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THE DEBT-MATURITY STRUCTURE OF SMALL FIRMS IN A CREDITOR-ORIENTED ENVIRONMENT

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ABSTRACT

Once a firm decides to issue debt, the characteristics of this debt instrument should be considered. One of the critical decisions involves debt maturity. Using a sample of 1091 Belgian small firms from 1996 until 2000, this study analyses the determinants of the corporate debt-maturity structure of small firms in a creditor-oriented system. Consistent with previous empirical evidence on large firms, the present results strongly support the maturity-matching principle. The hypothesis that firms with many growth opportunities will borrow on the short term as a response to the under-investment problem, is not supported. There is a clear relation between the credit worthiness of a firm and the debt-maturity structure. Firms with a better credit score borrow on the long term, whereas firms with a poor credit quality are apparently forced to borrow on the short term. This evidence contradicts the expected U-shaped relationship between credit worthiness and debt maturity. Size negatively influences debt maturity.

Keywords: debt maturity, capital structure, small firms
JEL classification: G32

INTRODUCTION

As Modigliani and Miller (1958) stated implicitly, and as Stiglitz (1974) demonstrated explicitly, both the capital structure of a firm and debt maturity are irrelevant in perfect capital markets. In other words, decisions concerning the maturity of a debt contracted by a firm can never augment the value of a firm. To prove this, Stiglitz (1974), as well as Modigliani and Miller (1958), made a number of assumptions. These included: (i) the absence of taxes; (ii) that default is not possible; and (iii) that personal lending is equivalent to corporate lending. Several theoretical papers have discussed the influence of so-called imperfections on the corporate debt-maturity structure. Myers (1977) demonstrated the importance of growth opportunities. Other important theoretical contributions have been those of Brick and Ravid (1985, 1991), Diamond (1991, 1993), and Flannery (1986). Empirical evidence has been provided by Guedes and Opler (1996), Barclay and Smith (1995), Stohs and Mauer (1996), Demirgüc-Kunt and Maksimovic (1999), Ozkan (2000), and Scherr and Hulburt (2001)

In the present paper, the determinants of the corporate debt-maturity structure of small firms in a creditor-oriented system are investigated. The present analysis adds to the existing literature in two important ways.

This is a study of small firms. Most studies of debt-maturity structure have used a sample of large, and often quoted firms. The only previous study to have employed data on small firms appears to have been that of Scherr and Hulburt (2001). Because small firms differ from large firms in several characteristics (for example, ownership structure, flexibility, taxes), their financing options and methods are also quite different. For these reasons, a specific study of the maturity structure of small firms is appropriate.

The present study uses data from a country with a creditor-oriented system. The only other study also focusing on a creditor-oriented system was that of Cai, Cheun and Goyal (1999) who investigated the determinants of the maturity of public debt issues in Japan. Because they examined public debt issues, their sample also included larger firms. Other authors have focused on listed firms in a market-oriented system (see Guedes and Opler (1996), Barclay and Smith (1995), Stohs and Mauer (1996), and Scherr and Hulburt (2001) for studies in the United States, and Ozkan (2000) for studies in the United Kingdom). This is a significant issue for consideration because it is often argued

that banks are better monitors of debt, and can mitigate agency problems. Taken together, these factors influence debt maturity.

The main findings of the present analysis, based on a sample of 4,506 firm-year observations for 1,091 small Belgian firms for the period from 1996 to 2000, are that: the maturity-matching principle is the most important determinant of the debt-maturity structure; growth options do not seem to influence debt maturity; the better the credit worthiness of a firm, the longer the borrowing period they utilise; and larger firms borrow on a shorter term than smaller firms.

The maturity-matching principle has been strongly supported in other empirical work, whereas evidence on the influence of growth opportunities has been mixed. The relationship presented here between credit worthiness and debt maturity is unique in the empirical literature. The empirical evidence on the influence of size has been mixed, with both positive and negative relationships having been reported.

The remainder of the present paper is structured as follows. In Section 2, a concise literature review is provided, and hypotheses are proposed. Section 3 provides information on the sample. Section 4 discusses the variables, and Section 5 discusses the estimation model used in the empirical analysis. In Section 6, the empirical results are presented. Section 7 provides a summarising conclusion to the study.

LITERATURE REVIEW AND RESEARCH HYPOTHESES

The choice of debt maturity

Morris (1976) has argued that firms try to match the maturity of assets and liabilities because this reduces the risk that incoming cash flows might be insufficient to cover interest payments and capital outlays. Debt with a maturity shorter than the maturity of assets is risky because the assets might not have yielded enough profit to repay the debt. Debt with a maturity longer than the maturity of the assets is also risky because debt might have to be repaid after the assets have ceased to yield income. Consequently, firms try to match the maturities of assets and debt. This is known as ‘maturity matching’. This leads to the following hypothesis being proposed:

Hypothesis 1: Firms try to match the maturity of assets with that of liabilities.

According to Myers (1977), reducing debt maturity is an attempt to solve the problem of under investment. He argued that, under debt financing, it is possible that managers might not carry out investments with a positive net present value. When leverage is high, residual claims will be very low and profits from investments will benefit only creditors. Because shareholders will not earn a fair return, they will be reluctant to pursue future investments, which reduces the investment opportunity set and, because firm value equals the value of assets in place and the value of the investment opportunity set, ultimately also reduces firm value. The under-investment problem is of course more severe when a firm has more growth opportunities. Myers (1977) has suggested some solutions to this under-investment problem. One solution consists of reducing the maturity of debt. Issuing debt that matures before an investment opportunity can be carried out will not lead to under investment. Long-term debt is thus best achieved by rolling over short-term debt. This leads to the following hypothesis being proposed:

Hypothesis 2: Firms with high growth opportunities borrow on the short term.

