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**THE DETERMINANTS OF FINANCIAL
STRUCTURE: NEW INSIGHTS FROM BUSINESS
START-UPS**

by

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The Determinants of Financial Structure:

New Insights from Business Start-ups

by

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Abstract:

Business start-ups lack prior history and reputation, face high default risk, and have highly concentrated ownership. These unique characteristics result in information and incentive problems, which, combined with entrepreneurial control benefits, affect initial financing decisions. This paper simultaneously examines their impact on leverage, debt mix and maturity. Unlike established firms, start-ups contract less bank debt when adverse selection and moral hazard problems are potentially high. Leasing and trade credit are used to compensate the lower bank debt. Entrepreneurs with large private benefits of control limit bank financing and increase its maturity to lower the default probability on their bank debt.

Keywords: *capital structure, start-ups, information and incentive problems, private benefits of control*

JEL: C31, G21, G32

1. Introduction

This paper investigates the initial financial structure of business start-ups. We focus on true entrepreneurial start-ups that are first-time operations. In other words, these firms do not arise from the split-up of another firm. Nor are they new divisions of existing firms or incorporations of a previously self-employed activity. Such start-ups are unique relative to established firms in a number of ways. They have no prior financial and operating history, and hence no reputation. Ownership and managerial control are not separated, and entrepreneurial private benefits of control can be quite large. Furthermore, the ex ante default risk is high compared to more mature firms. These distinctive characteristics are likely to affect the cost and availability of credit, as well as the financing preferences of the entrepreneur. This study contributes to the capital structure literature by explicitly acknowledging that financing decisions are context specific and that decisions concerning the level and composition of debt are made simultaneously.

First, this paper investigates how the unique features of start-up firms affect initial financing decisions. By examining financial structure at the onset of the life cycle, this study explicitly takes into account the argument of Harris and Raviv (1991) that the impact of capital structure determinants may vary according to the context of the firm. At the start-up stage, outside financiers have no historical data about the firm, which leads to a higher asymmetry in information compared to established firms. The lack of a valuable reputation also enhances the potential for incentive problems in entrepreneurial firms. Since ownership is highly concentrated in business start-ups, where entrepreneurs are owner-managers, agency costs of equity are trivial. On the other hand, entrepreneurs may highly value private benefits of control. As default risk is typically substantial in start-ups (e.g., Evans and Leighton, 1989; Dun & Bradstreet, 1994), financing decisions are likely to be influenced by control considerations. Furthermore, since they directly bear the wealth consequences from value decreasing actions, entrepreneurs could be concerned that lenders develop information monopolies whereby rents can be extracted from the firm.

Second, the debate on whether firms target a certain capital structure (e.g., Bradley, Jarrell and Kim, 1984; Rajan and Zingales, 1995; Helwege and Liang, 1996) or follow a pecking order (e.g., Myers, 1984; Shyam-Sunder and Myers, 1999) when raising funds, tends to be centered around established listed firms. For these firms, the observed capital structure at least partly depends on historical operating performance. Financing decisions of new firms are devoid of this dependency. Very little empirical work has been done on truly new firms, however, because the data are not readily available. A compromise has been to examine corporate spin-offs, as in Dittmar (2000) for example. However, the capital structure of corporate spin-offs may still be influenced by the parent company's reputation and history. The true start-ups studied here, on the other hand, have no history and prior ties to other firms.

Finally, this study examines several financing decisions simultaneously. Existing research typically focuses on one specific aspect of financial structure, such as leverage, the debt mix, or the maturity structure of debt.¹ However, firms and financiers may use more than one of these components simultaneously to reduce information and incentive problems. Leland (1998), for instance, shows that leverage and debt maturity are jointly determined by exogenous variables reflecting agency costs. Various approaches have been used to empirically incorporate the interaction between different components of financial structure.² However, allowing for only a restricted form of interdependence among leverage, the debt mix and maturity structure may result in a variety of econometric problems (see, e.g., Judge et al., 1988). For example, treating leverage as an exogenous variable may lead to biased and inconsistent parameter estimates. Also, parameters estimated from reduced form equations are

¹ For example, Bradley et al. (1984) and Titman and Wessels (1988) study leverage. Houston and James (1996), Johnson (1998), Carey et al. (1998), and Krishnaswami et al. (1999) examine the debt mix, whereas Barclay and Smith (1995) and Guedes and Opler (1996) examine debt maturity structure.

² Stohs and Mauer (1996) argue that leverage should be an explanatory variable when regressing debt maturity on measures of agency costs. Johnson (1998) partitions leverage into an endogenous and an exogenous part, with only the former part explained by the other variables in the model. Helwege and Liang (1996) take yet another approach by considering the financing decision as a sequential decision process.

unlikely to be efficient. To avoid these conceptual and econometric problems, this paper studies leverage, the debt mix and maturity structure in a simultaneous equations model.

The data set used in this study consists of 244 business start-ups, all incorporated in Belgium. This sample could be constructed because Belgian firms are required by law to make their financial statements and foundation charter public. The main findings are as follows. For start-ups that use bank debt, the fraction of assets and operations that is financed with bank loans is lower when adverse selection and moral hazard problems are potentially large. These problems, however, do not affect the maturity structure of bank loans. In contrast, the literature on mature listed firms finds that a higher proportion of debt consists of bank credit and that bank loans have shorter maturities when ex ante adverse selection and moral hazard problems are large. Our results illustrate the unique context of start-ups. They suggest that banks are unlikely to thoroughly screen and monitor small newly established firms. A likely explanation is that the small size of start-ups, and thus the associated loans, and the complexity associated with screening and monitoring of start-ups renders these activities cost ineffective from the point of view of banks. By financing a smaller fraction, banks still obtain a stake in the firm but can restrict their exposure to information and incentive problems without shortening the loan's maturity. The conclusion that banks do not thoroughly screen start-ups is further supported by the finding that entrepreneurs who provide a credible quality signal prefer short-term over long-term bank debt. Start-ups with high ex ante adverse selection and moral hazard problems access other sources of debt financing. A pecking order results, where leasing is preferred over trade credit. Nevertheless, overall leverage is significantly lower when risk shifting incentives are large. Hence, these firms cannot fully compensate the lower bank debt by using leasing and trade credit.

Start-ups with substantial growth opportunities raise a significantly larger fraction of bank debt. The positive effect from growth opportunities apparently dominates potential underinvestment problems when banks lend funds to newly founded enterprises. This result

also indicates that entrepreneurs of high growth firms, which will need to finance further projects in the future, are not largely concerned about future hold-up problems. However, firms with favorable growth prospects raise less debt financing at start-up, *ceteris paribus*.

Finally, entrepreneurs with larger private benefits of control raise a lower fraction of bank debt and increase the maturity of their bank loans. This result is consistent with the argument proposed by Wilner (2000) and Huyghebaert, Van de Gucht and Van Hulle (2001) that banks follow stricter liquidation rules than suppliers. While control rents are also negatively and significantly related to leverage, entrepreneurs with high private benefits of control compensate the lower bank debt with additional leasing and trade credit.

The paper proceeds as follows. The next section develops hypotheses based on the literature on adverse selection, moral hazard and hold-up problems, and on the role of control rights in entrepreneurial firms. Section three describes the sample, the variables and the methodology. Next follow the empirical results. Section five concludes the paper.

2. Determinants of financial structure at start-up

The structure of the funds raised at start-up results from the interactions between the willingness of external financiers to provide funds and the entrepreneur's preferences for certain types of financing. Prior studies document that start-up firms in traditional industries are mainly financed with equity, invested by the entrepreneur and friends or relatives, with bank loans, and with trade credit (e.g., Ooghe, Manigart and Fassin, 1991; Berger and Udell, 1998). For these firms, venture capital is not typically available at the start-up stage. Hence, their financing decisions are in effect reduced to decisions concerning debt rather than equity. Specifically, this study focuses on three key aspects of the start-up's debt structure: (i) the fraction of total financing that consists of external debt (leverage), (ii) the fraction of debt that is bank debt (debt mix), and (iii) the fraction of bank debt that is short-term (maturity

structure). Each of these three components is likely to be influenced by both creditors' and the entrepreneur's concerns.

