

# Were Modern Capital Structure Theories Valid Before World War I?

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## Abstract

This study investigates whether capital structure theory can explain debt ratios in an historical environment which was characterized by poor investor protection, booming stock markets and strong banks, and in which corporate income tax did not affect capital structure. Our results, based on a unique, hand-collected sample of 556 firm-year observations for 129 listed companies in pre-World War I Belgium, are remarkably similar to findings for present-day samples. Leverage was positively related to asset tangibility, firm size and firm age, and it was negatively related to profitability and prior stock returns. Bank relationships were associated with lower leverage.

**JEL Classifications:** G32, G21

**Keywords:** capital structure, corporate income tax, investor protection, bank relationships, universal banks

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## **1 Introduction**

Modigliani and Miller's famous 1958 article launched an overwhelming amount of research on capital structure. Taxes, costs of financial distress, agency conflicts, governance problems, asymmetric information and interactions between real and financial decisions have been added to their so-called perfect world, in ever so many attempts to explain why capital structure choice does seem to matter. A large number of studies have empirically investigated the determinants of capital structure choice. However, most of these studies are based on data from the U.S. and from other developed economies that have many similarities to the U.S.. There are a few exceptions such as Booth et al. (2001), who investigate capital structure choices of firms in 10 developing countries, de Jong et al. (2006), who consider 42 countries around the world including many developing countries, and Huan and Song (2002), who focus on the capital structure of Chinese firms. The results of these studies suggest that debt ratios in developing countries are generally affected in the same way and by the same type of variables that are significant in developed countries. However, Booth et al. and de Jong et al. point out that there are also systematic differences in the way debt ratios are affected by country factors, such the development of capital markets and GDP growth.

In recent years, a number of studies have investigated business and finance decisions in the past to gain insight in present-day corporate finance and corporate governance (e.g. De Long, 1991; Ramirez, 1995; Rajan and Zingales, 2003; Franks, Mayer and Wagner, 2006; Fohlin, 2006). Many of these studies focus on the late 19<sup>th</sup> and early 20<sup>th</sup> centuries, because this is widely regarded as the first great era of globalization, and there are close parallels between world finance 100 years ago and today (e.g. Goodhart

and Delargy, 1998; Bordo and Meissner, 2005). In this paper, we go back to the start of the 20<sup>th</sup> century to investigate the capital structure of Belgian listed firms. Belgium in this period provides a particularly interesting environment to study capital structure, for a number of reasons.

First, corporate financing decisions in pre-World War I Belgium were not affected by taxes. In the period considered, firms paid only a 2% “patent tax” on all revenues to the financiers: capital gains, dividends and interests (Belgian Law of 22 January 1849, Art. 3 and Belgian Law of 5 July 1871, Art. 12). Moreover, there were no personal taxes on dividends, which were introduced only in 1920 (De Visschere, 1935; Janssens et al., 1990).

Second, by modern standards institutions were weak, investors were poorly protected, and they faced severe information problems. Notwithstanding weak institutions and strong information problems, Belgium combined a very active stock market with a strongly developed banking sector. Rajan and Zingales (2003) find that in 1913, Belgium had the second largest fraction of gross fixed capital formation raised through equity and the largest number of publicly traded domestic firms per capita. Moreover, the ratio of stock market capitalization over GDP in Belgium (0.99) was similar to the ratio in the U.K. (1.09) and much higher than in the United States (0.39), Germany (0.44) or Japan (0.49). At the same time, the ratio of commercial and savings deposits over GDP indicates that the banking sector was more developed in Belgium (0.68) than in Germany (0.53), the U.S. (0.33), Japan (0.13) or the U.K. (0.10).

For a unique, hand-collected sample of 556 firm-year observations for 129 listed companies in pre-World War I Belgium, we investigate to what extent factors suggested by capital structure theories were correlated with leverage. We consider both

debt scaled by the book value of total assets, and debt scaled by the market value of equity plus the book value of total debt. Moreover, the available data allow us to distinguish between bonds and other debt. We find that by modern standards, debt ratios tended to be low. When we investigate the factors correlated with leverage, our findings are remarkably similar to those for present-day samples. Leverage was positively related to asset tangibility, firm size and firm age, and it was negatively related to profitability. We also find that debt ratios based on market values were negatively correlated with prior stock returns. This suggests that firms did little to counteract stock price changes (Welch, 2004).

In the period considered in this study, many Belgian firms had bank directors on their board. We find that bankers on the board were associated with lower leverage, which is consistent with the hypothesis that a bank director made it easier for firms to issue new equity. It contradicts the hypothesis that firms had bankers on their board to obtain more debt, either through monitoring by lending bankers, or through non-affiliated bankers providing bank debt market expertise.

The remainder of the paper is structured as follows. Section 2 discusses capital structure theories, factors that might be correlated with leverage, and the role bank relationships. Section 3 discusses the construction of the sample and the variables. The empirical results are presented in section 4. Section 5 concludes.

## **2 Literature**

### **2.1 Capital structure theories**

The principal theoretical models of capital structure center on the idea that firms have information that investors do not have, and that the interests of managers,

equityholders and debtholders may not coincide. The two dominant models are the Static Trade-Off model and the Pecking Order model. In the Static Trade-off model, capital structure moves towards an optimum leverage which is determined by balancing the corporate tax savings advantage of debt and the costs of financial distress. This idea has been developed in many papers, including Brennan & Schwartz (1978), DeAngelo and Masulis (1980) and Bradley, Jarrell and Kim (1984). However, it has been questioned by many others, including Miller (1977) and Graham (1990), who argue that the Static Trade-off model implies that many firms should be more highly levered than they really are, as the tax savings of debt seem large while the costs of financial distress seem minor.