Other solutions to the under-investment problem are: (i) reducing the amount of debt in the capital structure; or (ii) including restrictive covenants in the debt agreement. Diamond (1991) focused on the relationship between debt maturity and the credit worthiness of a firm. A key concept in his theory is liquidity risk. Diamond defined liquidity risk as the risk that a debtor will lose control rents because creditors do not want to refinance, and therefore choose to liquidate the firm. Control rents are then defined as the difference between the profits of a project and the payments to the debtor. Because short-term debt was seen by Diamond as being debt that matures before the profits of an investment are received, it is necessary to refinance short-term debt. The possibility of refinancing depends on the willingness of the creditors, which, in turn, depends on the new credit worthiness of the debtor. If refinancing is impossible, assets have to be sold to meet obligations. In this way, part of the control rents are lost. Of course, this has a negative influence on profitability. For firms with a high credit worthiness, the liquidity risk is not relevant. A decrease of their credit worthiness does not lead to a 'crunch' of credit to the firm. For this reason, firms with a high credit rating are expected to borrow on the short term. For firms with a medium credit rating, the liquidity risk can be of importance. If their credit worthiness decreases, creditors could refuse to extend the loan. They might

take control of the firm and, perhaps, liquidate it. Firms that are afraid that this might happen borrow on the long term. Firms with a low credit rating also like to borrow on the long term. However, creditors do not want to lend their money on a long-term basis to borrowers of this kind. Firms with a low credit rating are therefore forced to borrow on the short term.

Hypothesis 3: A non monotomous relation exists between credit worthiness and debt maturity. Firms with low and high credit worthiness borrow on the short term, whereas firm with medium credit worthiness borrow on the long term.

According to Smith and Warner (1979), there is a greater chance of conflicts between shareholders and debtors in smaller firms. Examples are the under-investment problem and the asset-substitution problem, which occurs when managers invest in more risky assets than that which was originally agreed upon (Barnea, Haugen and Senbet, 1980). In a small firm, the manager usually holds a large proportion of the equity. Actions that benefit the shareholders will therefore also benefit the manager. Because the manager controls the actions of the firm, managers of small firms could be more likely to take risks than managers in large firms. Because these problems can be reduced by issuing short-term debt, a positive relation between firm size and debt maturity is proposed (we admit that firm size is perhaps not the most convenient measure for manager ownership, but we lack better indications on manager ownership) :

Hypothesis 4: There is a positive relationship between size and debt maturity.

In most cases, the issuing costs of a public debt issue are fixed, and these costs are therefore independent of the magnitude of the debt. This enables economies of scale. For this reason, larger firms are especially likely to issue public debt. Because public debt has a longer maturity than private debt, a positive relation between the size of a firm and the maturity of debt is proposed. However, this reasoning does not apply to small unlisted firms, because these firms make very little use of public debt.

The present study also includes leverage and industry affiliation as determinants of debt maturity. Myers (1977) argued that the under-investment problem could also be solved by reducing leverage. It can also be expected that capital structure is, to some extent, sector-dependent.

The debt maturity choice for small firms in a creditor-oriented environment

As noted above, the present study specifically addresses small firms in a creditor-oriented system. The relationship between this sample and the hypotheses (proposed above) is now considered.

Hypothesis 1: Firms try to match the maturity of assets with that of liabilities.

Small firms are more common in the wholesale, retail, and service sectors, whereas large firms are more common in manufacturing. Because manufacturing involves more fixed investments, the maturity of assets in these (larger) firms is likely to be quite different from that of non-manufacturing (smaller) firms. However, the motive for matching maturity of assets and liabilities continues to be relevant for small firms.

Hypothesis 2: Firms with high growth opportunities borrow on the short term.

Petit and Singer (1985) argued that debt-related agency problems (such as the under-investment problem) appear to be potentially more serious in smaller firms. This is supported by the fact that smaller firms face more significant problems of asymmetric information—because most small firms do not supply audited financial statements. In addition, smaller firms have more flexibility, which exacerbates problems such as the asset-substitution problem. This suggests shorter debt maturities for small firms. Among others, Berlin and Loeys (1988) have argued that banks are better in monitoring firms than are other lenders. If bank lending does mitigate agency problems, then there could be less need to shorten debt maturity.

Hypothesis 3: A non monotomous relation exists between credit worthiness and debt maturity. Firms with low and high credit worthiness borrow on the short term, whereas firm with medium credit worthiness borrow on the long term.

An important concept in the theory of Diamond (1991), who proposed the above hypothesis, is that of liquidity risk. To avoid liquidation, firms with a medium creditworthiness will contract long-term debt. However, it can be argued that banks are more willing to renegotiate on contracts than are non-bank lenders (Hoshi, Kashyap, Scharfstein, 1990). If so, liquidity risk decreases for bank borrowers. This induces bank borrowers who have a medium credit worthiness to borrow on a shorter term than non-bank borrowers, for whom liquidity risk is still an important concern.