Given the lack of a prior history and reputation, the high failure risk, and the key role played by the entrepreneur, creditors will typically be concerned about adverse selection and moral hazard problems when lending funds at start-up. This argument is particularly true for banks, since they earn only small profit margins on their loan transactions (e.g., Remolona and Wulfekuhler, 1992; Benink and Llewellyn, 1994). Suppliers earn higher rates on their credit, with documented terms of up to 44% (e.g., Ng et al., 1999). Furthermore, and unlike banks, suppliers are legally prohibited from practicing price discrimination on their credit.³ Therefore, even when they collect information on firm quality, suppliers are legally forbidden from acting on this information through the trade credit terms. As a result, suppliers cannot adopt different credit policies for start-ups compared to incumbents. Prior studies confirm that suppliers adhere to an industry norm when extending credit to firms (e.g., Petersen and Rajan, 1997; Ng et al., 1999).

Entrepreneurs, on the other hand, may worry about banks developing information monopolies. Since uncertainty is high and the ex ante default risk of start-ups is substantial, entrepreneurs could anticipate that it will be difficult to switch creditors when their bank tries to extract rents at the renegotiation of debt contracts. This development of bank information monopolies over time is a realistic expectation since small firms usually borrow funds from only one bank (e.g., Petersen and Rajan, 1994). Entrepreneurs may also recognize that different lenders adopt different liquidation policies. These differences are likely to be important when entrepreneurs highly value private benefits of control. This section discusses the implications of these supply and demand considerations for the three components of initial financial structure.

³ In the U.S., the Robinson-Patman Act (1936) legally forbids price discrimination, both explicit and implicit, through trade credit terms. Articles 81 and 82 of the European Treaty (1997 version) also prohibit price discrimination.

2.1. Banks' considerations

Banks base their lending decisions on several considerations, such as their exposure to bad risks and the likelihood of borrowers taking actions that ex post reduce the value of their claims. These concerns are especially relevant for start-up loans. The following subsections discuss adverse selection and moral hazard problems in the specific context of entrepreneurial firms, and derive implications for the leverage, debt mix and maturity structure of bank debt.

2.1.1. Adverse selection problems

Entrepreneurial quality is difficult to measure since it is qualitative in nature. The value of the entrepreneur's project, which is often innovative in nature, is also difficult to judge, even for experienced creditors. Therefore, the information asymmetry between creditors and start-up firms is likely to be large. The typical scenario described by Akerlof (1970) results. Entrepreneurs with private information about their own quality and project are pooled in the credit market, where creditors charge a lemons premium as compensation for the pool's average credit risk. The larger the proportion of low quality firms in the pool, the larger the undervaluation of high quality start-ups. If this undervaluation is severe, high quality entrepreneurs will reduce their demand for credit or even withdraw from the credit market, and only low quality start-ups will remain in the pool.

Since banks earn only small margins on their loans, they may wish to limit the detrimental effects of adverse selection. They can do so by developing expertise in screening loan applicants. Fama (1985) and Nakamura (1993), for instance, argue that banks specialize in information production and credit evaluation. When banks screen, only high quality firms obtain the requested funds. Accordingly, screening should lower the lemons premium for bank debt compared to other types of credit, such as vendor financing. High quality entrepreneurs in industries with numerous low quality start-ups can therefore lower the cost of debt by contracting bank loans. Hence, when adverse selection problems are potentially large and

banks screen, firms that are not screened out are likely to raise a higher proportion of bank debt, holding constant total leverage.

Ravid and Spiegel (1997), however, argue that thorough screening of each start-up may not be cost effective because these firms are so small and complex. When banks do not screen, they can still limit their exposure to potential adverse selection by financing a lower fraction of assets and operations in these firms. If this is the dominant practice, start-ups with large ex ante adverse selection problems will have a lower proportion of bank debt, *ceteris paribus*.

Another way for banks to reduce adverse selection without screening is to shorten the maturity of the loan. Short-term debt gives a bank greater flexibility to terminate the contract, which is especially valuable when firm quality cannot be determined at start-up, but is revealed over time. The closer the bank monitors, the quicker its information with respect to the venture's quality will be updated, and the larger the value of limiting the loan's maturity at start-up. This argument leads to a negative relation between the extent of possible adverse selection problems and bank debt maturity. The negative relation is also a direct result from the Stiglitz and Weiss (1981) argument that firms may not be able to borrow long-term when default risk is substantial. The reason is that the rate of return required to compensate banks for bearing average long-term credit risk could induce further adverse selection.

The impact of potential adverse selection problems on total leverage is not a priori clear as it will depend on the bank's financing policy. When banks do screen out low quality firms, adverse selection is unlikely to impact leverage for the firms that obtain bank credit.

Conversely, when banks do not screen but restrict overall loan size, firms could compensate the lower bank debt by accessing other credit sources, such as trade credit. Petersen and Rajan (1997), for instance, find evidence that firms use trade credit when banks ration credit.

However, trade credit is more expensive than bank debt. In addition, suppliers may grant less trade credit to industries with large impending adverse selection problems. Under the latter circumstances, a negative relation between adverse selection and leverage might be observed.

In the following subsections, credit rationing and the threat of project termination under poor performance are discussed. Unlike screening, these mechanisms do not prevent pooling in the credit market, but discourage high quality firms from withdrawing from the bank loan market, respectively reduce the incentives of low quality firms to start up. These mechanisms, therefore, can be considered as indirect mechanisms to reduce adverse selection.

Credit rationing

According to Stiglitz and Weiss (1981), if banks require a similar rate from an observationally indistinguishable group of customers, adverse selection causes the composition of the pool to degrade. The interest rate that maximizes bank profits is then not necessarily the rate at which the market clears and credit rationing may result in equilibrium. Among loan applicants who appear identical, some firms will receive a bank loan while others will be refused. Because of credit rationing, the average quality of the firms that enter the bank loan market is higher compared to a situation where every firm obtains the credit it demands by offering to pay a higher rate. This results from high quality firms having smaller incentives to withdraw from the pool.

Under the Stiglitz and Weiss (1981) argument, fewer start-ups will be financed with a bank loan when banks ration their credit. But, for those firms that do obtain bank credit, banks could be willing to lend more and lengthen the maturity of the loans, *ceteris paribus*. The underlying reason is that the average quality of start-ups is higher under credit rationing. Since credit rationing affects only the banks' financing policy and not the other creditors' policies, credit rationing has no direct implications for leverage.

The threat of project termination

Banks can also reduce adverse selection problems by providing a credible threat to terminate the project when performance is poor. In practice, banks are well positioned to

impose such a liquidation threat, especially when they monitor their borrowers. On the one hand, banks have reputational capital at stake, and they are subject to extensive liability regulation (see also Chemmanur and Fulghieri, 1994; Carey, Post and Sharpe, 1998). On the other hand, monitored finance has the advantage of resolving the ambiguity of what caused bad short-run results.

von Thadden (1995) shows that when banks make it clear from the very start that defaulted debt will not be renegotiated, they can discourage entrepreneurs with low quality projects from entering the pool. Dewatripont and Maskin (1995) nevertheless show that a commitment not to refinance projects may no longer be credible *ex post* when sunk costs have been incurred. The solution they offer is a decentralization of credit. However, when banks decide to decentralize credit through limiting their own loan size, start-ups may increase their use of vendor financing rather than decentralize their bank credit. The reason is that the cost of borrowing from more than one bank is substantial for small firms, as argued by, for example, Petersen and Rajan (1994), Houston and James (1996), and Berger and Udell (1998). But studies such as Wilner (2000) and Huyghebaert et al. (2001) argue that suppliers implement a more lenient liquidation policy than banks. As a result, it is not unambiguously clear whether decentralizing credit leads to a credible termination threat in the case of start-ups.