A related literature focuses on the role of agency conflicts between managers, shareholders and debt holders. Managers are agents of the shareholders, but the interests of managers and shareholders may be in conflict. Managers may pursue personal interests at the expense of shareholders by overinvesting free cash flow (the excess of cash earnings over profitable investments) in perquisites and bad projects (the overinvestment problem). According to authors such as Jensen (1986) and Stulz (1990), debt may be useful to control for such misbehavior since debt must be repaid to avoid bankruptcy. Bankruptcy is costly for managers since they may lose their job.

There are also agency conflicts between debt-holders and shareholders. Myers (1977) shows that a highly debt-financed firm might forego good investment opportunities because debt holders can share in profitable future investment returns, thereby extracting some wealth of the shareholders. This wealth extraction may cause the shareholders to turn down profitable investment projects (the underinvestment problem). Moreover, equity can be seen as a call option on the firm, and call values

increase with the volatility of the underlying asset. This creates incentives for the shareholders to shift the firm's investments in high risk projects, at the expense of the debt-holders (the risk-shifting problem). Shareholders of highly indebted firms may even select investment projects with a negative present value, because the increase in risk leads to a wealth transfer from debt-holders to shareholders that exceeds the net present value of the project.

Myers and Majluf (1984) provided a theoretical foundation for the proposition of Donaldson (1961) that there is a financing hierarchy, where firms prefer internal finance, and if external finance is required firms issue the safest security first. In the Pecking Order model of Myers and Majluf, raising external finance is costly because insiders have more information about the firm's prospects than outside investors, and outside investors know this. From the perspective of outside investors, equity is riskier than debt. They will rationally demand a higher risk premium for equity than for debt. From the point of view of the insiders, debt is therefore a better source of funds than equity is, and internal funding is even better. Debt financing will only be used when there is an inadequate amount of internal funding available, and equity will only be used as a last resort. As a consequence, there is no optimal leverage. Observed leverage is simply the sum of past financing events.

A number of papers have tried to explain the observation that firms tend to issue equity when their stock prices are high. Baker and Wurgler (2002) argue that firms issue equity when it is overvalued by irrational investors. Capital structure is the cumulative outcome of past attempts to time the equity market. Lucas and McDonald (1990) and Korajczyk, Lucas and McDonald (1991) on the other hand posit that adverse selection costs are time-varying, as are stock prices, and firms will issue equity when stock

prices are high if a high stock price coincides with low adverse selection. According to Dittmar and Thakor (2007), managers will issue equity to finance a project when there is agreement among managers and investors that the project is a good project. In their view, the link between stock prices and equity issues emerges because a higher stock price is evidence of market agreement.

Welch (2004) shows that the market-based debt-equity ratios of U.S. companies vary inversely with fluctuations in their own stock prices, because these companies do little to counteract the influence of stock price changes on their capital structure. The stock price effects are often large and last a long time, at least several years.

## **2.2 Factors correlated with leverage**

Capital structure theories suggest a number of factors that may be correlated with leverage. In this paper, we focus on factors that are commonly used in the empirical literature on capital structure: the market-to-book ratio, asset tangibility, profitability, firm size and firm age (see e.g. Titman and Wessels, 1988; Rajan and Zingales, 1995; Booth et al., 2001; Fama and French, 2002, Frank and Goyal, 2003; de Jong et al., 2006). We also consider the firm's prior stock return (Welch, 2004).

The *market-to-book-ratio* is usually thought of as a proxy for investment opportunities<sup>1</sup>. The agency costs of debt suggest a negative relationship between investment opportunities and debt levels. As shown by Myers (1977), highly levered firms are more likely to pass up profitable investment opportunities. Moreover, the expected costs of financial distress are higher for firms with good investment

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<sup>1</sup> R&D expenses is another measure of investment opportunities commonly used in the empirical literature. However, our data do not allow us to measure R&D expenses.

opportunities. Therefore, it is expected that firms with good investment opportunities will use a greater amount of equity finance.

As Rajan and Zingales (1995) note, there might still be other reasons why the market-to-book ratio is negatively correlated with leverage. The shares of highly levered firms in financial distress may be discounted at a higher rate because distress risk is priced. The tendency for firms to issue stock when their stock price is high relative to book value, may also lead to a negative correlation between the market-to-book ratio and the ratio of debt to the book value of assets.

*Asset tangibility* is commonly assumed to be positively correlated with leverage. Tangible assets are easy to collateralize and thus they reduce the agency costs of debt. If assets cannot be collateralized, creditors may require more favorable terms, which may lead firms to use equity rather than debt financing. Moreover, it can be expected that a high proportion of tangible assets reduces the costs of financial distress.

However, Titman and Wessels (1988) point out that the tendency of managers to pursue personal interests at the expense of shareholders might produce a *negative* relation between tangible assets and debt levels. As noted by e.g. Jensen (1986), high debt levels control for such misbehavior since debt must be repaid to avoid bankruptcy. The agency costs of managerial discretion may be higher for firms with assets that are less collateralizable since monitoring the cash outlays of such firms is probably more difficult. For this reason, firms with less tangible assets may choose high debt levels to limit managerial discretion.

The Pecking Order Theory predicts that firms with high *profitability* will need less external financing and will therefore have lower debt ratios<sup>2</sup>. On the other hand, if firms use debt as a means of reducing tax payments as suggested by the trade-off theory, firms with higher profits should have higher debt ratios. Higher profits allow the firm more corporate tax deductions, and they reduce bankruptcy risk. However, this argument does not apply to our sample, as there was basically no corporate income tax in the period considered. Rajan and Zingales (1995) point to another rationale for a positive relationship between profitability and leverage: if the market of corporate control is effective, it may force firms to commit to paying out cash by leveraging up, which would also lead to a positive relationship between profitability and leverage.