Hypothesis 4: Size has a positive effect on debt maturity

Because agency problems are worse in small, owner-managed firms, and because shortening debt maturity is a solution for such agency problems, the present paper argues that a positive relation is to be expected between size and debt maturity. However, because the present sample consists entirely of small firms, it is possible that most of these firms are owned by their managers. In this case, the expected relation will not be observed.

SAMPLE

The data used to construct the sample for the present study were gathered from the Belfirst DVD of Bureau Van Dijk. This DVD is the repository of the annual accounts of the firms that deposit their accounts with the central reserve bank of Belgium. In Belgium, firms with limited liability (irrespective of their size), have a legal duty to deposit their annual accounts in a prescribed format. A distinction is made between firms that have to prepare their annual accounts in a complete format and firms that are allowed to prepare their annual accounts in an abbreviated format. A firm has to use the complete format if it has more than 100 employees or if it satisfies at least two of the following criteria: number of employees (yearly average) of at least 50, turnover (value-added tax excluded) of at least 200 million Belgium Francs (BEF) (4,957,880 Euro (EUR)) and total assets of at least 100 million BEF (=2,478,940 EUR).

The firms in our population had to satisfy the following conditions: (i) be required to deposit an abbreviated account; (ii) have submitted an account in every year from 1996 until 2000; (iii) have at least one employee (because the existence of firms without employees is merely driven by fiscal motivations); and (iv) not belong to the financial sector or governmental sector. Financial firms were

excluded because, due to capital requirements, decisions concerning capital and maturity structure could be affected by other factors. Governmental firms were also excluded because, as Smith (1986) has argued, managers in governmental firms have less discretion concerning investments than do managers in non-governmental, and thus, less regulated firms.

From this population, we drew a random sample of 1,200 firms. Observations with missing values were discarded. Outliers were filtered in the following way: (i) the percentage of long-term debt and the percentage of fixed assets could not exceed 100%; and (ii) the short-term default indicator could not exceed 1. The proxies for growth opportunities were filtered by removing the upper and lower 0.5% percentile. Thus, a sample of 4,506 firm-year observations from 1,091 firms for the period from 1996 to 2000 was obtained.

VARIABLES

Variable definition

Guedes and Opler (1996) noted that there are two empirical approaches to investigating the determinants of debt maturity. The first is to investigate the maturity of individual debt issues. However, this approach was problematic with the sample of small firms utilised in the present study because none of the firms made use of public debt issues, and because databases of issues of bank debt were not accessible. The second approach involves the use of cumulative data from the annual account, and this was the approach followed here.

Debt maturity was measured in terms of the percentage of total debt outstanding. Amounts payable in more than one year were added to the current portion of amounts payable after one year, and this was divided by the total debt outstanding, with the result being expressed as a percentage. It was therefore calculated as follows:

$$\%Ltdebt = \frac{Amounts\ payable\ in\ more\ than\ one\ year + Current\ portion\ of\ amounts\ payable\ after\ one\ year}{Total\ debt}$$

Debt that matured within one year but that had an original maturity of more than one year was also included in the measure of long-term debt (because this was issued with a long-term intention).

An alternative dependent variable was also specified in which only financial debt was considered. However, results were very similar using this alternative specification.

The maturity of assets was measured by the percentage of total assets that was fixed.

$$asset\ maturity_i\ (in\ \%) = \frac{fixed\ assets_i}{total\ assets_i}$$

It is very difficult to measure growth opportunities for a sample of non-listed firms. Previous studies using data from listed firms have focused on Tobin's Q as a proxy for growth opportunities. This measure could not be used here because the firms in the present sample were not quoted. Growth opportunities therefore had to be proxied in other ways.

As a first variable, following Scherr and Hulburt (2001), the present study used past growth in total assets. Growth opportunities in a given year were thus calculated as the geometric average of the yearly growth in total assets over the three preceding years. In this approach, it is assumed that firms that grew faster in the past also have greater opportunities for future growth.

Secondly, the ratio of capital expenditures to asset book value was used. Kallapur and Trombley (1999) concluded that, for non-listed firms, this measure best captures ex post realised growth. Growth opportunities in a given year were proxied as the ratio of capital expenditures on asset book value in the same year.

$$Asset\ growth_i = \sqrt[3]{\frac{total\ assets_{i-1} - total assets_{i-4}}{total\ assets_{i-4}}}$$

$$Capital\ \text{exp}\ enditures_i = \frac{New\ investments\ in\ \ fixed\ assets_i}{total\ assets_i}$$

Credit worthiness of a firm is often proxied by ratings offered by agencies such as Standard & Poor's (S&P) and Moody's. However, none of the firms in the present sample had such a rating. This study therefore used a short-term default risk indicator, based on the OJD score, which is a multivariate logit score for failure prediction. This score was developed for Belgian firms as an alternative to the linear Altman's Z score (Ooghe, Joos and de Bourdeaudhuij, 1995). Scores for the short-term default indicator are between 0 (financially healthy firm), and 1 (financially distressed firm).

$$stdefault_i = 1 - short\ term\ OJD\ score_i$$

The non monotomous relation between debt maturity and credit worthiness was tested in two ways. First, both STDEFAULT and the square of the STDEFAULT were included as variables. If the relationship between default risk and debt maturity is parabolic, as Diamond (1991) proposed, the coefficient of the default risk should be positive and the coefficient of the square should be negative.

