the hands of a rich farmer[1]. Poor farmers have only the tractor and the returns from tracto,r but no cash; the rich farmer has cash, the tractor and the return from the tractor. Each farmer demands exactly one single tractor.

The return on the tractor is either high or low with equal probability:

$$R = \begin{cases} \mathrm{R_i} + \mathrm{h} \\ \mathrm{R_i} - \mathrm{h} \end{cases}, \text{ i=(rich, poor)}$$

The variable costs v are assumed to be less than the return on the tractor for the poor farmer, $v < R_p$. Furthermore N_i is defined as the number of farmers in each group

[1] There is no reasonable explanation given, one explanation might be that rich farmers have better soil.

2.1.2 Bank

The bank charges interest r(C) on he tractor's cash price C. Since the bank must break even on loans the following must hold:

$$(1)\ \ r(C)=\begin{cases} 0 \ \ \text{if } C \le R_p\text{-h} \\ 1\text{-}(R_p\text{-h})/C \text{ if } R_p\text{>}C\text{>}R_p\text{-h} \end{cases}$$

For the poor farmer to buy the tractor the following condition must be fulfilled:

$$(2)\ \ C(1+r)\ \le\ R_p\text{+h}$$

From (1) and (2) together it follows that $C \le R_p$, $C \le R_r$.

2.1.3 Manufacturer

Here we have to distinguish between two cases: either the manufacturer makes vendor financing available to the farmers or not.

In the case of no trade credit the manufacturer can set $C=R_p$ in which case he sells to both classes of farmers and if he sets $C=R_r$ then he only sells to the rich. If we assume that the relative numbers of both classes and their reservation prices make it optimal to sell to both groups of farmers we can write the manufacturer's profit as:

$$(3)\ \ p(C)=(N_p+N_r)(R_p\text{-v})$$

If the manufacturer decides to compete with the bank and offers trade credit at the interest rate r* the manufacturer's profit as a function of the cash price C and the interest rate (assuming again that it is optimal to sell to both groups of farmers) becomes:

$\pi(C, r^*)=N_r(C\text{-v})+(N_p/2)(C(1+r^*)+R_p\text{-h-2v})$, which is fulfilled if $R_r \le R_p + h + \frac{N_p}{N_r}\ (R_p\text{-v})$

In general, the manufacturer's maximization problem can be written as:

(4) $\max_{c,r^*} \pi(C, r^*)$

s.t.

(5) $C(1+r^*) \leq R_p+h$, the discounted price is less than the poor farmer's return on the tractor.

(6) $C \leq R_r$, the price charged is lower than the rich farmer's reservation price, and

(7) $r^* \geq 0$, a negative interest rate would be equivalent to a reduction of the cash price and would induce even rich farmers to seek vendor financing.

Two cases depending on whether equation (7) is binding or not have to be distinguished.

Case A: Non-binding

In this case, the manufacturer will set $C=R_r$ and charge the highest interest rate consistent with (5) $r^*(R_r)=(R_p+h)/R_r-1$.

Thus we obtain the vendor's profit as:

(8) $\pi(R_r,r^*)=N_r(R_r-v)+N_p(R_p-v)$

The rate of return on vendor financing given by $Rp/Rr - 1<0$ keeps the banks from competing, and the positive contractual rate is sufficient to deter rich farmers. In this case, the manufacturer will be extracting the poor farmers' entire surplus, since the positive interest rate will induce rich farmers to pay cash.

Case B: $R_r>R_p+h$, the interest rate constraint is binding

In this case, it is not possible to sell to rich farmers at their reservation price without charging them a negative interest rate. The optimal price and interest rate are given by $C=R_p+h$, $r^*=0$ and thus the manufacturer's profit is:

(9) $\pi(R_r+h, 0)=N_r(R_p+h-v)+N_p(R_p-v)$

In this case, the vendor will not be able to extract the farmers' surplus since he cannot separate the two groups. Again, banks won't compete since $Rp/(Rp+h) - 1 < 0$.

Comparing the case without vendor financing (3) with the cases (8) and (9) with vendor financing, we see that (3) is always dominated. In other words, vendor financing increases the manufacturers profitability.