*Firm size* may be correlated with leverage for a number of reasons. Size is often considered as a proxy for the probability of default: larger firms tend to be more diversified and to have less volatile assets, and are therefore less likely to fail and to be liquidated<sup>3</sup>. From this point of view a positive relation between size and leverage is to be expected. However, size may also be an inverse proxy for informational asymmetries between insiders in a firm and the capital markets. Larger firms should be more capable of issuing equity, and should therefore have *lower* debt ratios. An alternative proxy for the information outside investors have is *firm age*. Older firms are better known to outside investors and should therefore find it easier to issue informationally sensitive equity.

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<sup>2</sup> Strebulaev (2006) also argues that in a dynamic economy with frictions, cross-sectional tests may reveal a negative relation between profitability and leverage if firms optimally adjust their leverage only infrequently.

<sup>3</sup> We could also use time-series data to estimate volatility, but estimates of volatility based on 5 years of data are likely to be a very noisy measure. Moreover, it would limit our sample to survivors with a sufficient number of data.

The relationship between size and leverage may also be affected by the transaction costs of raising external funds. Kurshev and Strebulaev (2005) demonstrate that in a dynamic capital structure model with fixed costs of raising external funds, cross-sectional tests may reveal a positive relation between size and leverage if firms adjust their leverage only infrequently.

Welch (2004) argues that *prior stock returns* are the primary determinant of market-based debt ratios, as firms do not counteract the influence of stock price changes on their capital structures. The other proxy variables used in the literature fail to explain much of capital structure dynamics when stock returns are taken into account. According to Welch, many of these proxies only seem to help explain capital structure dynamics because they correlate with omitted stock return dynamics.

### **2.3 The role of bank relationships**

In the late 19<sup>th</sup> and early 20<sup>th</sup> century, banks in industrializing countries generally played a dominant role in corporate finance (e.g. Cameron, 1967; Carosso, 1970; Rajan and Zingales, 2003; Fohlin, 2006). This was also the case in Belgium, where by 1913 the banking sector was more developed than in the U.S., the U.K., Germany and Japan (Rajan and Zingales, 2003). The most prominent of these banks were universal banks, which offered a wide range of services to firms: they took equity stakes, provided loans, assisted firms in the issuance of securities and were often involved in the management of affiliated firms (e.g. Kurgan-Van Hentenryk, 1991). According to Durviaux (1947), in the early 20<sup>th</sup> century universal banks contributed most of the money for the financing of new securities issued by Belgian firms, either by investing in securities themselves, or by selling securities to the public. Van Overfelt et al. (2006) find that in the period considered in this study many Belgian firms indeed had

bank directors on their board. Moreover, their results suggest that these bank relationships had a positive impact on firm performance. This raises the question how bank relationships affected capital structure.

*(a) Monitoring*

First, it could be argued that bank relationships facilitated the provision of bank loans. Bank loans are typically the most closely monitored mode of finance. Delegated monitoring by a financial intermediary has lower monitoring costs than monitoring by a group of individual borrowers, and it avoids the free rider problem (Diamond, 1984). Such monitoring is thought to alleviate risk-shifting behaviour as well as over- and underinvestment (Jensen and Meckling, 1976; Myers, 1977; Stulz, 1990). The provision of several services by universal banks encourages long-term relationships with borrowers, which lead to a better exchange of information between bank and borrower, more flexible contracting, intertemporal smoothing of contract terms, and better monitoring of activities and outcomes by the bank (Boot, 2000). Moreover, if the bank is not only a debtholder but also a shareholder of the firm, agency conflicts between debtholders and shareholders are likely to be less important. Firms affiliated with a (universal) bank should therefore find it easier to obtain bank loans. This could result in higher debt ratios.

Rajan (1992) also points out that the proprietary information about borrowers that banks obtain as part of their relationships may give them an information monopoly. Banks may abuse this information monopoly by charging high interest rates, and they may even force affiliated firms to overborrow in order to earn more interest.

These arguments imply that the presence of bankers whose banks are lending to the firm is positively related to firm debt. However, Booth and Deli (2001) find for a

sample of U.S. firms that it is the presence of commercial bankers who have *no* relationship with the firm other than as a director which is positively related to firm debt. The explanation they offer is that non-affiliated bankers provide bank debt market expertise.

*(b) Certification*

It has been argued that a primary role of banks in the late 19<sup>th</sup> and early 20<sup>th</sup> centuries was to remove barriers for firms to capital markets (e.g. Carosso, 1970; De Long, 1991; Ramirez, 1995; Baskin and Mirante, 1997; Franks, Mayer and Wagner, 2006). Board positions may have provided signals of credit worthiness to capital markets. A bank with access to more timely information and with incentives to produce more durable information can better certify offer prices in securities issues. According to Carosso (1970) and Baskin and Mirante (1997), in the U.S. during the second half of the 19<sup>th</sup> century specialized railroad underwriters – banks with reputations for honesty and competency – mitigated the uncertainties associated with railroad finance. Wealthy investors in both the U.S. and Europe relied on the professional counsel of J.P. Morgan & Company and Kuhn-Loeb & Company in deciding where to commit their capital. Ramirez (1995) finds that firms affiliated with J. P. Morgan in the early 20<sup>th</sup> century were indeed less liquidity constrained, and DeLong (2001) shows that the presence of directors affiliated with J.P. Morgan was associated with higher firm value. Jagannathan and Krishnamurthy (2004) find that even today, U.S. firms with investment banker directors are more likely to pay dividends, to have a credit rating and to issue commercial paper, and they pay out a larger fraction of their earnings. Moreover, they are able to raise larger amounts of external equity capital, with smaller underpricing and lower underwriting fees. The finding of Deloof et al. (2006) that in

the period considered in this study, Belgian firms with a banker on their board paid higher and more stable dividends than stand-alone firms is consistent with the “certification” role of bank directors.