The liquidation threat is also more credible when bank loans are secured with firm assets. The reason is that collateral reduces bank incentives to renegotiate following default (e.g., Welch, 1997; Repullo and Suarez, 1998).⁴ Since collateral gives banks a larger recourse when the firm defaults, and since collateral, through the credible termination threat, discourages low quality entrepreneurs from starting up, the fraction of bank debt could increase, *ceteris paribus*. Also, when the liquidation threat is credible and effective, banks no longer need to shorten the loan maturity to reduce adverse selection problems. Then, the

⁴ Start-ups often complain that, when loans are backed by collateral, banks withdraw credit more hastily or reject refinancing more often. Furthermore, Berger and Udell (1990) find that businesses that are financed by highly secured loans are more likely to fail. Both observations are consistent with our argument.

termination threat may be negatively related to the fraction of bank debt that is short-term. The termination threat has no direct implications for leverage, however, since it only affects the banks', and not the suppliers', financing policy.

2.1.2. Moral hazard problems

Moral hazard problems essentially arise because it is impossible to write complete contracts, i.e. contracts that specify the payout under every future contingency. With incomplete contracts, entrepreneurs may have incentives to expropriate wealth from external investors after the inception of the financial contract. Financial research identifies two specific incentive effects of debt on investments. These are incentives to shift into riskier projects and incentives to underinvest in positive NPV projects. The following paragraphs discuss their implications for the funding of entrepreneurial firms.

Risk shifting incentives

The incentives to shift investments from low to high risk assets or projects are especially strong in start-up firms for two reasons. First, start-ups are riskier than established firms. Dun & Bradstreet (1994), for instance, document that in 1993, approximately 50% of all firms that failed did so in the first five years of their existence. Bergman and Callen (1991) show that risk shifting incentives are especially prevalent when firms are heading towards financial distress. Second, the wealth of entrepreneurs is typically highly correlated with the performance of their firm since entrepreneurs usually invest a large portion of their personal wealth in the firm and/or have substantial firm specific human capital at stake. The easier assets can be substituted and the larger default risk, the higher ex ante risk shifting incentives will be.

When risk shifting is a concern, banks can add value through monitoring. Hence, start-ups with higher ex ante incentives to shift risks may raise a larger fraction of bank debt, ceteris

paribus. As argued earlier, monitoring resolves the ambiguity of what caused bad interim results. Research on mature listed firms indeed finds that the debt mix is largely tilted towards private (bank) debt when monitoring is beneficial (e.g., Houston and James, 1996; Johnson, 1998). For start-ups, on the other hand, the monitoring may not be cost effective since firm size is so small. When banks prefer to limit their exposure to risk shifting incentives, start-ups will have a lower proportion of bank debt, *ceteris paribus*.

Risk shifting incentives are unlikely to affect the maturity of bank debt. The reason is that long-term contracts typically include the right to prematurely end a loan when risk shifting is detected, which precludes the need to shorten the debt's maturity. The impact of risk shifting incentives upon total leverage is not a priori clear. When banks monitor, total leverage will not be affected. Conversely, when banks reduce their lending, the relation between risk shifting incentives and leverage will depend on the firm's ability to access other credit sources. If the cost of trade credit is prohibitive, or if suppliers extend less credit to firms in industries with large incentives to shift risks, a negative relation between risk shifting incentives and leverage will result.

Underinvestment incentives

Firms with high leverage may not pursue an investment opportunity with a positive NPV if the project's benefits mainly accrue to existing debtholders (Myers, 1977). Such underinvestment incentives are potentially high for start-ups whose value largely consists of future growth opportunities. Informed bank finance, however, provides flexibility through contract renegotiability, thereby reducing underinvestment incentives. Smith and Warner (1979) and Berlin and Loeys (1988), among others, argue that restrictive covenants included in bank loan contracts may require firms to return to their bank when attractive investment opportunities would be forgone otherwise. At that time, banks may agree to renegotiate outstanding debt contracts, which will positively affect firm value. Entrepreneurs with

substantial growth options therefore may prefer to finance a larger fraction of their assets and operations with bank debt. If this is the dominant practice, a positive relation between growth opportunities and the debt mix will be observed, holding leverage constant. On the other hand, banks could reduce their exposure to underinvestment problems by limiting loan size at start-up. Then, firms with attractive growth prospects will have a lower fraction of bank debt, *ceteris paribus*.

Myers (1977) argues that short debt maturities can reduce underinvestment incentives when the debt matures before the investment option must be exercised. Hence, start-ups with substantial growth opportunities could have a higher proportion of short-term bank loans. Holding constant the debt mix and maturity structure, underinvestment incentives can also be reduced by limiting total leverage (Myers, 1977). Rajan and Zingales (1995) show that, for established firms, the observed relation is indeed negative, but also that this relation is mainly driven by the firms with access to public equity markets. Start-ups, however, cannot access public equity. Furthermore, in industries where growth opportunities are high, suppliers have no incentives to reduce their credit. Trade credit is by nature short-term, and the suppliers' implicit equity stake is positively related to the start-up's growth opportunities.

2.2. Entrepreneurial considerations

Lending banks may develop information monopolies, which allow them to extract rents from the firm. Furthermore, banks can decide to liquidate the firm when the latter defaults on its loan. These issues, and their implications for the entrepreneur's choice of initial financial structure, are discussed in the following subsections.

2.2.1. Hold-up problems

Information generated during the banking relationship typically is private to the lender and, therefore, cannot be easily transferred to other creditors. Due to a winner's curse

problem, information monopolies make it difficult for borrowers to switch lenders. As a result, the monitoring lender may hold up the firm at the time initial contracts need to be renegotiated or renewed by appropriating a share of the surplus from undertaking profitable projects.

Petersen and Rajan (1994), for instance, find that bank relationships reduce the interest rate on bank loans to small firms by less than the true decline in cost from improved borrower quality. Such hold-up problems are especially detrimental for start-ups with high growth opportunities since their financing needs are large while access to alternative financing sources is limited. Rajan (1992) suggests a trade-off between informed and uninformed debt to moderate potential hold-up problems. Under this trade-off, entrepreneurs use less bank debt when the adverse consequences of informed finance more than offset the positive effects of monitoring in reducing underinvestment.⁵

The relation between hold-up problems and the maturity of bank loans is not a priori clear. On the one hand, long-term loans reduce the need for renegotiation, thereby curbing potential hold-up problems. On the other hand, the bank may just charge a higher rate for long-term contracts.

2.2.2. Entrepreneurial control rights

Entrepreneurs enjoy private benefits of control from running their own firm. Hamilton (2000), for instance, concludes that the non-pecuniary benefits of self-employment must be considerable for entrepreneurs who enter and persist in business despite lower earnings and earnings growth than in paid employment. Since start-ups are not publicly quoted, entrepreneurs involuntarily lose control rights only when their firm defaults on its debt obligations. Hence, the differential enforcement of liquidation rights by various lenders will influence the entrepreneur's debt choice.

⁵ While decentralizing bank debt can also reduce hold-up problems, as suggested by Houston and James (1996), borrowing funds from multiple banks is especially costly for small firms, as argued in section 2.1.1.

Wilner (2000) and Huyghebaert et al. (2001) argue that banks adopt a relatively strict liquidation policy because the profits they earn on loan transactions and, thus, the implicit equity stake they hold in their borrowers, is rather small. Reputation and liability considerations reinforce that, following default, banks will decide to liquidate when the firm's liquidation value exceeds its going concern value. Conversely, suppliers may hold a larger implicit equity stake and, therefore, adopt a more lenient liquidation policy. The findings in Evans (1998) and Franks and Sussman (2000) support the differential enforcement of liquidation rights between banks and suppliers.