In the second approach, dummies were used to classify the firms into three categories according to their default risk. Firms with a low default risk (high credit worthiness) were taken to be those situated below the 33rd percentile (dumsthi), firms with a medium default risk (and medium credit worthiness) were taken to be those between the 33rd and 66th percentile (dumstme). The upper 33% of the firms were viewed as firms with a high default risk (dumstlo). To avoid the dummy trap, only two of the three dummies could be included in the regression. The sign expected for the different dummies thus depends on the dummies that were entered in the regression.

$$dumsthi = 1 \; if \; stdefault < 0.0425$$
$$dumstme = 1 \; if \; 0.0425 \leq stdefault < 0.1672$$
$$dumstlo = 1 \; if \; stdefault > 0.1672$$

Although size can be measured in several ways, the present study used the natural logarithm of total assets and the natural logarithm of added value.

Table 1 presents an overview of the hypotheses, the variables, and the hypothesised signs.

Insert Table 1 about here

Descriptives

Table 2 depicts descriptive statistics of the variables. On average, 47.7 % of the debt issued was long-term debt, with the median being 46.0%. The average proportion of fixed assets to total assets, at 46.1%, was close to the proportion of long-term debt. Standard deviation of the percentage long-term debt was also remarkably close to the standard deviation of the percentage of fixed assets, with the values being 26.2% and 27.2% respectively. This was the first indication that the maturity-

matching principle is apposite. Past growth, which was this study's measure of growth opportunities, was fairly high, with the mean being 6%. This figure was twice the median, which amounts to 3%. This indicated the influence of some high-growth firms (which could also be deduced from the maximum, which amounts to 99%). The same picture emerged when capital expenditures were used as a proxy for growth opportunities. On average, new investments in fixed assets accounted for 7% of total assets. The median firm spent an amount equivalent to 3% of total assets.

The average size of the firms in the present sample, measured by total assets, was 756,340 EUR. A very large variance was observed, with the minimum being 13,000 EUR and the maximum being 32,849,000 EUR. This led to a median that was very different from the average observation of 387.000 EUR. The same conclusion was drawn when examining added value. Firms in the present sample were somewhat smaller than those in the sample of Scherr and Hulburt (2001). They used four subsamples, in which the mean of total assets ranged from $1 million to $2 million.

The average leverage ratio was 68.7%, and the median was 72.3%. This leverage ratio was substantially higher than in most other empirical studies. This is due to the fact that the present sample was drawn from a banking-oriented environment in which debt is used more frequently. In addition, the measure of leverage used in the present study not only includes financial debt, but also other categories of debt (such as trade debt).

Insert Table 2 about here

ESTIMATION MODEL

Because the present data included observations of firms over five years, panel data analysis techniques could be used. Baltagi (1995) has argued that panel data have several benefits. The greatest advantage of panel data to the present study is that they allow control for individual heterogeneity. Panel data suggest that firms are heterogeneous. Because time series and cross-section studies do not control for this heterogeneity, the estimation results could be biased. Panel data analysis allows a consideration of a firm-specific time-invariant effect. The analysis can be run by either a

fixed-effects model or a random-effects model. The fixed-effects model can, in general terms, be described by the following equation:

$$y_{it} = a_i + \underline{x}_{it}^{'} \underline{B} + e_{it}$$

in which α_i represents an unknown firm-specific constant, which is referred to as a 'fixed effect'.

The alternative, the random-effects model, is described as follows:

$$y_{it} = a + \underline{x}_{it}^{'} \underline{B} + e_{it}$$

To determine which of these regressions should be run, the Hausman test can be used. This test examines whether the difference between the estimators generated by random-effects regression and the estimators generated by fixed-effects regression approximates zero. In other words: H_0 = random effects and H_A = fixed effects. (In the present analysis H_0 was rejected ($p < 0.0001$), which means that the fixed-effects model was to be preferred.)

As a check for robustness, run pooled OLS-regressions were also run, as were cross-sectional OLS-regressions (in which the observations were the time-series means of the different firms).

RESULTS

Correlations

Table 3 shows the correlations among the various variables. These results again demonstrate preliminary evidence of the significance of the matching principle—in that the correlation between the maturity of assets and the percentage of long-term debt equalled 62 % (which was statistically significant at the 1% level). The correlation between the credit worthiness of the firm and the percentage of long-term debt was very slightly positive (but this was not significant). The variables measuring growth opportunities of a firm correlated negatively with the percentage of long-term debt, which is in line with the findings of Myers (1977). Asset growth was significant at the 5% level, whereas capital expenditures were not significant. There was a very low (and insignificant) positive correlation between total assets and long-term debt, whereas the correlation between added value and long-term debt was strongly negative, and very significant. Because both these measures attempt to capture the size of a firm, no clear picture emerged from this analysis.

Insert Table 3 about here

Regression results

Fixed-effects regression results

Table 4 depicts the results of the fixed-effects regressions. Hypothesis 1 (which proposed that firms seek to match the maturities of assets and liabilities) was strongly confirmed. In every regression, the MATACT coefficient was significant at the 1% level. Maturity matching was undoubtedly the most important factor in choosing between short-term and long-term debt.