From this perspective, a negative relation between leverage and bank relationships could be expected. The presence of bankers on the board makes it easier for the firm to issue securities to investors. These securities might be bonds as well as stocks, but the “reputation” effect of banks is likely to be stronger for stocks. From the point of view of investors stocks are riskier than bonds, and the advantage of a bank endorsing the issue’s “investment quality” will be greater.

*(c) Conflicts of interest*

The different payoff structures associated with debt and equity lead to divergent interests in how the shareholders and the creditors prefer the firm to be run. Creditors prefer that the firm maximizes the probability of debt repayment rather than maximize the expected returns to shareholders. It could therefore be argued that lending bankers on the board exercised downward pressure on the debt ratio in order to protect the interests of the lending bank (e.g. Kroszner and Strahan, 2001; Byrd and Mizruchi, 2005). However, the results of Deloof et al. (2006), who investigate the dividend policy of Belgian firms in the period considered, are inconsistent with this hypothesis. They find that firms with a bank director paid higher dividends, and higher dividends are against the interests of the lending bank(s)<sup>4</sup>.

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<sup>4</sup> They also find that the bank held an equity stake in a substantial number of firms, which would mitigate the debt/equity agency conflict.

### **3 Sample and Variables**

#### **3.1 Sample**

We constructed a sample of listed Belgian firms during the period 1905-1909 in four major industries: coal-mining, trams, railways and textiles. These were the four largest industries in terms of (i) the number of companies in the industry and (ii) the number of companies with a bank director. To be included in the sample, we require that a firm had a listing on the Brussels Stock Exchange for at least one year. The firms listing or delisting in a particular year are therefore not considered in the year of listing or delisting. As noted in the introduction, the 1905-1909 period was characterized by unprecedented globalization, increasing international competition and extended financial development, and Belgium at that time had a particularly interesting institutional environment.

Stock market data were collected from a database constructed at the University of Antwerp by the “StudieCentrum voor Onderneming en Beurs” (SCOB). The primary source of this database is the archive of the Brussels Stock Exchange. The data were hand-collected and double checked from various sources including the official quotation list and firms’ correspondence with the exchange. The database includes all listed firms, contains information on share prices, dividends, the number of stocks outstanding and goes back as far as 1832 (see <http://www.scob.be>). In addition, a sector classification code, based on the primary activity of the firm, and a geographical code which identifies the location of the firm’s activity was assigned to each firm. We restrict our sample to Belgian firms with main activities in Belgium (as defined by SCOB).

We also collected financial statement data. The financial statement data were hand-collected data from the appendices to the Official Gazette (“Annexes au Moniteur Belge: Recueil Spécial des Actes des Sociétés”). This is the most reliable source of Belgian financial statement data for that period. All firms constituted under Belgian corporate law were legally required to publish their balance sheets and income statements in the Official Gazette no later than two weeks after the approval by the general meeting (Théate, 1905). At least one month before the annual meeting, the executive board of the firm had to deliver a (non-public) report (“inventaire”) to the supervisory board (“commissaires”) for approval. After approval, an annual report containing the balance sheet and the income statement had to be deposited at the head office of the firm and had to be sent to all nominal shareholders at least two weeks before the general meeting. The general meeting had to approve the annual report. For a number of firms we were able to obtain the annual report presented at the general meeting, and we found that the balance sheet and income statement presented in the annual report were the same as the ones reported in the appendices of the Official Gazette.

Since the discretionary power of management to design the financial statement was high, there is substantial heterogeneity in the structure of the financial statements and we had to reformat the financial statements in a uniform structure. Fortunately, the law provided guidelines about the depreciation of assets and the distribution of profits (Resteau, 1913a and 1913b) and we are able to check practitioners’ guides to get a better understanding of the accounting principles at the turn of the century (François, 1902 and 1907).

After removing observations with missing values for the variables considered in the empirical analysis, one observation for which the total debt ratio was greater than one, and one observation for which asset tangibility was greater than one, our sample consists of 556 firm-year observations for 129 different firms.

### **3.2 Variables**

Fama and French (2002) note that there is some ambiguity about the extent to which predictions of the main capital structure theories apply to debt ratios based on market values, or to debt ratios based on book values. Because of this ambiguity, we always present empirical results for debt scaled by the book value of total assets, and debt scaled by the market value of equity plus the book value of total debt. Firms can obtain debt in a variety of forms, from different sources. The financial statements of the firms considered in this study allow us to distinguish between two forms of debt: “obligations” or bonds, and “créditeurs”, which is all other debt. “créditeurs” could be bank debt but also trade liabilities. We therefore consider six different debt ratios: total debt, bonds and other debt are each scaled by the book value of total assets and by the market value of equity plus the book value of total debt. Finally, we also consider a Bonds dummy, which equals one if the firm has bonds outstanding, and zero otherwise.

As for the explanatory variables, the *market-to-book ratio* of equity is market value of equity (aggregated over all categories of stock) divided by the book value of equity at the beginning of the fiscal year. *Asset tangibility* is defined as the ratio of fixed assets over total assets at the beginning of the fiscal year. *Profitability* is operating profit plus depreciation over the fiscal year, divided by the book value of total assets at the beginning of the fiscal year. *Ln(size)* is the natural logarithm of total assets at the

beginning of the fiscal year; and  $\ln(age)$  is the natural logarithm of difference between the current year and the year the firm transformed to a limited liability company. *Prior stock return* is the stock return net of dividends over the previous fiscal year<sup>5</sup>.

We also include industry dummies for the tram sector, the railways sector and the textiles sector. For the coal mining sector, we include four geographical dummies which indicate the location where the coal mining firm operates and refer to geological conditions. They measure differences in the quality of extracted coal or the difficulty to extract coal in a particular region (Wautelet, 1976).