In the second and third step BMZ show how adverse selection in credit market due to heterogeneous credit customers is sufficient for price discrimination and hence for vendor financing to occur and they also show how oligopolistic supply can be integrated instead of a monopolistic supplier.[2]

The supplier can use credit either as a way to subsidize its supply or it could be used for clients that would otherwise not receive credit from a bank. Trade credit effectively reduces the price to low quality borrowers since, as opposed to bank debt, terms are normally independent of buyers' quality. The latter's interest rate normally reflects the all the risk characteristics of the buyer. Risky buyers – as opposed to good risks – will prefer trade credit to other sources of financing. Thus, trade credit is a way to reach customers that would otherwise not be able to buy a certain product. The profit with extension of trade credits dominates profits without extension. The testable hypothesis from the following:

Hypothesis: Ceteris paribus, the provision of trade credit increases companies' profitability.

The model and hypotheses presented do not include all variables affecting capital structure. This would for example imply that companies would extend infinite amounts of trade credits to maximize profits. Of course, there are limits to the use of credits. The theory predicts that an individual firm ceteris paribus should obtain better performance by giving more loans, but it does not follow that firms, which extend more credit automatically perform better.

[2] For the presentation of the model with adverse selection and an oligopolistic market, structure the reader is referred to the appendix.

Many factors affect profitabilty and the link between profiability and the ectension of trade credit. In the case of trade credit, the effect within a certain industry will depend on the ability of the supplier to pricediscriminate, the larger the degree of price discrimination is, the larger are the profits from extending trade credit. However, there exists a certain optimum from the lender's point of view, if price discrimination is impossible the lender will not provide vendor financing. Furthermore, increasing the amount of trade credit extended will increase the lenders' risk of bankruptcy due to credit losses and the extension of trade credit would affect the profitability of the lender negative above an optimal level limiting the supply of trade credit.

In addition, borrowers only have a limited amount of profitable projects to be financed by either debt or equity. Therefore, the demand for credit is limited by the availability of these profitable projects. A further problem is the fact that the probability of default on the borrowers' side increases with the increasing use of trade credit and would thus affect the profitability of the lender negative above a certain optimum. The number of profitable projects might vary between industries; older industries might have fewer new and profitable projects compared to young industries. Hence, total trade credit is limited from both the supply and the demand side.

In the case of trade credit the effect within a certain industry will also depend on the ability of the supplier to price discriminate and to vary credit terms. The greater the degree of price discrimination the larger the profit from trade credit through price discrimination. However, even here exists a certain optimum from the lender's point of view, if price discrimination is impossible the lender will not discriminate by providing vendor financing.

Firms in different industries have different optima and therefore we need to control for industry in the empirical tests. The basic problem is that firms are expected to choose an optimal proportion of different kinds of loans and other financial arrangements. The question is whether firms that optimally choose a relatively large supply of trade credits also are the firms with relatively high performance. Different industries have different optima. Different industries have different numbers of profitable projects and different numbers of potential borrowers and lenders. We can also expect different degrees of price discrimination in different industries. Firms with the highest profits have the largest degree of price discrimination given industry; the more price discrimination is possible the better the firm. In a cross section of firms' we expect firms extending more trade credit to be relatively more profitable, when controlling for industry differences.

3 Description of Variables

3.1 Firm Performance[3]

The first problem to be solved is the choice of profitability measure. The first decision to be made is whether to use a market based performance measure such as Tobin's Q or related measures or measures derived from accounting date such as operating profits, return on investment, etc. Looking at the model leads us to abandon a market-based measure since the model presented above is clearly expressed in terms of profit as revenue minus cost and not in terms of firm value.

One possible measure would be the return on sales or simply the profit margin. But as Majumdar and Chibber (1999) point out, this measure lacks a link with either agency or governance influences, since this measure neglects the investment dimension present in the agency literature. They therefore settle for return on net worth[4] as the appropriate measure of profitability.

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[3] See among others for a discussion Mehran (1995).
[4] Net Worth=Total Assets-Total Liabilities.

However, in most of the capital structure studies, including Chen and Hammes (1997), Rajan and Zingales (1995) or Gleason, et al. (2000) some measure of return on assets as in e g, either using profit after or before tax adjusted by depreciations and tax, is used as the appropriate measure, which seems to provide the above-mentioned link with either agency or governance influences as well. Therfore, this is the measure used in this study. Alternatively, the profit margin was tested with less than satisfying results.