Insert Table 4 about here

Myers' hypothesis—that firms with significant growth opportunities borrow on the short term—was not confirmed. The coefficients of past growth in assets (regression (1)) and capital expenditures (regression (2)) were not significant. Growth options, and the associated under-investment problem, do not seem to have influenced decisions concerning corporate debt maturity. However, caution is required before rejecting the under-investment hypothesis. It is doubtful whether past growth is a good measure of future growth options.

The coefficient of STDEFAULT (the measure of credit worthiness in this study) was significantly negative, whereas the square of this variable had a significant positive coefficient. This was not in accordance with Hypothesis 3, which predicted a non monotomous, U-shaped relation between debt maturity and credit worthiness—whereby good and bad firms borrow on the short term, whereas firms of medium quality borrow on the long term. Figure 1 graphically shows the empirical relationship.

Insert Figure 1 about here

The relation was U-shaped. However, the lowest value on the parabolic curve is situated at minus the coefficient of the variable divided by two times the square of this coefficient. In all the regressions, this figure was higher than 60%. Because most of the observations were below this level (with the 95% percentile being situated at a stdefault value of 0.55), it can be concluded that the debt maturity was a constantly increasing function of credit worthiness. This was confirmed by the coefficients of the dummy variables used to classify the firms according to their credit rating (regression (4)). The firms belonging to the category with the highest credit score clearly borrowed on a longer term. The firms with a low credit score borrowed more on the short term. Either way, there was no evidence for the non monotomous relation between credit score and debt maturity, as proposed by Diamond (1991).

The final hypothesis proposed a positive relation between size and debt-maturity structure. The results contradicted this proposition (but confirmed the results of Scherr and Hulburt (2001) for American small firms). The first proxy, the natural logarithm of total assets, yielded a negative coefficient which was highly significant at the 1% level (regressions (1) and (2)). Using the alternative variable, the natural logarithm of value added, the coefficient was insignificant (regression (4)).

Leverage, as a control variable, yielded a statistically significant positive coefficient, and was therefore shown to exert a positive influence on debt maturity. Higher indebted firms might have borrowed on the longer term to ensure that they had earned enough money to be able to repay the creditors. Because the industry to which a firm belongs is time-invariant, these dummies could not be used as a control variable in a fixed-effects regression.

Robustness

To check whether the results were dependent on the regression methodology used, the results of the pooled regressions (Table 5) and the cross-sectional regression (Table 6) were analysed. Again, the maturity matching principle was supported strongly. The coefficients were positive and significant. There is no doubt that maturity matching was very important. Consistent with the results of the fixed-effects regression, growth opportunities do not seem to have played a role in determining the debt-maturity structure. When growth opportunities were measured as past growth in total assets, the

coefficients had the expected negative sign, but they never reached a significant level. When capital expenditures were used, coefficients were also negative and sometimes reached the 10% significance level. However, this evidence was too weak to conclude that growth options determined the corporate debt-maturity structure.

The relationship between credit worthiness and debt maturity also appeared to be very robust in the applied methodology. For each approach, a positive relationship was deduced—that is, financially healthy firms were able to borrow on the longer term, whereas firms with a weak financial condition were forced to borrow on the short term. Diamond's (1991) U-shaped relation was never supported in the present analyses.

The final hypothesis proposed that size has a positive influence on debt maturity. On the basis of the alternative regression used here, support was again found for a negative relation—in that the coefficients were negative and statistically significant for both total assets and added value.

A closer analysis of the industry dummies revealed that wholesale and catering firms appeared to have borrowed on the shorter term. This result was obtained in both the pooled and the cross-sectional regression. Because wholesale and catering firms do not produce goods, they can be expected to own relatively few fixed assets. Assuming that they matched the maturity of their assets and liabilities, this could explain their shorter debt maturity.

Insert Table 5 & 6 about here

Comparison with earlier work

Although comparison with earlier empirical studies is difficult (due to the different environments and samples involved), it is nevertheless worthwhile to consider similarities and dissimilarities with earlier empirical work. An important observation is that, no matter what kind of firm, or which environment, maturity matching is very important. All studies of which the present authors are aware have found strong evidence for maturity matching.

In contrast, the evidence with respect to growth opportunities is mixed, and seems to vary with the size of the firms that are studied. Consistent with Scherr and Hulburt (2001), the present study found no evidence in support of the growth opportunities hypothesis for small firms. This could be interpreted as evidence that banks are good monitors, so that agency problems do not have to be solved by reducing debt maturity. This is a very plausible explanation in the context of our Belgian system. Most small firms tend to take loan agreement with a local office of their bank. So, these small firms are very like to be closely monitored by these local offices.

Empirical evidence on large firms has been more supportive of the growth opportunities hypothesis. Barclay and Smith (1995), Guedes and Opler (1996), and Ozkan (2000) all found a negative relation between growth opportunities and debt maturity. Stohs and Mauer (1996) also reported this relation. However, after controlling for leverage, the growth opportunities coefficient was not significant in the present study.

Most studies have indicated that credit worthiness influences debt maturity. Barclay and Smith (1995) and Stohs and Mauer (1996) both supported Diamond's (1991) hypothesis for large firms, whereas Guedes and Opler (1996) concluded that large US firms with a high credit worthiness borrow on the short term, and Scherr and Hulburt (2001) found that small US firms with lower default risk borrow on the shorter term. This contradicts the present findings, which indicated a positive relation between credit worthiness and debt maturity. Because of the high risk, banks will not lend money on the long term to weak debtors. The finding that good firms borrow on the long term is consistent with that of Graham and Harvey (2001). In their survey of corporate financial policies, issuing long-term debt to minimise the risk of having to refinance in "bad" times is the second most important factor affecting a choice between short-term and long-term debt (with maturity matching being the most important factor).