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Insert Table 1 about here  
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Table 1 presents descriptive statistics. Debt ratios tended to be low. The average total debt ratio based on market values was 19.91%, of which 9.55% were bonds and 10.36% was other debt. However, there are large differences across firms. The median total debt ratio is only 10.68%. While bonds seem to have been an important financing tool for some firms in the sample, the median firm did not issue any bonds. Debt ratios based on book values depict a similar picture, with the average total debt ratio being 26.89% (median is 19.88%).

### **3.3 Bank relationships**

Regarding the impact of bank relationships, we assume a bank relationship if the firm has a bank director on its board: a relationship at the board level represents a

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<sup>5</sup> Some firms had more than one type of stock listed on the stock exchange. In that case we use the weighted average of stock returns.

continuous interaction and information exchange between the firm and the bank<sup>6</sup>. As in Germany, the boards of Belgian firms had a dual structure, consisting of an executive board (“administrateurs”) and a supervisory board (“commissaires”). The executive board members acted on behalf of and for the account of the firm, they were appointed by the articles of incorporation or by the general meeting of shareholders, and their responsibilities were limited by the firm’s articles of incorporation. Supervisory board members were charged with the supervision of the executive board members and they had to approve the firm’s annual accounts.

We collected data on the board of directors from the “Recueil Financier”, a financial annual containing a variety of firm-specific information, including the members of the board as well as their mandate (executive board or supervisory board) and sometimes their domicile. To check the accuracy of the “Recueil Financier”, we compared the information in the “Receuil Financier” with the entries in the appendices of the Official Gazette for a sub-sample of firms but we found no differences. Bank directors are based on the boards of 1905<sup>7</sup>.

We consider bank relationships with six different banks: (i) the Société Générale; (ii) the Crédit Général Liégeois; (iii) the Banque d'Outremer; (iv) the Banque Liégeoise; (v) the Banque de Bruxelles and (vi) the Banque Internationale de Bruxelles. These

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<sup>6</sup> As an alternative measure of bank affiliation, we also considered a dummy variable which equals one if a universal bank held an equity stake in the firm. However, this measure was never significant in any of the regressions (results available from the authors upon request).

<sup>7</sup> For some companies that went public after 1905, we also used the 1905 board if it was available in the Recueil Financier. If it was not available, we used the board from the year the listing started. Bank relationships were very stable anyway. Van Overfelt et al. (2006) find for the same sample that most firms with a bank director in 1905 already had a bank director in 1895, and most firms without a bank director in 1905 did not have a bank director in 1895.

were the most important listed universal banks both in terms of total assets and the value of the industrial portfolio (Durviaux, 1947; see also Van Overfelt et al., 2006).

As a consequence of the two-tier board structure, four different types of bank relationships can be considered: bank executive directors on the firm executive board; bank executive directors on the firm supervisory board; bank supervisory directors on the firm executive board; and bank supervisory directors on the firm supervisory board. While executive directors held a significant number of directorships in other firms, their supervisory peers rarely held directorships in other firms. We therefore assume a bank relationship if an executive director of the bank is on the executive board of the firm.

We cannot rule out the possibility that some of these directors were in fact industrialists sitting on the board of a bank, and not bankers on the board of industrial firms. However, anecdotal evidence suggests that these directors generally were representing the interests of the bank. For example, *Edouard Despret*, who died in October 1906, held board positions in 19 different firms at the time of his death. He was the vice-president of the *Société Générale*, which was by far the largest bank in Belgium. In November 1906, he was succeeded on the board of the *Société Générale* by *Jean Jadot*. Before becoming a director of the *Société Générale*, Jean Jadot held no board positions at all. Three years later, he was a director of 14 different firms. In most of these firms, Edouard Despret had been a director when he died<sup>8</sup>.

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<sup>8</sup> Sources: the 1906 annual report of the *Société Générale* and the 1906 and 1910 editions of the *Receuil Financier*.

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Insert Table 2 about here  
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Table 2 depicts the number of bank directors and the number of related banks for the 126 firms in our sample. 48 firms had at least one bank director on their board. The highest number of bank directors was four (six firms), but most firms either had one bank director (24 firms) or two bank directors (10 firms). 36 firms were related to one bank, 10 firms were related to two banks and two firms were related to three different banks.

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Insert Table 3 about here  
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#### **4 Empirical Results**

Table 3 presents the results of regressions which include market-to-book ratio, asset tangibility, profitability,  $\ln(\text{size})$ ,  $\ln(\text{age})$  and the bank director dummy as independent variables. All regressions are estimated assuming random effects. We use clustered standard errors to assess the significance of the estimated coefficients. Standard errors clustered by firm account for the fact that standard errors of regression coefficients are downward biased if residuals are correlated across time for a given firm. When both a firm and a time effect are present in the data, the time effect can be addressed by including time dummies and then estimate standard errors clustered on the other dimension (Petersen, 2006).

In regression 1, the dependent variable is total debt scaled the market value of equity plus the book value of total debt, and in regression 2 it is total debt scaled by the book

value of total assets. The results for asset tangibility, size and age and profitability are generally consistent with capital structure theories.

We find that total debt was significantly positively related to asset tangibility, confirming the hypothesis that tangible assets reduce the agency costs of debt because they can be used as collateral. Furthermore, total debt was significantly negatively related to profitability. This result is consistent with most empirical studies on capital structure, and it confirms the Pecking Order theory, according to which a firm first uses retained earnings to finance new investments before raising external finance, because of asymmetric information costs.

Empirical capital structure studies have found contradictory results on size and age. For example, the multi-country studies of Rajan and Zingales (1995), Booth et al. (2001), and de Jong et al. (2006) all find both positive and negative relationships. In our sample, larger and older firms had more debt. This is consistent with the hypothesis that larger and older firms could afford higher levels of leverage because they tended to be more diversified and to have more stable cash flows.