3.2 Trade Credit

To capture the degree of price discrimination explaining the relationship between the extension of trade credit and profitability we use the balance sheet position of trade debtors, which is explicitly provided by Extel. In so far we follow most of the existing literature, see for instance Deloof and Jegers (1999) and Petersen and Rajan (1996).

3.3 Size

This variable is as the other following variables an important control variable. The size of a company as measured by the logarithm of turnover is one of the few variables relatively immune to different accounting standards. Large firms might have higher profitability due to economies of scale or increased market power, but on the other hand firms' complexity increases with size and thus the cost of coordinating economic activity, information and transaction costs increase. So size might actually be detrimental to profits.

3.4 Age

Age is an important determinant of firm performance even though it is not entirely clear what the relation really is. A standard finding is that very young and very old firms tend show inferior performance, the young firms due to the fact that enormous amounts of money are needed to grow and to establish in the markets, while old firms simply run out of ideas and are additionally selling in mature markets with tough competition. On the other hand older firms might be more profitable due to economies of scope. No prediction on the sign of age is made.

3.5 Industry

In order to control for industry specific effects on performance single digit SIC-codes are included in the regressions. The SIC codes are obtained from Extel/ Discovery. In cases of multiple SIC codes the code determined as the main code by the database Amadeus is chosen. Of course restricting the analysis to the first—digit is quite coarse but going to deeper levels and/ or including secondary SIC codes would lead to results impossible to interpret and an extreme loss of degrees of freedom.

3.6 Country-market conditions

The results of the estimation are surely affected by the individual situation in each country and the predominant market conditions. By estimating the model for each country separately we put no restriction on the estimates, especially the intercept can vary freely which is preferable to using dummy variables for each country. The market conditions are not explicitly modeled since it is almost impossible to analyze these conditions for 12 countries and 6 different main industrial sectors. However, market structure is important for the effect of trade credit extension, in a situation of perfect competition the additional profits generated by the extension of trade credits are probably competed away. By estimating the model seperately for each country, we include the possibility of differences in market structures. Unfortunately, the model by BMZ is quite about this case.

The final equation to be estimated for each country is of the following type:

$$\text{Profit}=\text{a}+\beta_1\text{Trade Debtors }+\beta_2\text{Size}+\beta_3\text{Age}+\sum\gamma_{\text{Industry}}$$

4 The Data

The data stems from the Financial Times Database Extel and from its successor Discovery. It contains comprehensive information on over 12000 listed companies all over the world. Complete balance sheets, profit loss accounts and daily company news as well as share prices etc are provided. All chosen firms fall into EXTEL category “C” which stands for commercial, industrial and mining companies that are comparable according to normal standards.

The unbalanced panel contains firm level data from 1990 to 1997, and in total 2143 firms from 12 countries. A definite problem is the fact that only listed firms and not even all listed firms are to be found in the EXTEL database. With regard to trade credits, a sample selection bias is introduced since listed firms are normally the largest ones in a country and might therefore not be representative for the whole economy. One problem with the data provided by Extel/Discovery is the entry of firms into the dataset. Some old firms are included into the data later then others without a reasonable explanation. At least the exit of firms is not a problem; it is well documented in Extel and Discovery. Fortunately, almost all exits of firm are due to mergers and not due to bankruptcy. The later might distort our results otherwise.

5 Empirical Analysis

5.1 Descriptive Statistics

To begin with, the sample is described using simple statistics presented in Appendix 1.

Insert Table 1

With regard to bank loans, the US represents – as expected – the lower end with a share of bank loans of 0.01 or 1% of total assets, while the other extreme is marked by Belgium with an average of 0.152 or 15.2%. The other countries lie somewhere in between with Canada (0.048) and Sweden (0.0366) close to the US while the United Kingdom (0.1405) lies surprisingly close to Belgium. Germany as a well-known example for a bank-oriented system lies close to the top with 14.65%.

Trade debt (ranging from 4% to 30%(!) of total assets) and trade credit (ranging from 7.9% to 22.59% of total assets) have in all countries a significant share of the balance sheet.
Again, in both positions the USA mark the lower bound, a finding consistent with the picture of a large and well-developed capital market. Firms in the United States seem to have other, cheaper sources of finance at hand.