Entrepreneurs trade off the lower price of bank debt against the cost induced by the strict bank liquidation policy (Huyghebaert et al., 2001). Entrepreneurs with larger control benefits therefore contract less bank debt, *ceteris paribus*. These entrepreneurs also prefer long-term over short-term maturities. Increasing the maturity of bank loans reduces the debt burden in the first few years, when start-ups typically incur losses (e.g., Laitinen, 1994). Whether control rents affect leverage will depend on the firm's ability to compensate lower bank debt with other credit sources.

3. Operationalization

This section describes the sample selection criteria, the data, the variable measurements and the methodology.

3.1. Sample selection and description

Empirical research on capital structure tends to focus on listed firms. Little empirical research has been done on entrepreneurial firms, simply because the data are not readily available. Most countries do not require unlisted firms to make their financial statements available to the public. In Belgium, however, all limited liability firms – except for financial institutions, insurance companies, exchange brokers and hospitals – are legally required to file

annual financial statements with the National Bank. In addition, newly founded firms have to publish an abstract from their foundation charter in the Government Newspaper (*Staatsblad*). Each firm receives a unique and chronologically accorded Value Added Tax number the first time it registers with the tax authorities. This VAT number allows us to identify newly established firms and their financial statements in the database of the National Bank.

We identify 652 limited liability firms that are founded in 1992 in the manufacturing industry. Restricting the sample to start-ups in a single year ensures greater homogeneity in macro-economic conditions at start-up, which controls for aspects that are unrelated to information and incentive problems. The manufacturing sector is selected because of its higher optimal scale of operations, at least when compared to retailers, wholesalers or service firms. Entrepreneurs in this sector may therefore lack the personal financial resources to fully finance all assets and operations at start-up. To be included in the sample, firms must report their industry code, i.e. the European NACE code, at the four-digit level.

This sample is subsequently cleaned to remove all firms that are not true business start-ups. Using the foundation charter, true start-ups can be distinguished from newly established subsidiaries of existing firms, split-ups, spin-offs, etc. Firms arising from the incorporation of a previously self-employed activity, identified through follow-up phone calls, are also removed from the sample. These screening criteria reduce the sample to 328 true business start-ups. Lastly, firms with missing values for the variables used in the regression models are also deleted. The final sample consists of 244 true business start-ups, spread over 97 industries based on their four-digit NACE code. Table 1 describes the industry distribution of the sample firms, based on their two-digit NACE code. The firms are highly represented in the paper, printing and publishing industry (67 firms); the food, drink and tobacco industry (40 firms); and the timber and wooden furniture industry (32 firms).

insert Table 1

The data include the financial statements of the first accounting year for all sample firms, as well as the financial statements of all incumbent firms in the corresponding 97 industries over the period 1988-1991, i.e. during the four years preceding the sample year. The data on the incumbent firms are used to calculate historical, exogenous industry variables.

Table 2 reports some descriptive statistics on firm size, asset structure, and financial structure at the end of the start-up year. The average firm employs 3.10 persons in the start-up year and its total financing sources amount to € 313,033. Since total assets on average are less than total financing sources, the average firm incurs accounting losses during the start-up year. Summary statistics on asset structure indicate that tangible fixed assets, on average, represent 44.85% of total assets in place, whereas inventories, and cash and marketable securities each represent roughly 10% of total assets.

The start-ups are highly levered: on average, 75.73% of the initial financing sources is raised as external debt (median of 82.04%).⁶ Debt is hereby defined as the sum of long-term debt and current liabilities, including trade credit. To separate the debt mix from the leverage decision, the debt mix is measured as the ratio of bank debt to total debt, rather than to total financing sources. Bank debt on average represents 44.76% of total debt financing while trade credit represents 27.86%.⁷ Almost all firms (96.72%) use trade credit. Furthermore, 28.69% of the sample firms use leasing to finance assets. For these firms, leasing on average represents 15.01% of total debt. Given the importance of trade credit, it is not surprising that

⁶ Huyghebaert (2000) argues that the loans entrepreneurs extend to their firm resemble preferred equity rather than debt financing. Entrepreneurs are unlikely to voluntarily file for bankruptcy when only the debt service payments on these loans can no longer be met. Unlike the U.S., the Belgian bankruptcy law is creditor oriented, so that debtors have no incentive to seek protection under it.

⁷ A potential concern is that firms with greater operational activities in the start-up year accumulate trade credit more easily, which then might bias our financial structure variables. To test this argument, we split our sample on the basis of the ratio of operational cash flows to total funds flow in the start-up year. Leverage and bank debt maturity structure are not significantly different across the two subsamples. However, firms with greater operational activities in the start-up year have a significantly larger fraction of debt that consists of trade credit. Since the latter result is driven by the firms whose entrepreneurs value control rights highly, we can conclude that it is not the supply, but rather the demand for trade credit that drives the observed difference. This argument is reinforced by the observation that leverage is not significantly different across the two subsamples.

the majority of debt is short-term: 52.31% of total debt matures within one year.⁸ On average, 22.84% of bank debt matures within one year.

insert Table 2

3.2. *Variable measurements*

The proxy variables are measured either at the firm level, or at the industry level. Since start-ups have no history, historical firm level data are not available for the theoretical constructs. Furthermore, using data on asset structure from the start-up year could result in serious endogeneity problems. The reason is that initial asset and financial structure are likely to be highly related. Therefore, highly disaggregated industry level data are also used to proxy for some firm characteristics at start-up. These industry level variables are based on historical data for the incumbent firms in the corresponding four-digit NACE industry. Hence, the industry level variables exclude the sample firms. Table 3 describes the explanatory variables.

The extent of potential adverse selection problems is proxied by FAILURE RATE, which equals the proportion of newly established firms founded in the industry during 1988-1991 that filed for bankruptcy within three years after start-up (moving window). The measure for credit rationing builds on the theoretical construct introduced by Stiglitz and Weiss (1981). They argue that when a pool of customers is credit rationed, some firms will receive a bank loan whereas identical others will be refused. CREDIT RATIONING equals the historical proportion of newly founded firms in the corresponding industry during 1988-1991 that start up without bank debt. The threat of project termination is proxied by the firm level dichotomous variable TERMINATION THREAT, which equals one when bank debt is fully secured by business assets at start-up and zero otherwise. Personal assets pledged as collateral

⁸ The financial statements only distinguish between short-term and long-term debt using a one year dividing line. Barclay and Smith (1995), in their study of large listed U.S. firms, find that their results are qualitatively similar for one, two, three, four and five year maturity dividing lines.

are excluded since these guarantees could be considered as a quality signal. Indeed, by pledging external assets as collateral, the entrepreneur puts more personal wealth at stake, and hence provides a credible quality signal. Collateralization of business assets, on the other hand, only reorders the claims of the firm's creditors.

A start-up's potential for risk shifting depends on its flexibility to substitute riskier for safer assets. Tangible assets have a relatively high liquidation value and low appraisal costs, which facilitates risk shifting. However, tangibles are also suitable collateral pledges, in which case they impede risk shifting. Therefore, this study uses highly liquid assets rather than tangibles to proxy for risk shifting incentives. Myers and Rajan (1998) also argue that highly liquid assets have a relatively high liquidation value, but are seldom pledged as collateral. The variable ASSET LIQUIDITY is computed as the industry 1991 average of accounts receivable, cash and marketable securities to total assets. Since risk shifting incentives are greatest when firms are heading towards distress, ASSET LIQUIDITY is multiplied by FAILURE RATE *100 to represent the variable RISK SHIFTING INCENTIVES.

A start-up's incentives to underinvest depend on its future growth opportunities. The commonly used Tobin's Q measure is not useful for this study since all start-ups and a majority of the incumbent firms are unlisted. Therefore, UNDERINVESTMENT INCENTIVES equals the historical industry growth rate in total assets during 1988-1991.