As for the market-to-book ratio, we find that the market based total debt ratio was not significantly related to the market-to-book ratio, while the book based total debt ratio was significantly *positively* related to the market-to-book ratio. As discussed in section 2, capital structure theory suggests a negative relationship between leverage and the market-to-book ratio. Most studies indeed find a significant negative relationship (see e.g. Rajan and Zingales, 1995), but Booth et al. (2001) and de Jong et al. (2006) find a significant positive relationship in some developing countries. A more negative relationship for the market based debt ratio than for the book based debt ratio could be due to spurious correlation introduced by having market values in the numerator of the

market-to-book ratio and the denominator of the market total debt ratio. However, it remains unclear why there was a positive relationship between the market-to-book ratio and the book total debt ratio. A possible explanation could be that firms of which the stock was highly valued found it easier to issue debt.

Interestingly, the bank director coefficient is negative in both regression 1 and regression 2, and it is significant at the 1% level in regression 1: a bank director on the board reduced the market total debt ratio by 10.6%. This result contradicts the hypothesis that firms had bankers on their board to obtain more debt, either through monitoring by lending bankers, or through the provision of bank debt market expertise by non-affiliated bankers (e.g. Booth and Deli, 1999; Byrd and Mizruchi, 2005). It is consistent with the hypothesis that a banker on the board made it easier for firms to issue new equity, and with the hypothesis that lending bankers on the board exercised downward pressure on the debt ratio in order to protect the interests of the bank. However, as noted in section 2.3., the results of Deloof et al. (2006) on dividend policy of Belgian firms in the period considered are inconsistent with the latter hypothesis.

To gain further insight in the capital structure of the firms in our sample, we investigate bonds and other debt separately. Dependent variables are the likelihood of bonds outstanding (regression 3), the market based bonds ratio (regression 4), the book based bonds ratio (regression 5), the market based other debt ratio (regression 6), and the book based other debt ratio (regression 7). Regression 3 is estimated with the Random Effects Probit Model.

In all these regressions, the market-to-book coefficient is insignificant. Asset tangibility on the other hand was significantly and positively related to (the likelihood of) bonds (regressions 3, 4, 5), while it was negatively related to other debt

(regressions 6, 7). This implies that firms with more fixed assets had more bonds but less other debt, which is consistent with the traditional matching argument that long-term assets should be financed with long-term liabilities (assuming that the average maturity of other debt was shorter than the average maturity of bonds). Firms with fewer tangible assets turned to other debt instead of bonds.

Not surprisingly, profitability was negatively related to bonds and to other debt, although the profitability coefficient is not significant in regression 3 (likelihood of bonds) and in regression 4 (market based bonds ratio).

Size was positively related to both (the likelihood of) bonds and other debt, but the size coefficient is much larger in regressions 4 and 5 (bonds) than in regressions 6 and 7 (other debt). Age was also significantly and positively related to (the likelihood of) bonds, but not to other debt. These results suggest that in pre-World War 1 Belgium, which was an environment characterized by high asymmetric information, older and larger firms found it easier to issue bonds, while size and age mattered less for other debt.

Finally, we find that a banker on the board was significantly negatively related to (the likelihood of) bonds, but it was not related to other debt. Assuming that universal banks gained board positions as a result of equity underwriting, these results suggest that new equity was an alternative for bonds, but not for other debt.

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Insert Table 4 about here  
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Table 2 revealed a substantial heterogeneity regarding the number of bank directors and the number of related banks. We therefore also estimated regressions which include the number of bank directors and the number of related banks. However, the results (reported in Table 4) suggest that neither the number of bank directors (regressions 8 and 9) nor the number of related banks (regression 10 and 11) was significantly related to total debt<sup>9</sup>.

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Insert Table 5 about here  
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We also included the stock return in the previous year as an additional explanatory variable in the model. Debt ratios may have varied with fluctuations in stock prices, if firms did little to counteract the influence of stock price changes on their capital structures (cf. Welch, 2004). As there were no tax advantages to debt in the period considered, and the debt ratios of the firms in our sample were relatively low, it indeed seems unlikely that firms tried to rebalance their capital structure in response to stock price fluctuations. This is confirmed by the results in Table 5. The stock return over the previous fiscal year was significantly and negatively related to the market based total debt ratio (regression 12), while it was not related to the book based total debt ratio (regression 13). When we consider bonds and other debt separately, the effect is almost

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<sup>9</sup> When we consider bonds and other debt separately, the number of bank directors and the number of related banks are also always insignificant (results not reported, available from the authors upon request).

equal for the market based bonds ratio (regression 14) and the market based other debt ratio (regression 15).

The dependent variable in our regressions varies between 0 and 1, which may affect our results. As a robustness check, we therefore also estimated all regressions reported in the paper with the logistic transformation of the debt ratio, that is,  $\log [\text{debt ratio} / (1 - \text{debt ratio})]$  as dependent variable. The results of these regressions (not reported) are generally consistent with those reported in the paper<sup>10</sup>.

It is interesting to compare our results to those of Fohlin (2006). Her book on the development on universal banks, securities markets and corporate finance in Germany in the two decades before World War I includes a study on the capital structure of German firms. To the best of our knowledge, it is the only other study which investigates capital structure in an historical environment such as the one considered in our study. Consistent with our findings, her results suggest that leverage was positively related to tangibility and size, and it was negatively related to profitability. As we do, she finds that bank affiliations reduced leverage. One difference between her results and ours is the effect of age: she finds that older firms had lower debt ratios. However, we have to be careful when interpreting the age variable. Both in the study of Fohlin and in ours, age is defined as the number of years since incorporation, which could be very different from the actual age of the company since it was founded as a private firm.