Looking at profitability as measured by EBITDA we find that the Netherlands and the USA take the top position with about 14% while we find Swedish firms at the lower end with only a little bit more than three percent. In the other countries, profitability is around 10% on average.

The variation for (unadjusted) total debt is surprisingly small between the different countries, ranging from a lowest level of 0.2099 to a maximum of 0.3057, ignoring Irelands 1.1991, which is a real value but distorted by on outlier.

5.2 Estimation

In the estimation procedure, we take full advantage of the fact that we have access to a - though unbalanced - panel data set.[5]

In matrix notation we can write:

$y_{it}=\beta_o+\beta_1 x'_{it} + u_{it,}$

Here u_{it} is a random term and $u_{it}=\mu_i+\nu_{it}$, where μ_i are firm specific effects and ν_{it} is a random term.

In panel data the OLS regression estimates are still consistent, but not efficient, the estimates of the standard errors are biased. Depending on the underlying assumptions the model(s) can be estimated as fixed effects (FE) or random effects (RE). In FE, μ_i and ν_{it} are fixed parameters and are estimated together with the other parameters. The explanatory variables x_{it} and μ_i are assumed to be uncorrelated $E(x_{it}|\mu_i) \neq 0$ and ν_{it}~iid $(0,\sigma_v^2)$. In the RE-model chosen here, μ_i and ν_{it} are random with known distribution. We are interested in the parameters associated with the distribution, i. e. μ_i~iid $(0,\sigma_v^2)$, $\lambda_t \approx (0,\sigma_\lambda^2)$, $\nu_{it} \approx (0,\sigma_v^2)$. The variance components, σ_v^2, σ_i^2, σ_μ^2 and are used to transform the data. The variance components σ_μ^2 and σ_v^2 have to be estimated. First consistent estimates of the variance components are obtained which are then used to transform the variables.

[5] Baltagi and Chang (1994) show that it is more efficient to use the whole unbalanced dataset instead of making the dataset balanced by cutting of excess data.

In the second step, OLS on the transformed variables is applied. OLS on transformed data is feasible GLS. FGLS does not rely on time (T) going to infinity while the Least-Square Dummy Variables (LSDV) relies on T increasing for consistency.[6] One can test the significance of μ_i and λ_t and the validity of RE or FE models by checking the F value.

5.3 Results

The results can be divided into three groups. In the first group of countries, we find a significant relation between the extension of trade credit and profitability. In this group, we find Canada, USA, Ireland, Sweden, and the Netherlands with parameter estimates for trade debtors ranging from 0.0798 (NL) to 0.23207(Canada). In the second group, consisting of Denmark, France, Germany, Italy, Spain and the UK the results are not significant and quite small even though positive in all cases but Denmark and Spain. The results for the second group might be partially explained by strong bank relationships alleviating the problem of asymmetric information. However, the UK is usually seen as a market-oriented economy. Thus, another possible explanation might be differences in market structure; the latter group might enjoy more competition among suppliers of trade credits than the former. In this case, the US does not fit the picture, unless markets in the US are less competitive than usually assumed. The third group, consisting only of Belgium, is marked by a negative effect of the extension of trade credit on firms' profitability. Here the question must be raised, why firms do extend trade credit.

Insert table 2

Our control variables are mostly insignificant for all countries except for the US where we find a significantly positive size-effect and some positive industry effects for D1 (negative) D2 (positive).

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[6] Greene (2000) pp.575.

6 Conclusions

This paper analyses the empirical evidence for the price discrimination theory of vendor financing by Brennan, Maksimovic and Zechner. Some empirical support for the price discrimination theory of trade credit is found. In most of the countries apart from Belgium, Denmark, and Spain, the provision of vendor financing has a positive impact on the vendors' profitability and in at least five countries, this impact is not only positive but also highly significant.

One reason for these inconclusive results might be the fact that the theory does not include market structure on the demand side. If the suppliers of trade credits act on the perfectly competive markets, the surplus generated by the extension of credit might be competed away still keeping the banks out. In addition, a monopolistic or oligopolistic demand might lead to the partial or total extraction of the suppliers surplus. Another reason might be In order to understand what the case is; a study of the vendor finance relations including market-structure analysis would be required.