Private benefits of control in listed firms are usually proxied by the firm's ownership structure, as in Demsetz and Lehn (1985), for example. However, in the case of start-ups, shareholdings are all highly concentrated, and hence exhibit little cross-sectional variability. This study uses the type of incorporation as a proxy for control rents. This proxy is based on Freedman and Godwin (1992), who find that some legal forms are associated with a higher business credibility. This association apparently influences small business owners' choice in the U.K.. In Belgium, limited liability firms can choose among several legal forms. One of these forms, N.V. structure, grants entrepreneurs more contractual freedom with respect to

dividend rights, and is also considered to be more prestigious. Entrepreneurs who choose the N.V. corporate form at start-up, therefore, are likely to enjoy higher control rents. LEGAL FORM is a dichotomous variable equal to one when the firm is founded as an N.V. and zero otherwise. However, N.V.'s face higher equity requirements at the time of start-up, for which we need to control to avoid spurious conclusions.⁹

In addition to the above explanatory variables, the models include variables that control for the demand/need for external funds, quality signaling, the liquidation value of firm assets, and the usefulness of debt tax shields. Prior studies document that these variables may influence financial structure (e.g., Bradley et al., 1984; Titman and Wessels, 1988; Barclay and Smith, 1995; Guedes and Opler, 1996; Houston and James, 1996; Johnson, 1998).

An entrant's capital needs are directly related to the industry's economies of scale. Since start-ups have limited access to external equity, scale economies may be positively related to the start-up's leverage. Scale economies are measured by the industry median of the logarithm of total assets in 1991 (variable MES). Another proxy for the firm's financing needs is the variable FULLY PAID EQUITY, which is set to one when entrepreneurs fully invest the amount of equity at start-up and zero otherwise. While shareholders are fully liable for the equity that they have committed to invest, this amount need not be invested immediately at start-up, but can be spread out over several years. Hence, FULLY PAID EQUITY likely indicates whether entrepreneurs are financially constrained at start-up.

Quality signals can increase the willingness of banks to lend and lengthen the maturity of extended bank loans. We control for quality signaling by including the logarithm of the

⁹ Even though banks could require corporations to bring in more equity at start-up as a condition for extending a requested loan, there is no reason why banks would require firms to take on a particular corporate form. In other words, the variable LEGAL FORM is unlikely to be endogenous.

amount of equity issued at start-up (LNEQUITY).¹⁰ While the percentage of equity retained by the entrepreneur provides a credible quality signal in the Leland and Pyle (1977) model, this variable is not useful in the present study given the high ownership concentration in start-ups.

To avoid spurious conclusions about the relationship between initial financial structure and bank debt collateral, we control for the firm's asset structure. Firms whose assets mainly consist of tangibles can more easily secure their debt and have a higher liquidation value. The variable TANGIBLE ASSETS is measured by the industry 1991 average of tangibles to total assets.

Following the paper of DeAngelo and Masulis (1980), commonly used proxies for non-debt tax shields are depreciation charges and investment tax credits. However, non-debt related tax shields may also proxy for the collateral value of assets, leading to a positive relation with leverage (e.g., Bradley et al., 1984; Dittmar, 2000). Therefore, we consider the ratio of taxes paid to total assets, averaged across all firms in the corresponding industry in 1991, as a proxy variable for the usefulness of debt tax shields (DEBT TAX SHIELDS).

To limit the influence of outliers, all explanatory variables – except dichotomous variables – are winsorized at the 1% and 99% percentiles. Pairwise correlations never exceed 0.70, suggesting that multicollinearity is not likely to be a problem (Judge et al., 1988). The dependent variables of the model, i.e. LEVERAGE, DEBT MIX, and MATURITY STRUCTURE, are constrained within the [0, 1] interval, which could lead to non-normal errors. Therefore, the usual log-odds transformation $y' = \ln\{y/(1 - y)\}$ is implemented.¹¹

¹⁰ The amount of equity invested at start-up may not be entirely at the discretion of the entrepreneur. In fact, when adverse selection and moral hazard problems are potentially extensive, banks could require entrepreneurs to invest more equity in exchange for extending a requested loan. To test for this potentially ongoing endogenous process, the variable LNEQUITY is regressed on the proxy variables for adverse selection and moral hazard (variables FAILURE RATE, RISK SHIFTING INCENTIVES and UNDERINVESTMENT INCENTIVES). To control for the fact that entrepreneurs may invest more equity when scale economies are important without this being a matter of quality signaling, the industry MES is included as a control variable. The residuals from this regression are considered as the idiosyncratic part of the variable LNEQUITY. Replacing LNEQUITY by its idiosyncratic part does not affect our conclusions. These regression results can be obtained upon request.

¹¹ Values of $y = 0$ or $y = 1$ lead to missing values for y' . Hence, these values were changed to $y = 0.01$ and $y = 0.99$, respectively, before transformation.

insert Table 3

3.3. Methodology

This study employs a cross-sectional regression analysis where the three dependent variables are studied simultaneously. This framework, therefore, allows to take the interdependencies between the various components of financial structure into account, resulting in the following structural equations system:

$$\begin{cases} y_1\gamma_{11} + y_2\gamma_{21} + y_3\gamma_{31} + x_1\beta_{11} + x_2\beta_{21} + x_3\beta_{31} + x_4\beta_{41} + \dots + x_K\beta_{K1} + e_1 = 0 & (1) \\ y_1\gamma_{12} + y_2\gamma_{22} + y_3\gamma_{32} + x_1\beta_{12} + x_2\beta_{22} + x_3\beta_{32} + x_4\beta_{42} + \dots + x_K\beta_{K2} + e_2 = 0 & (2) \\ y_1\gamma_{13} + y_2\gamma_{23} + y_3\gamma_{33} + x_1\beta_{13} + x_2\beta_{23} + x_3\beta_{33} + x_4\beta_{43} + \dots + x_K\beta_{K3} + e_3 = 0 & (3) \end{cases}$$

where y_i : endogenous variables; $i = 1, \dots, M$
(here: y_1 = leverage; y_2 = debt mix; y_3 = maturity structure of bank debt)
 x_j : explanatory variables; $j = 1, \dots, K$
 e_i : error terms
 γ_{ii} , β_{ji} : parameters to be estimated

Normalization implies that γ_{11} , γ_{22} and γ_{33} are set to one. After bringing all non-normalized variables to the right hand side in each equation, the structural equations system can be considered as a system that explains leverage, the debt mix and the maturity structure of bank debt, respectively. The system is estimated using three-stage least squares (3SLS), which takes the information contained in the contemporaneous correlations among the error terms into account. Judge et al. (1988) argue that the asymptotic distribution of 3SLS estimators is normal.

To obtain unique parameter estimates, M^2 linearly independent restrictions on the parameters of the system are needed. Normalization already reduces the number of required restrictions to $(M^2 - M) = M(M - 1)$. From section two, it is clear that some variables can be set to zero a priori. In particular, credit rationing, the termination threat and quality signaling

only influence the financing decisions of banks. Hence, these variables will have no incremental influence upon leverage, except through the impact that the debt mix and bank debt maturity structure have on leverage. Similarly, the control variables MES and FULLY PAID EQUITY are expected to only influence the leverage decision. Also, there is no theoretical reason for a relation between risk shifting incentives and the maturity structure of bank debt, as banks withhold the right to accelerate loan maturity when risk shifting is detected. Finally, since the price of bank debt, leasing as well as trade credit can be subtracted as a cost in the income statement, the variable DEBT TAX SHIELDS is set to zero in the debt mix equation.¹² These restrictions are denoted by zero in the results tables, and result in each equation being identified.