A positive relation between size and debt maturity was reported by Barclay and Smith (1995) and by Stohs and Mauer (1996). Guedes and Opler (1996) and Scherr and Hulburt (2001) found a negative relation. The present evidence supports the latter findings. As Scherr and Hulburt (2001) have argued, this mixed evidence on size could be caused by the fact that size proxies for several variables (such as agency problems, asymmetric information, etc.).

CONCLUSION

In this study, four hypotheses concerning the determinants of debt maturity structure were tested in a sample of small firms in a creditor-oriented environment. The major concern of the firms in this sample seems to have been matching the maturity of assets and liabilities. The maturity-matching principle was very strongly supported. Myers' (1977) hypothesis, suggesting that firms with many growth opportunities will borrow on the short term as a response to the under-investment problem, was not supported by the present study. There is a clear relation between the credit worthiness of a firm and the debt-maturity structure—whereby firms with a better credit score borrowed on the long term, whereas firms with a poor credit quality were apparently forced to borrow on the short term. The size of a firm plays a role that is in direct contrast to what might be expected from the theoretical literature—that larger firms borrow more on the short term. The present findings concerning maturity matching, growth opportunities, and size are fairly much in line with earlier empirical work. The relation found here between credit worthiness and debt maturity has not been previously reported.

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TABLE 1

Hypotheses, variables, expected signs

Hypothesis	Variable	expected sign
Firms try to match the maturity of assets with that of liabilities	Maturity assets	positive
Firms with high growth opportunities borrow on the short term	Growth assets	negative
	Capital expenditures	negative
The relationship between the credit worthiness of a firm and the debt maturity is U shaped	stdefault	negative
	$stdefault^2$	positive
Size has a positive effect on debt maturity	ln(total assets)	positive
	ln(added value)	positive

TABLE 2

Descriptive statistics of dependent and independent variables

Variable	Mean	Std Dev	Minimum	Maximum	Median
%Long term debt[a]	47.7	26.2	0.0	99.8	46.0
Asset maturity[a]	46.1	27.2	0.0	1.0	43.7
Asset growth[a]	6.4	22.8	-86.2	99.3	3.8
Capital expenditures[a]	7.6	21.7	0.0	98.8	3.4
Short term default	0.2	0.2	0.0	1.0	0.1
Total assets[b]	756.3	1364.4	13.0	32849.0	387.0
Added value[b]	243.9	336.1	1.0	5138.0	126.0
Leverage[a]	68.7	21.7	1.2	99.6	72.3

The dependent variable, %Long-term debt, is the percentage of total debt that was issued with a long-term intention—that is, debt that matures in more than one year plus debt that matures this year but that had an original maturity of more than one year. Asset maturity is the percentage of total assets that are fixed. Asset growth is the geometric average of growth in total assets for the three preceding years (in percentage terms). Capital expenditures is the ratio of capital expenditures this year divided by total assets of this year (in percentage terms). Stdefault is one minus the OJD score (between 0 and 1). Leverage is the ratio between total debt and total assets (in percentage terms).

[a] Percentage

[b] Thousands of EUR

TABLE 3

Pearson correlation matrix

	Long-term debt	Maturity assets	Growth assets	Capital expenditures	Stdefault	Stdefault²	Dumsthi	Dumstme	Dumstlo	Total assets	Added value	Leverage
%Long term debt	1.00											
Asset maturity	0.62***	1.00										
Asset growth	-0.04**	-0.06	1.00									
Capital expenditures	-0.03	-0.01	0.01	1.00								
Stdefault	0.01	0.34***	-0.09**	0.01	1.00							
Stdefault²	0.01	0.28***	-0.08**	0.01	0.93***	1.00						
Dumsthi	-0.01	-0.27***	0.06*	-0.02	-0.52***	-0.30***	1.00					
Dumstme	0.01	-0.01	0.02	0.01	-0.29***	-0.33***	-0.54***	1.00				
Dumstlo	0.00	0.28	-0.08	0.00	0.83***	0.66***	-0.40***	-0.55***	1.00			
Total assets	0.01	0.11**	-0.05	0.02	0.10***	0.07	-0.04	-0.05	0.10	1.00		
Added value	-0.17***	-0.13***	0.01	-0.02	-0.08**	-0.08**	0.02	0.04	-0.06	0.42	1.00	
Leverage	-0.04	0.07	-0.07	0.00	0.35***	0.23***	-0.46***	0.14***	0.30***	-0.05	-0.08	1.00

The dependent variable %Long-term debt is the percentage of total debt that was issued with a long-term intention—that is, debt that matures in more than one year plus debt that matures this year but that had an original maturity of more than one year. Asset maturity is the percentage of total assets that are fixed. Asset growth is the geometric average of growth in total assets for the three preceding years (in percentage terms). Capital expenditures is the ratio of capital expenditures this year divided by total assets of this year (in percentage terms).Stdefault is one minus the OJD score (between 0 and 1), stdefault² is the square of stdefault. Dumsthi is a dummy variable that equals 1 when stdefault score is below 0.0425, and 0 otherwise. Dumstme is a dummy variable that equals 1 when stdefault score is between 0.0425 and 0.1672, and 0 otherwise. Dumstlo is a dummy variable that equals 1 if stdefault exceeds 0.1672. Leverage is the ratio between total debt and total assets (in percentage terms).