Appendix 1 Sample statistics and regression results

Table 1 Sample Statistics (Mean, Standard deviation, Minimum, Maximum)

	Belgium	Canada	Denmark	France	Germany	Ireland	Italy	NL	Spain	Sweden	Uk	US	Hungary	Poland
Size	12.6485	7.1852	6.8931	14.2016	13.4639	10.3994	12.7173	13.2788	10.5288	8.4904	10.8811	8.1087	9.9943	4.6588
	2.5715	1.7177	1.5788	2.3369	2.1842	2.6097	2.4190	2.0078	1.6531	1.7661	2.3023	1.4303	2.9915	1.3627
	2.5572	-2.8134	2.8007	5.3279	5.8319	0.6931	-0.2472	4.0604	2.7147	-0.5108	0.0000	1.4670	4.4796	0.2963
	17.2156	10.4100	10.0564	19.2653	20.6633	14.9827	19.5240	18.3651	14.9559	14.9827	16.1550	14.9827	16.9509	7.7107
EBITDA	0.0935	0.1071	0.0999	0.1035	0.1094	-2.8482	0.1029	0.1450	0.2373	0.0144	0.5883	0.1398	0.0915	0.1726
	0.1100	0.1500	0.3123	0.1016	0.1998	50.9236	0.3143	0.0898	3.2001	0.1658	6.9284	0.1074	0.1057	0.1666
	-0.9120	-1.4678	-6.2170	-0.3697	-2.9052	-898.0000	-5.8910	-0.3675	-0.5489	-2.9052	-2.9052	-2.9052	-0.3864	-0.1950
	0.4455	0.9780	0.6162	0.9730	1.9059	0.2957	2.5032	0.6062	87.3067	0.3456	132.8956	0.6755	0.6573	1.2692
Bank	0.1521	0.0463	0.0605	0.0784	0.0692	0.1371	0.0997	0.1034	0.1203	0.0448	0.1351	0.0128	0.0584	0.0277
Loans	0.1547	0.0942	0.0987	0.1012	0.0817	0.1540	0.1359	0.1245	0.1351	0.0884	0.2566	0.0487	0.1044	0.0698
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.7502	0.6686	0.5625	0.7084	0.5426	0.9804	0.9458	0.6108	0.9139	0.5276	3.5641	0.9115	0.5206	0.5354
Trade	0.1044	0.0478	0.0891	0.1578	0.0867	0.2632	0.1411	0.1281	0.1273	0.0901	0.1561	0.0598	0.0942	0.0542
Debt	0.0915	0.0705	0.0588	0.1065	0.0638	2.8026	0.0879	0.0959	0.1210	0.0604	0.1508	0.0654	0.0952	0.0805
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.5181	0.4270	0.3561	0.5944	0.4305	49.5000	0.5601	0.7065	0.7533	0.3836	0.9190	0.8451	0.5341	0.3979
Trade	0.1519	0.0784	0.1781	0.2291	0.1653	0.1072	0.1948	0.2150	0.1960	0.1726	0.2074	0.0803	0.1051	0.0458
Credit	0.1399	0.0825	0.0981	0.1370	0.1207	0.1275	0.1226	0.1452	0.1579	0.1007	0.1607	0.0972	0.1304	0.0956
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.8332	0.4498	0.5768	0.6373	1.1639	1.5000	0.6127	0.7535	0.7372	0.5520	0.8425	0.7462	0.9946	0.4475
Lage	4.0747	3.6780	3.9870	3.7465	4.2557	3.0908	3.8928	3.7852	3.7709	3.6960	3.0202	3.5578	3.3987	3.5824
	0.7161	0.8162	0.7697	0.9658	0.8057	0.8892	0.7606	1.0958	0.6011	1.0018	1.1964	0.8872	1.1687	1.0279
	1.7918	1.0986	1.0986	0.0000	0.0000	0.6931	0.0000	0.0000	1.0986	0.0000	0.0000	0.0000	0.0000	0.6931
	5.4027	4.7707	5.3230	5.7746	5.6802	4.6347	5.0239	5.8435	4.7536	5.8861	4.7362	5.0370	5.6664	5.0039
Total	0.2344	0.2764	0.3057	0.2099	0.1999	1.1991	0.2720	0.2200	0.2134	0.2523	0.2034	0.2570	0.1589	0.0377
Debt	0.1756	0.1672	0.8765	0.1389	0.1849	17.4265	0.1671	0.3557	0.1658	0.2097	0.3140	0.1691	0.1757	0.0787
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.8136	0.9083	18.4070	0.7787	1.3429	307.5000	0.9458	6.4734	0.9139	2.4190	4.1306	2.9131	1.8928	0.5354
Profit	0.0355	0.0316	0.0300	0.0463	0.0766	-2.9079	0.0133	0.0777	0.0340	0.0366	0.0759	0.0731	0.0528	0.1290
Before	0.0946	0.1468	0.4456	0.0916	0.1587	51.3185	0.2910	0.0841	0.1022	0.1529	2.3241	0.1078	0.0972	0.1056
Taxes	-0.9240	-1.4399	-9.1632	-0.5624	0.0000	-905.0000	-7.0112	-0.4525	-0.6636	-2.9865	-34.7853	-2.9865	-0.3908	-0.1950
	0.3181	0.5126	0.4853	0.6856	3.5828	0.2292	1.5026	0.4876	0.8237	0.3547	36.9714	0.5144	0.5833	0.5438