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<sup>10</sup> There are a few differences. When the logistic transformation of the debt ratio is the dependent variable, the  $\ln(\text{age})$  coefficient is insignificant in the “total debt (market)” regressions and the “bonds (market)” regression; the profitability coefficient and the  $\ln(\text{size})$  coefficient are insignificant in the “other debt (book)” regression.

## 5 Conclusion

This study investigates the factors correlated with leverage in an historical environment which was characterized by poor investor protection, booming stock markets and strong banks, and in which corporate income tax did not affect capital structure. We find that debt ratios tended to be low. The results on factors correlated with debt confirm to a large extent those for present-day samples. Leverage was positively related to asset tangibility, firm size and firm age, and it was negatively related to profitability. These findings are consistent with theories stressing the role of asymmetric information and agency conflicts as determinants of capital structure.

We also find that bankers on the board were associated with lower leverage, which confirms the hypothesis that a bank director made it easier for firms to issue new equity. It contradicts the hypothesis that bank affiliations allowed firms to obtain more debt, either because of monitoring by lending bankers, or because non-affiliated bankers provided bank debt market expertise.

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**Table 1****Descriptive Statistics**

This table reports descriptive statistics for a sample of 556 firm-year observations for 129 listed Belgian firms in the coal mining, trams, railways and textiles industries in the period 1905-1909. The descriptives for Stock Return are based on 554 firm-year observations. The debt variables are scaled by the market value of equity plus the book value of total debt (Market) or by the book value of total assets (Book). The market-to-book ratio of equity (MTB) is market value of equity (aggregated over all categories of stock) divided by the book value of equity at the beginning of the fiscal year. Asset tangibility is the ratio of fixed assets over the book value of total assets at the beginning of the fiscal year. Profitability is operating profit plus depreciation over the fiscal year, divided by the book value of total assets at the beginning of the fiscal year. Ln(size) is the natural logarithm of total assets at the beginning of the fiscal year. Ln(age) is the natural logarithm of difference between the current year and the year the firm transformed to a limited liability company. Prior stock return is the stock return net of dividends over the previous fiscal year.

	Mean	Median	Standard Deviation	Minimum	Maximum
Total Debt (Market)	0.199	0.107	0.222	0.001	1.000
Total Debt (Book)	0.269	0.199	0.231	0.001	0.998
Bonds (Market)	0.104	0.000	0.165	0.000	0.904
Bonds (Book)	0.130	0.000	0.191	0.000	0.882
Other Debt (Market)	0.096	0.050	0.110	0.000	0.591
Other Debt (Book)	0.143	0.095	0.136	0.000	0.747
Market-to-Book	2.305	1.694	2.059	0.000	15.994
Asset Tangibility	0.453	0.499	0.290	0.000	0.963
Profitability	0.138	0.113	0.117	-0.255	0.872
Ln(Size)	15.432	15.328	0.949	13.727	18.737
Ln(Age)	3.077	3.178	0.826	0.000	4.394
Prior Stock Return	0.010	0.028	0.288	-0.590	2.191

**Table 2****Bank Relationships**

For a sample of 129 listed Belgian firms in the coal mining, trams railways and textiles industries, this table reports the distribution of firms according to the number of bank directors and the number of related banks. A firm is related to a bank if an executive director of the bank is a member of the executive board of the firm.

Number of Bank Directors ↓	Number of Related Banks →			Total
	1	2	3	
1	24			24
2	8	2		10
3	3	5	0	8
4	1	3	2	6
Total	36	10	2	48

**Table 3****Factors Correlated with Leverage**

Regressions are based on a sample of 556 firm-year observations for 129 listed Belgian firms in the coal mining, trams, railways and textiles industries in the period 1905-1909. The debt variables are scaled by the market value of equity plus the book value of total debt (Market) or by the book value of total assets (Book). The bonds dummy equals one if the firm had bonds outstanding, and zero otherwise. The market-to-book ratio of equity (MTB) is market value of equity (aggregated over all categories of stock) divided by the book value of equity at the beginning of the fiscal year. Asset tangibility is the ratio of fixed assets over the book value of total assets at the beginning of the fiscal year. Profitability is operating profit plus depreciation over the fiscal year, divided by the book value of total assets at the beginning of the fiscal year. Ln(size) is the natural logarithm of total assets at the beginning of the fiscal year. Ln(age) is the natural logarithm of difference between the current year and the year the firm transformed to a limited liability company. Bank director is a dummy which equals one if the firm had a director interlock with a universal bank, and zero otherwise. All regressions include year dummies and industry dummies. P-values (robust for heteroscedasticity) are in parentheses below each coefficient. P-values for random effects estimations are based on clustered standard errors. \*\*\*: denotes significance at the 1% level; \*\*: denotes significance at the 5% level; \*: denotes significance at the 10% level.

Regression	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Estimation Method	Random Effects	Random Effects	Random Probit	Random Effects	Random Effects	Random Effects	Random Effects
Dependent Variable	Total Debt (Market)	Total Debt (Book)	Bonds Dummy	Bonds (Market)	Bonds (Book)	Other Debt (Market)	Other Debt (Book)
Market-to-Book	-0.018 (0.688)	0.011** (0.025)	-0.088 (0.540)	0.000 (0.924)	0.004 (0.175)	-0.003 (0.138)	0.009 (0.146)
Asset Tangibility	0.118** (0.022)	0.134* (0.082)	3.206*** (0.001)	0.153*** (0.001)	0.241*** (0.000)	-0.050 (0.125)	-0.127*** (0.000)
Profitability	-0.120* (0.068)	-0.259*** (0.001)	-3.002 (0.124)	-0.050 (0.270)	-0.150** (0.019)	-0.089** (0.028)	-0.127** (0.034)
Ln(Size)	0.085*** (0.000)	0.089*** (0.000)	1.168*** (0.001)	0.068*** (0.000)	0.067*** (0.000)	0.017* (0.078)	0.020* (0.072)
Ln(Age)	0.037** (0.043)	0.042** (0.028)	0.646* (0.070)	0.024*** (0.005)	0.027** (0.015)	0.007 (0.546)	0.011 (0.373)
Bank Director	-0.106*** (0.004)	-0.052 (0.209)	-1.069* (0.081)	-0.075*** (0.002)	-0.044 (0.107)	-0.027 (0.209)	-0.009 (0.720)
R <sup>2</sup>	0.366	0.310		0.480	0.481	0.238	0.278