4. Empirical results

The empirical results of the simultaneous equations estimations are presented in Tables 4–7. We start by discussing the impact of adverse selection and moral hazard problems upon lending by banks, followed by a discussion of the other creditors. The discussion then turns to the role of demand side factors for structuring funds at the time of start-up.

 insert Table 4

4.1. Banks' concerns

The following paragraphs examine the impact of adverse selection and moral hazard on the debt mix and the maturity structure equations.

¹² We acknowledge that tax neutrality only holds exactly when the price of bank debt, leasing and trade credit is the same.

4.1.1. Adverse selection problems

In Table 4, FAILURE RATE has a negative and significant impact on the proportion of bank debt (p -value of 0.0160). Contrary to the literature on mature listed firms (see e.g., Johnson, 1998; Krishnaswami et al., 1999), the proportion of bank debt is lower in start-ups with potentially large adverse selection problems. These findings suggest that banks limit their exposure to adverse selection in the case of start-ups and support the argument of Ravid and Spiegel (1997) that start-ups – and, thus, the associated loans – are so small and complex that screening does not pay off. Rather than staying out totally, banks apparently still finance some, but a lower fraction of total external funds.¹³ To reduce adverse selection problems, banks can also limit loan maturity. While FAILURE RATE has the expected positive sign in the maturity structure equation, it is not significant (p -value of 0.2355).

The maturity of bank debt is significantly longer when mechanisms to reduce adverse selection problems are employed. Both CREDIT RATIONING and TERMINATION THREAT are negative and significant in the maturity structure equation (p -values of 0.0051 and 0.0001, respectively). These findings are consistent with our hypotheses: banks can lengthen the maturity of their loans when credit rationing and/or the threat of liquidation are used to reduce adverse selection problems. These mechanisms, however, do not induce banks to increase the size of the loans since the coefficients are insignificant in the debt mix equation (p -values of 0.7042 and 0.7057, respectively).

4.1.2. Moral hazard problems

The negative and significant coefficient of RISK SHIFTING INCENTIVES in the debt mix equation (p -value of 0.0488) indicates that banks finance a lower fraction of assets and operations in those firms that are more likely to engage in risk shifting after the inception of

¹³ We also estimated a logit model that explains the likelihood of using bank debt in the start-up year. The results show that FAILURE RATE does not significantly affect the likelihood of positive bank debt. These findings can be obtained upon request.

debt contracts, *ceteris paribus*. The negative relation indicates that banks also limit their exposure to risk shifting incentives, but still wish to obtain a stake in the firm.¹⁴ This result also contrasts with the literature on established listed firms (see e.g., Johnson, 1998; Krishnaswami et al., 1999).

The variable UNDERINVESTMENT INCENTIVES is positively and significantly related to the debt mix (*p*-value of 0.0584). The proportion of bank debt thus is significantly greater for firms with large growth opportunities at start-up. For these firms, the incentives to forgo profitable projects may be severe at the time the entrepreneur has to decide on new investments. Apparently, from the point of view of banks, the positive effects from providing loans to start-ups with substantial growth prospects dominate potential underinvestment problems, *ceteris paribus*. Houston and James (1996) also find a positive relation, but only for firms with multiple banking relationships; for firms with a single banking relationship, the relation is negative. However, unlike start-ups, the firms in their sample have access to public debt markets.

Finally, investment opportunities are not significantly related to the maturity of the bank debt, *ceteris paribus* (*p*-value of 0.4549). Barclay and Smith (1995), on the contrary, find that for mature listed firms the relation between growth opportunities and debt maturity is negative. Since underinvestment incentives can be reduced by limiting loan maturity, our finding could indicate that the possibility of bank debt contract renegotiation indeed is the driving force behind the positive relation between growth opportunities and the debt mix. Indeed, when bank loans can be renegotiated as warranted, there is no longer a need to shorten maturity. Conversely, the lack of a significant relationship between growth opportunities and maturity structure could also indicate that banks are not largely concerned about a potential underinvestment problem at start-up.

¹⁴ In the logit model that explains the likelihood of using bank debt in the start-up year, RISK SHIFTING INCENTIVES is not significant either. This finding provides further support for our conclusion.

4.2. Other lenders' concerns

This paragraph discusses the evidence on the lending practices of non-bank creditors to start-up firms. To this end, we refer to the leverage equation in Table 4.

4.2.1. Adverse selection problems

Adverse selection problems do not have a significant impact on leverage (p -value of 0.2305), holding constant the demand for external funds, controlled for by MES, FULLY PAID EQUITY and growth opportunities. This result suggests that entrepreneurs can offset the lower bank debt by using other credit sources. Table 2 shows that the most important alternatives for start-ups are leasing and trade credit. Sharpe and Nguyen (1995) argue that lessors are not highly vulnerable to default risk, and indeed find that lessors finance assets of firms that face high default risk. However, Smith and Wakeman (1985) point out that leasing contracts are not readily available for highly specialized assets and assets with high maintenance costs. Hence, not all start-ups may be able to access leasing. The impact on trade credit is more complex. As argued in section two, the supply of trade credit is industry determined. If the supply of trade credit is lower in industries where ex ante failure risk is high, entrepreneurs will not be able to offset the lower bank debt with trade credit.

Whether firms compensate lower bank debt by using other financing sources is studied in more detail in Panel A of Table 5. The leverage equation in these models includes an interaction term of FAILURE RATE with either LEASING or TRADE CREDIT. LEASING is the industry 1991 average ratio of leased assets to fixed tangible assets whereas TRADE CREDIT is the industry 1991 mean ratio of trade credit to purchases.

insert Table 5

The parameter estimate of FAILURE RATE is negative, but remains insignificant in the leverage equation (p -value of 0.5547). Furthermore, both interaction terms have a positive

sign in the leverage equation, but only the variable FAILURE RATE * LEASING is significant (p -value of 0.0001). This result suggests that start-ups in industries with high failure risk compensate the lower bank debt with leasing rather than with trade credit.

We further examine this conjecture in Panel B of Table 5, where the latter system is estimated on the subsample of start-ups that use no leasing in the year of start-up ($N = 174$ firms). The interaction variable FAILURE RATE * TRADE CREDIT is significant (p -value of 0.0518). This result indicates that start-ups do use trade credit to finance themselves when constrained by banks because of adverse selection, but only when not using leasing. Together, the findings in Panel A and B of Table 5 suggest a pecking order for firms that are constrained because of adverse selection problems: firms prefer leasing over trade credit, possibly because it is a cheaper source of funds, and if difficult to access, they use more of the relatively expensive trade credit.

The other parameter estimates and their significance levels in Panel A of Table 5 and, to a smaller extent also in Panel B, remain largely unchanged.

4.2.2. *Moral hazard problems*

The base model in Table 4 reports a significant negative relation between risk shifting incentives and leverage (p -value of 0.0549), which indicates that the reluctance of banks to lend because of risk shifting on average cannot be fully offset by increasing the use of other financing sources. This negative relation is consistent with studies by Titman and Wessels (1988) and Johnson (1998), among others. Again, we use interaction variables to examine whether firms attempt to compensate the lower bank debt by increasing leasing and/or trade credit use. The leverage equation in Panel A of Table 6 includes the interaction variables of RISK SHIFTING INCENTIVES with either LEASING or TRADE CREDIT.

 insert Table 6

Both interaction terms are positive, but only the interaction term with leasing is significant (p -value of 0.0001). Estimating the system of equations for newly founded firms that do not use leasing in the year of start-up ($N = 174$ firms), as reported in Panel B of Table 6, shows that the interaction term with trade credit is positive with a p -value of 0.0833. The pecking order where leasing is preferred over trade credit apparently also holds in the case of risk shifting problems.

To continue the discussion of the base model in Table 4, the leverage equation shows that start-ups in industries with abundant growth opportunities contract significantly less debt financing at start-up, despite the significant positive effect in the debt mix equation. This result is consistent with the literature (see, e.g., Dittmar, 2000). Unlike Rajan and Zingales' (1995) argument, this negative relation is not driven by the firms with better access to equity financing. Indeed, the correlation between the amount of equity invested and growth opportunities is not significant. A possible explanation for the negative relation between growth opportunities and leverage is that firms anticipate substantial future cash flows from their projects, inducing them to limit external debt at start-up.