Table 2 Regression Results Profit before tax as dependent variable (Estimate, Standard Error, t-value, ***significant at 1%, **significant at 5% *significant at 10%)

	Belgium	Canada	Denmark	France	Germany	Ireland	Italy	NL	Spain	Sweden	Uk	US
Intercept	-0.04989	-0.00615	0.00147	0.07434***	0.06493	0.03356	-0.02706	-0.04037**	0.04302	0.00239	-0.22288	0.00147
	0.03049	0.03600	0.15742	0.02150	0.04555	0.02585	0.08348	0.02105	0.03454	0.02103	0.42562	0.01213
	-1.64	-0.17	0.01	3.46	1.43	1.30	-0.32	-1.92	1.25	0.11	-0.52	0.12
Trade	-0.07082**	0.23207***	-0.02546	0.00243	0.0002259	0.11947***	0.05408	0.07498***	-0.00452	0.10236***	0.15785	0.08578***
Credit	0.03191	0.06516	0.21948	0.02157	0.04128	0.03366	0.08445	0.01635	0.02363	0.03378	0.51238	0.01579
	-2.22	3.56	-0.12	0.11	0.01	3.55	0.64	4.59	-0.19	3.03	0.31	5.43
Size	0.00692***	-0.00118	0.01294	0.00022046	-0.00351	0.00128	0.00614	0.00799***	0.00323	0.00061735	0.02297	0.00644***
	0.00153	0.00421	0.01258	0.00118	0.00253	0.00185	0.00532	0.00157	0.00238	0.00230	0.03914	0.00131
	4.53	-0.28	1.03	0.19	-1.39	0.69	1.15	5.09	1.36	0.27	0.59	4.90
Age	0.00267	0.00769	-0.00463	-0.00783**	-0.00237	0.00231	-0.01203	-0.00329	-0.00864	0.00525	0.0008236	0.00311*
	0.00526	0.00722	0.02503	0.00329	0.00674	0.00342	0.01276	0.00230	0.00649	0.00395	0.07119	0.00178
	0.51	1.07	-0.18	-2.38	-0.35	0.67	-0.94	-1.43	-1.33	1.33	0.01	1.75
D1	0.01658	0.01328	-0.04673	0.00066354	0.04371*	0.00190	0.04765	0.00328	0.00891	0.00848	-0.05855	-0.00989***
	0.01260	0.01400	0.19065	0.00945	0.02407	0.00550	0.05197	0.01141	0.01118	0.02672	0.48932	0.00374
	1.32	0.95	-0.25	0.07	1.82	0.35	0.92	0.29	0.80	0.32	-0.12	-2.64
D2	0.00504	0.00245	0.00889	0.00512	0.04867***	0.00394	-0.01196	0.00046981	0.00070280	0.00742	-0.08907	0.00806**
	0.00832	0.01165	0.08447	0.00832	0.01414	0.00554	0.02611	0.00567	0.00917	0.00880	0.33217	0.00344
	0.61	0.21	0.11	0.61	3.44	0.71	-0.46	0.08	0.08	0.84	-0.27	2.34
D3	-0.00844	-0.01162	-0.02531	0.00008427	-0.0002737	-0.00394	0.01794	0.00492	-0.00708	-0.00169	-0.02601	0.00200
	0.01288	0.01598	0.07659	0.00567	0.01284	0.00809	0.03205	0.00477	0.00917	0.00730	0.25672	0.00324
	-0.66	-0.73	-0.33	0.01	-0.02	-0.49	0.56	1.03	-0.77	-0.23	-0.10	0.62
D4	0.00422	0.01550	-0.01222	-0.00246	0.01479	0.00744	-0.01631	0.00675	-0.00054612	-0.01655	0.00655	0.01218
	0.00942	0.01367	0.07494	0.00588	0.01955	0.00629	0.03955	0.00570	0.01016	0.01501	0.36525	0.00520
	0.45	1.13	-0.16	-0.42	0.76	1.18	-0.41	1.18	-0.05	-1.10	0.02	2.34
D5	-0.02185	0.03024	-0.02256	-0.02383**	0.01473	-0.01198	0.00288	0.00271	0.00242	-0.02484**	-0.01640	0.00190
	0.01625	0.03864	0.09261	0.01112	0.03470	0.01645	0.03575	0.00652	0.01176	0.01088	0.38180	0.01279
	-1.34	0.78	-0.24	-2.14	0.42	-0.73	0.08	0.42	0.21	-2.28	-0.04	0.15
D6	-0.00114	0.00249	-0.03096	0.00377	0.01593	0.00375	-0.00232	-0.0000622	0.00362	-0.00049958	-0.01959	0.00400
	0.01061	0.01720	0.07458	0.00775	0.01742	0.00434	0.05294	0.00466	0.01338	0.01233	0.21950	0.00383
	-0.11	0.14	-0.42	0.49	0.91	0.86	-0.04	-0.01	0.27	-0.04	-0.09	1.04
D7	0.01762	0.01728	0.00158	-0.01135	0.03186	-0.00886	0.04517	0.00943	0.01166	-0.01378	0.03185	-0.00669
	0.01566	0.01573	0.09585	0.01501	0.04479	0.01344	0.05363	0.01027	0.01565	0.01468	0.69284	0.00519
	1.13	1.10	0.02	-0.76	0.71	-0.66	0.84	0.92	0.75	-0.94	0.05	-1.29
R2	0.2227	0.1340	0.0217	0.2840	0.0324	0.7816	0.0127	0.5341	0.1862	0.2933	0.0011	0.5198
R2-adj	0.2059	0.1148	-0.0032	0.2732	0.0219	0.7685	-0.0026	0.5275	0.1742	0.2756	-0.0120	0.5173
F Value	13.23	6.98	0.87	26.29	3.09	59.55	0.83	80.96	15.51	16.64	0.08	206.27
Pr > F	<.0001	<.0001	0.5688	<.0001	0.0004	<.0001	0.6100	<.0001	<.0001	<.0001	1.0000	<.0001