* denotes statistical significance at the 10% level.

** denotes statistical significance at the 5% level respectively.

*** denotes statistical significance at the 1% level.

TABLE 4

Results of fixed-effects regressions

Independent variable	Expected sign	(1)	(2)	(3)	(4)
Asset maturity	+	0.60 (25.62)***	0.60 (25.63)***	0.59 (25.48)***	0.58 (23.32)***
Asset growth	-	-0.00 (-0.43)			-0.00 (0.35)
Capital expenditures	-		0.00 (0.09)	0.00 (0.16)	
Stdefault	+	-0.30 (-6.87)***	-0.30 (-6.87)***	-0.30 (-6.81)***	
Stdefault²	-	0.17 (3.10)***	0.18 (3.11)***	0.18 (3.11)***	
Dumstme					-0.03 (-4.12)***
Dumstlo					-0.07 (-7.42)***
Total assets	+	-0.01 (-2.98)***	-0.01 (-2.94)***		
Added value	+			-0.00 (-0.86)	-0.00 (-0.82)
Leverage		0.10 (3.95)***	0.10 (3.95)***	0.10 (4.13)***	0.08 (3.64)***
Adjusted R^2		77.0%	77..4%	77.1%	82.3%

The dependent variable %Long-term debt is the percentage of total debt that was issued with a long-term intention—that is, debt that matures in more than one year plus debt that matures this year but that had an original maturity of more than one year. Asset maturity is the percentage of

total assets that are fixed. Asset growth is the geometric average of growth in total assets for the three preceding years (in percentage terms). Capital expenditures is the ratio of capital expenditures this year divided by total assets of this year (in percentage terms). Ln(Total assets) equals the natural logarithm of total assets, ln(added value) equals the natural logarithm of added value. Stdefault is one minus the OJD score (between 0 and 1), stdefault^2 is the square of stdefault. Dumsthi is a dummy variable that equals 1 when stdefault score is below 0.0425, and 0 otherwise. Dumstme is a dummy variable that equals 1 when stdefault score is between 0.0425 and 0.1672, and 0 otherwise. Dumstlo is a dummy variable that equals 1 if stdefault exceeds 0.1672. Leverage is the ratio between total debt and total assets.

* denotes statistical significance at the 10% level.

** denotes statistical significance at the 5% level respectively.

*** denotes statistical significance at the 1% level.

TABLE 5

Results of pooled regressions

Independent variable	Expected sign	(5)	(6)	(7)	(8)
Intercept		0.34 (9.65)***	0.35 (9.72)***	0.38 (12.11)***	0.18 (4.54)***
Asset maturity	+	0.70 (31.10)***	0.70 (31.21)***	0.68 (30.35)***	0.68 (30.30)***
Asset growth	-	-0.05 (-1.17)			-0.05 (-1.08)
Capital expenditures	-		-0.07 (-1.84)*	-0.07 (-1.90)*	
Stdefault	+	-0.61 (-5.40)***	-0.62 (-5.43)***	-0.64 (-5.77)***	
Stdefault²	-	0.39 (2.36)***	0.40 (2.40)***	0.41 (2.51)***	
Dumsthi					0.20 (9.59)***
Dumstme					0.12 (6.41)***
Total assets	+	-0.02 (-4.05)***	-0.02 (-4.08)***		
Added value	+			-0.03 (-6.42)***	-0.03 (-6.12)***
Leverage		0.01 (0.48)	0.01 (0.43)	0.04 (1.17)	0.05 (1.55)
Dumman		0.00 (0.18)	0.01 (0.30)	0.01 (0.81)	0.01 (0.69)
Dumwho		-0.04 (-2.39)***	-0.04 (-2.33)***	-0.04 (-2.76)***	-0.04 (-2.70)***
Dumret		-0.01 (-0.82)	-0.01 (-0.60)	-0.02 (-1.22)	-0.02 (-1.39)
Dumcat		-0.06 (-2.56)***	-0.06 (-2.48)**	-0.05 (-2.12)**	-0.06 (-2.41)***
Adjusted R²		49.0%	49.1%	50.7%	49.9%

The dependent variable %Long-term debt is the percentage of total debt that was issued with a long-term intention—that is, debt that matures in more than one year plus debt that matures this year but that had an original maturity of more than one year. Asset maturity is the percentage of total assets that are fixed. Asset growth is the geometric average of growth in total assets for the three preceding years (in percentage terms). Capital expenditures is the ratio of capital

expenditures this year divided by total assets of this year (in percentage terms). Ln(Total assets) equals the natural logarithm of total assets, ln(added value) equals the natural logarithm of added value. Stdefault is one minus the OJD score (between 0 and 1), stdefault^2 is the square of stdefault. Dumsthi is a dummy variable that equals 1 when stdefault score is below 0.0425, and 0 otherwise. Dumstme is a dummy variable that equals 1 when stdefault score is between 0.0425 and 0.1672, and 0 otherwise. Dumstlo is a dummy variable that equals 1 if stdefault exceeds 0.1672. Leverage is the ratio between total debt and total assets. Dumman equals 1 if the firm belongs to the manufacturing industry. Dumwho equals one if the firm belongs to the wholesale industry. Dumret equals one if the firm belongs to the retail industry. Dumcat equals one if the firm belongs to the catering industry.