4.3. Entrepreneurial concerns

This paragraph discusses the evidence on the entrepreneur's concerns about potential hold-up problems and the loss of private benefits of control following default.

4.3.1. Hold-up problems

The significant positive relation between growth opportunities and the debt mix in Table 4 (p -value of 0.0584) also indicates that entrepreneurs are not largely concerned about a potential hold-up problem when contracting bank debt at start-up. From the point of view of entrepreneurs, the renegotiability of bank debt apparently outweighs the potential for hold-up problems in high growth industries. The reason why high growth start-ups use more bank debt

is not because they have few alternative financing sources: the positive relation between growth opportunities and the debt mix holds after controlling for leverage. The relation between growth opportunities and bank debt maturity structure is not significant (p -value of 0.4549), which further indicates that financing decisions are not driven by hold-up concerns.

4.3.2. *Entrepreneurial control rights*

Table 4 shows that entrepreneurs who value private benefits of control more highly (the variable *LEGAL FORM*) raise significantly less bank debt at start-up (p -value of 0.0001). Furthermore, the maturity of their bank debt is longer, even though this variable is only marginally significant (p -value of 0.1248). These results are consistent with the models of Wilner (2000) and Huyghebaert et al. (2001), where the liquidation policies of banks are stricter than those of suppliers.

Control rents are negative but not significant in the leverage equation (p -value of 0.3364), which suggests that, on average, entrepreneurs access alternative sources of debt financing to fully remedy their reluctance to raise bank debt when they value private benefits of control highly. Table 7 further tests this argument by interacting the proxy variable for control rents with *LEASING* and also with *TRADE CREDIT*.

insert Table 7

The interactions of *LEGAL FORM* with *LEASING* and with *TRADE CREDIT* are both positive and significant (p -values of 0.0001 and 0.0095, respectively). Entrepreneurs with high control rents contract both more leasing and more trade credit to offset their reluctance to raise bank debt. The absence of the earlier documented pecking order indicates that the additional cost of trade credit is more than offset by the more lenient liquidation policy when private benefits of control are high. *LEGAL FORM* has become significantly negatively related to leverage (p -value of 0.0003). Together, these results indicate that entrepreneurs with

high control rents prefer to raise less debt, unless leasing and trade credit are readily available. Then, lower leverage is actually compensated by using these alternative financing sources.

4.4. Control variables

The discussion of the control variables is based on Table 4. The need for external funds increases the fraction of debt financing at start-up. Start-ups have significantly higher leverage when they operate in industries with high scale economies (MES; p -value of 0.0037). When the entrepreneur fully invests the issued equity at start-up, leverage is significantly lower (FULLY PAID EQUITY; p -value of 0.0048).

Consistent with our hypotheses, the quality signal LNEQUITY is positively and significantly related to the proportion of bank debt, *ceteris paribus* (p -value of 0.0001). Note that for established listed firms, the relation between firm quality and bank debt use is negative. Houston and James (1996) and Johnson (1998) find that high quality listed firms prefer to raise funds in relatively cheap public debt markets. For start-ups, the only alternative to bank credit may be more expensive vendor financing. In addition, LNEQUITY is positively and significantly related to the fraction of bank debt that is short-term (p -value of 0.0001). This result might seem surprising at first since a credible quality signal should induce banks to lengthen debt maturity. A potential explanation, which is consistent with our earlier findings, is that high quality entrepreneurs prefer short-term bank financing because it is less sensitive to underpricing (e.g., Flannery, 1986). This feature is valuable when quality signaling is not perfect and when banks do not screen thoroughly, which our earlier results suggest. High quality entrepreneurs also prefer short-term debt when information asymmetries will be reduced in the future because then refinancing occurs sooner (e.g., Diamond, 1993).

Start-ups with more TANGIBLE ASSETS have a significantly larger fraction of bank debt (p -value of 0.0184), and their bank loans have longer maturities (p -value of 0.0374). These relations are at odds with the literature on mature listed firms, but can be explained by

the theoretical models of Wilner (2000) and Huyghebaert et al. (2001). They argue that especially when firms have a high liquidation value, banks adopt stricter liquidation policies than suppliers. Entrepreneurs in these firms then reduce their reliance on bank debt, and prefer long-term loans.

Tax considerations do not significantly influence the initial financial structure of start-ups. Both in the leverage and the maturity structure equations, DEBT TAX SHIELDS is not significant. A possible explanation is that the tax advantage of debt financing is minimal in the first years following start-up, when EBIT usually is very low or even negative (e.g., Laitinen, 1994).

4.5. Interactions between leverage, debt mix and maturity structure

The interactions between the variables leverage, debt mix and maturity structure are significant. Start-ups that are highly leveraged have a lower proportion of bank debt (p -value of 0.0084) and their bank loans have longer maturities (p -value of 0.0019). Likewise, firms financed with long-term bank loans are less leveraged (p -value of 0.0327) and have a lower proportion of bank debt (p -value of 0.0086). These results confirm that the various components of financial structure are set simultaneously rather than sequentially, thereby justifying the need for simultaneous estimation. The system weighted R^2 of the model, which measures the fit of the joint model, amounts to 16.77%. Hence, our model captures a non-trivial part of the variability in financial structure at start-up.

5. Conclusions

This study sheds a new light on the role of banks in financing the start-up stage of small newly founded enterprises. Compared to established firms, start-ups have no prior history and reputation, and face high default risk. In addition, ownership is highly concentrated and private benefits of control can be quite large. As a result of these contextual characteristics,

start-up firms have unique information and incentive problems. Screening and monitoring would seem highly valuable in this situation. Our findings, however, show that the screening and monitoring role performed by banks in start-ups deviates from the role played by banks in established firms.

First, the results reveal that adverse selection problems significantly affect the initial financial structure of business start-ups. Banks actually finance a smaller fraction of assets and operations in start-ups when adverse selection problems are potentially large. Furthermore, even though shortening the loan maturity can reduce adverse selection problems, banks do not adjust the maturity according to the level of ex ante adverse selection problems. These results suggest that banks do not screen start-ups as thoroughly as the literature on established firms would suggest. Nevertheless, we find that entrepreneurs who provide a credible quality signal through the amount of equity committed to their venture obtain a larger fraction of bank debt, which indicates that banks do take at least some information into account. However, the bank loans granted to these same entrepreneurs have significantly shorter maturities. By limiting loan maturity, high quality entrepreneurs seem to avoid locking in their financing costs at start-up. This finding thus further suggests that banks are only imperfectly informed about the venture's quality at the time of start-up.

Second, risk shifting problems also significantly influence initial financial structure. As entrepreneurs have substantial financial and human capital at stake, it is not surprising that risk shifting under financial distress is a major concern for banks. Newly founded enterprises where the entrepreneur's ex ante incentives to shift risks are larger have a lower fraction of bank debt outstanding, *ceteris paribus*. These findings contrast with the monitoring role the literature attributes to banks. Furthermore, start-ups cannot offset the reluctance of banks to lend by contracting other credit sources.

We also document that leasing and trade credit are used more extensively when adverse selection and risk shifting problems are high. A potential explanation for this finding might be

that lessors and suppliers use other mechanisms to reduce these problems. The features included in lease contracts typically reduce default risk, as explained in Sharpe and Nguyen (1995), among others. Alternatively, trade credit generally is very short-term debt, and therefore less subject to information and incentive problems. Suppliers may also take other considerations into account when providing funds, such as their implicit equity stake in the firm (e.g., Wilner, 2000; Huyghebaert et al., 2001). Furthermore, our results suggest a pecking order with firms preferring leasing over trade credit to offset a shortage of funds when information and incentive problems in the credit market are extensive. In the case of adverse selection problems, firms are able to offset the reluctance of banks to lend by using leasing and trade credit, but this does not hold when ex ante risk shifting problems are substantial.