** R^2 in GLS estimations is not really meaningful as a measure of fit (see Greene 1993)

Appendix 2 The BMZ model with heterogeneous credit customers

Instead of different reservation prices farmers are now distinguished by an unobservable risk parameter h only known to the farmer. Now we have $R_p=R_r=R$ and the return on the tractor is R+h or R-h with equal probability, and $h \in (\underline{h}, \text{hbar})$ is uniformly distributed. A rich farmer will buy as long as R>C and a poor farmer as long as $C(1+r)<= R+h_i$. Then h*=C(1+r)-R, the lowest risk level of a poor farmer buying a tractor.

Here again we have two cases:

Case A: z+v < R. tractors bought by rich and poor farmers

The optimal price charged will be C*=(z+v+R)/2 and the vendors profit becomes:

$\pi(C^*)=N_r/2 +N_p/d\ (R_p\text{-}v+z))\ (R\text{-}v+z)$

Case B: z+v < R. tractors bought by rich farmers only

Here C*=R leading to

$\pi(C^*)=Nr(R\text{-}v)$

Here there is no chance for banks to break even when R is equal to the cash price implying a zero interest.

Considering now the extension of vendor financing leads to:

$\pi(C_1, C_2)=N_r(C_1\text{-}v)+q_p(C_2\text{-}v)$,

where C1 is the price for a cash costumer and C2 the price charged to a captive finance subsidiary just breaking even on loans. Again the profit with the extension of trade credit dominates the profit without trade credit extension

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