* denotes statistical significance at the 10% level.

** denotes statistical significance at the 5% level respectively.

*** denotes statistical significance at the 1% level.

TABLE 6

Results of cross-sectional regressions

Independent variable	Expected sign	(9)	(10)	(11)	(12)
Intercept		0.91 (22.18)***	0.91 (22.24)***	0.84 (23.48)***	0.21 (10.81)***
Asset maturity	+	0.45 (17.53)***	0.45 (17.53)***	0.43 (16.63)***	0.65 (55.58)***
Asset growth	-	0.02 (0.31)		0.01 (0.03)	
Capital expenditures	-		-0.03 (-0.69)		-0.03 (-1.92)*
Stdefault	+	-1.26 (-9.77)***	-1.27 (-9.84)***	-1.32 (-10.20)***	
Stdefault^2	-	0.95 (5.00)***	0.95 (5.04)***	1.01 (5.32)***	
Dumsthi	-				0.16 (16.92)***
Dumstme					0.09 (12.11)***
Total assets	+	-0.03 (-4.80)***	-0.02 (-4.80)***		
Added value	+			-0.02 (3.50)***	-0.03 (-10.79)***
Leverage		0.02 (0.66)	0.02 (0.68)	0.045 (1.29)	0.03 (1.98)**
Dumman		0.03 (1.92)**	0.04 (1.93)**	0.03 (1.81)*	0.01 (1.47)
Dumwho		-0.04 (-1.99)**	-0.04 (-2.02)**	-0.05 (-2.62)***	-0.05 (-5.04)***
Dumret		0.02 (1.34)	0.02 (1.35)	0.02 (1.11)	-0.02 (-2.04)**
Dumcat		0.00	0.00	0.02	-0.05

		(0.07)	(-0.08)	(0.56)	(-3.56)***
Adjusted R^2		45.21%	44.98%	45.84%	44.74%

The dependent variable %Long-term debt is the percentage of total debt that was issued with a long-term intention—that is, debt that matures in more than one year plus debt that matures this year but that had an original maturity of more than one year. Asset maturity is the percentage of total assets that are fixed. Asset growth is the geometric average of growth in total assets for the three preceding years (in percentage terms). Capital expenditures is the ratio of capital expenditures this year divided by total assets of this year (in percentage terms). Ln(Total assets) equals the natural logarithm of total assets, ln(added value) equals the natural logarithm of added value. Stdefault is one minus the OJD score (between 0 and 1), $stdefault^2$ is the square of stdefault. Dumsthi is a dummy variable that equals 1 when stdefault score is below 0.0425, and 0 otherwise. Dumstme is a dummy variable that equals 1 when stdefault score is between 0.0425 and 0.1672, and 0 otherwise. Dumstlo is a dummy variable that equals 1 if stdefault exceeds 0.1672. Leverage is the ratio between total debt and total assets. Dumman equals 1 if the firm belongs to the manufacturing industry. Dumwho equals one if the firm belongs to the wholesale industry. Dumret equals one if the firm belongs to the retail industry. Dumcat equals one if the firm belongs to the catering industry.

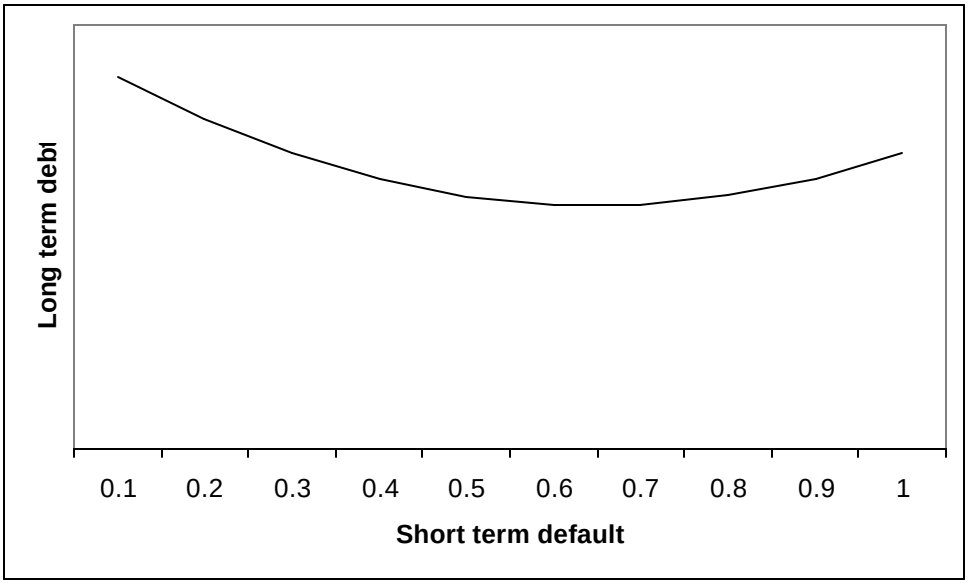
* denotes statistical significance at the 10% level.

** denotes statistical significance at the 5% level respectively.

*** denotes statistical significance at the 1% level.

FIGURE 1

Empirical relationship between short-term default and debt maturity



This figure graphically represents the relation between short-term default and the percentage long-term debt, based on the coefficients found in the regression analysis.