**Table 4****Factors Correlated with Leverage – Bank Relationships**

Regressions are based on a sample of 556 firm-year observations for 129 listed Belgian firms in the coal mining, trams, railways and textiles industries in the period 1905-1909. The debt variables are scaled by the market value of equity plus the book value of total debt (Market) or by the book value of total assets (Book). The market-to-book ratio of equity (MTB) is market value of equity (aggregated over all categories of stock) divided by the book value of equity at the beginning of the fiscal year. Asset tangibility is the ratio of fixed assets over the book value of total assets at the beginning of the fiscal year. Profitability is operating profit plus depreciation over the fiscal year, divided by the book value of total assets at the beginning of the fiscal year. Ln(size) is the natural logarithm of total assets at the beginning of the fiscal year. Ln(age) is the natural logarithm of difference between the current year and the year the firm transformed to a limited liability company. Bank director is a dummy which equals one if the firm had a director interlock with a universal bank, and zero otherwise. Number of bank directors is the number of director interlocks with a universal bank. Number of related banks is the number of banks of which a director was a director on the board of the firm. All regressions include year dummies and industry dummies. P-values (robust for heteroscedasticity) are in parentheses below each coefficient. P-values for random effects estimations are based on clustered standard errors. \*\*\*: denotes significance at the 1% level; \*\*: denotes significance at the 5% level; \*: denotes significance at the 10% level.

Regression	(8)	(9)	(10)	(11)
Estimation method	Random Effects	Random Effects	Random Effects	Random Effects
Dependent Variable	Total Debt (Market)	Total Debt (Book)	Total Debt (Market)	Total Debt (Book)
Market-to-Book	-0.002 (0.713)	0.010** (0.035)	-0.002 (0.704)	0.010** (0.035)
Asset Tangibility	0.118** (0.022)	0.134* (0.083)	0.118** (0.023)	0.136* (0.081)
Profitability	-0.119* (0.069)	-0.259*** (0.001)	-0.119* (0.069)	-0.259*** (0.001)
Ln(Size)	0.086*** (0.000)	0.088*** (0.000)	0.086*** (0.000)	0.086*** (0.000)
Ln(Age)	0.038** (0.042)	0.041** (0.031)	0.038** (0.043)	0.041** (0.030)
Bank Director	-0.084 (0.159)	-0.072 (0.299)	-0.086 (0.206)	-0.120 (0.116)
Number of Bank Directors	-0.012 (0.575)	0.011 (0.712)	-	-
Number of Related Banks	-	-	-0.016 (0.670)	0.054 (0.273)
R <sup>2</sup>	0.367	0.310	0.367	0.311

**Table 5****Factors Correlated with Leverage –Prior Stock Return**

Regressions are based on a sample of 554 firm-year observations for 129 listed Belgian firms in the coal mining, trams, railways and textiles industries in the period 1905-1909. The debt variables are scaled by the market value of equity plus the book value of total debt (Market) or by the book value of total assets (Book). The market-to-book ratio of equity (MTB) is market value of equity (aggregated over all categories of stock) divided by the book value of equity at the beginning of the fiscal year. Asset tangibility is the ratio of fixed assets over the book value of total assets at the beginning of the fiscal year. Profitability is operating profit plus depreciation over the fiscal year, divided by the book value of total assets at the beginning of the fiscal year. Ln(size) is the natural logarithm of total assets at the beginning of the fiscal year. Ln(age) is the natural logarithm of difference between the current year and the year the firm transformed to a limited liability company. Bank director is a dummy which equals one if the firm had a director interlock with a universal bank, and zero otherwise. Prior stock return is the stock return net of dividends over the previous fiscal year. All regressions include year dummies and industry dummies. P-values (robust for heteroscedasticity) are in parentheses below each coefficient. P-values for random effects estimations are based on clustered standard errors. \*\*\*: denotes significance at the 1% level; \*\*: denotes significance at the 5% level; \*: denotes significance at the 10% level.

Regression	(12)	(13)	(14)	(15)
Estimation method	Random Effects	Random Effects	Random Effects	Random Effects
Dependent Variable	Total Debt (Market)	Total Debt (Book)	Bonds (Market)	Other Debt (Market)
Market-to-Book	-0.007 (0.306)	0.011** (0.030)	-0.003 (0.668)	-0.006** (0.029)
Asset Tangibility	0.123** (0.022)	0.132* (0.090)	0.155*** (0.001)	-0.051 (0.117)
Profitability	-0.064 (0.326)	-0.259*** (0.001)	-0.023 (0.658)	-0.063* (0.092)
Ln(Size)	0.086*** (0.000)	0.091*** (0.000)	0.068*** (0.000)	0.175* (0.082)
Ln(Age)	0.0436** (0.023)	0.040 (0.037)	0.027*** (0.003)	0.009 (0.460)
Bank Director	-0.105*** (0.005)	-0.052 (0.209)	-0.074*** (0.003)	-0.025 (0.238)
Prior Stock Return	-0.061*** (0.005)	0.003 (0.815)	-0.032* (0.053)	-0.029*** (0.001)
R <sup>2</sup>	0.364	0.311	0.479	0.239