In addition to these supply driven determinants, this study also examines the demand side of initial financial structure. We find that firms with higher ex ante growth opportunities finance a significantly larger fraction of assets and operations with bank debt at the time of start-up. This positive relation indicates that entrepreneurs are not largely concerned about future hold-up problems when borrowing from banks. Furthermore, entrepreneurs who value private benefits of control more highly structure their financing so as to reduce the likelihood of premature liquidation. In particular, these entrepreneurs reduce their reliance on bank debt at the time of start-up. Also, entrepreneurs with large private benefits of control raise longer term bank debt, and limit leverage at start-up, unless they can easily access leasing and trade credit. These results further add to the findings of Agrawal and Narayanan (1990), who uncover that in firms with a higher managerial control of voting rights and family relationships among senior managers, leverage is lowered and financial slack increased to preserve control.

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Table 1: Industry distribution of manufacturing start-ups

This table displays the industry distribution of the start-up firms, based on their four-digit NACE industry code. All sample firms are incorporated in Belgium and start their operations in the manufacturing industry in 1992. The sample is constructed from the Belgian National Bank database. Based on the foundation charter and follow-up phone calls, only true entrepreneurial start-ups are retained.

NACE code	description	number of firms
2200-2299	Production and preliminary processing of metals	1
2300-2399	Extraction of minerals other than metalliferous and energy-producing minerals; peat extraction	1
2400-2499	Manufacture of non-metallic mineral products	6
2500-2599	Chemical industry	2
3100-3199	Manufacture of metal articles (except for mechanical, electrical and instrument engineering and vehicles)	12
3200-3299	Mechanical engineering	7
3400-3499	Electrical engineering	8
3600-3699	Manufacture of other means of transport	4
3700-3799	Instrument engineering	13
4100-4299	Food, drink and tobacco industry	40
4300-4399	Textile industry	16
4400-4499	Leather and leather goods industry (except footwear and clothing)	2
4500-4599	Footwear and clothing industry	15
4600-4699	Timber and wooden furniture industries	32
4700-4799	Manufacture of paper and paper products; printing and publishing	67
4800-4899	Processing of rubber and plastics	5
4900-4999	Other manufacturing industries	13
TOTAL		244 firms

Table 2: Characteristics of the start-up firms

This table provides descriptive statistics for the sample of 244 start-up firms. All sample firms are incorporated in Belgium and start their operations in the manufacturing industry in 1992. The sample is constructed from the Belgian National Bank database. Based on the foundation charter and follow-up phone calls, only true entrepreneurial start-ups are retained. The descriptive characteristics are based on the financial statements of the first accounting year. To calculate total financing sources, we undo the balance sheet of the first accounting year from the proceeds realized during the first year, i.e. we remove retained earnings and built up reserves. Balance sheet items that do not correspond to flows of money (e.g., surplus values from revaluation, provisions, etc.) are not included in the financing sources. Loans extended by the entrepreneurs to their firm are considered as preferred equity rather than debt financing.

	mean	median	min	max	std. dev
FIRM SIZE					
Number of employees	3.0984	2	0	38	4.5486
Issued equity (€)	49,025	18,592	1,487	1,189,889	104,190
Total financing sources (€)	313,033	143,418	11,279	8,505,103	686,910
Total assets (€)	299,983	144,571	5,057	8,505,896	670,012
ASSET STRUCTURE					
Tangible fixed assets/total assets	0.4485	0.4551	0	0.9821	0.2424
Inventories/total assets	0.1071	0.0568	0	0.7500	0.1370
Cash and marketable securities/total assets	0.0878	0.0390	0	0.7751	0.1217
FINANCIAL STRUCTURE					
Leverage: debt/total financing sources	0.7573	0.8204	0.0741	0.9930	0.1962
Debt mix: bank debt/total debt	0.4476	0.4469	0.0010	1.0000	0.2586
Trade credit/total debt	0.2786	0.2449	0	0.9773	0.2222
Leasing/total debt	0.0399	0	0	0.8569	0.1087
Leasing/total debt if leasing > 0	0.1501	0.0858	0.0033	0.8569	0.1675
Short-term debt (1 year)/total debt	0.5231	0.5095	0	1	0.2728
Maturity structure: short-term bank debt (1 year)/bank debt	0.2284	0	0	1	0.3429

Table 3: Description of the explanatory variables used in the estimations of the financial structure determinants

This table describes the explanatory variables that are used in the simultaneous equations estimations of the financial structure determinants for start-up firms. The sample of start-up firms is described in Tables 1 and 2. The industry level variables are constructed from the financial statements of the incumbent firms in the corresponding four-digit NACE industry prior to the 1992 start-up year. These variables hence exclude the 244 sample firms. Data on the incumbent firms was obtained from the Belgian National Bank database.

variable name	description	mean	median
Adverse selection			
FAILURE RATE	Industry mean failure rate of firms that start up in 1988-1991 and are tracked for three years following their start-up year (moving window).	0.0506	0.0426
CREDIT RATIONING	Fraction of firms that start up in 1988-1991 with no bank debt in the start-up year.	0.2104	0.2088
TERMINATION THREAT	Dichotomous firm level variable equal to one when bank debt is fully secured by business assets at start-up and zero otherwise.	0.2746	0
Moral hazard			
RISK SHIFTING INCENTIVES	Interaction term between FAILURE RATE and the mean of liquid assets to total assets for all incumbents in 1991, multiplied by 100.	0.8535	0.7124
UNDERINVESTM. INCENTIVES	Mean growth in total assets over all incumbents during 1988-1991.	0.7056	0.4311
Control rents			
LEGAL FORM	Dichotomous firm level variable equal to one when the start-up is an N.V. and zero otherwise.	0.3361	0
Control variables			
MES (minimum efficient scale)	Median logarithm of total assets, measured over all incumbent firms in the industry in 1991.	9.8546	9.8002
FULLY PAID EQUITY	Dichotomous firm level variable equal to one when the entrepreneur fully pays committed equity at start-up and zero otherwise.	0.6270	1
LNEQUITY	Firm level logarithm of equity issued at start-up.	6.7858	6.6201
TANGIBLE ASSETS	Mean of tangible assets to total assets, measured over all incumbent firms in the industry in 1991.	0.6863	0.7075
DEBT TAX SHIELDS	Mean of taxes to total assets, measured over all incumbent firms in the industry in 1991.	0.0202	0.0180

Table 4: The determinants of leverage, debt mix and bank debt maturity structure for start-up firms: the base model

This table presents the 3SLS simultaneous equations estimates of the determinants of (1) leverage, (2) the debt mix, and (3) the maturity structure of bank debt in the start-up year for 244 industrial new firms founded in 1992. Leverage is the ratio of total debt to total financing sources. Debt mix is the ratio of bank debt to total debt. Maturity structure is the ratio of short-term bank debt to total bank debt. The dependent variables are transformed using the log-odds transformation: $y' = \ln\{y/(1-y)\}$. Restrictions are denoted by zero in the columns of parameter estimates. The explanatory variables are defined in Table 3.

	Leverage prop. of total funds that is debt financing		Debt mix prop. of debt financing that is bank debt		Maturity structure prop. of bank debt that is short-term debt	
	parameter estimate	p-value	parameter estimate	p-value	parameter estimate	p-value
INTERCEPT	0.9884	0.2779	-1.3226	0.4469	2.9773	0.4833
Adverse selection						
FAILURE RATE	0.2617	0.2305	-0.7837	0.0160	0.9078	0.2355
CREDIT RATIONING	0		-0.3593	0.7042	-6.3483	0.0051
TERMINATION THREAT	0		0.0625	0.7057	-2.2355	0.0001
Moral hazard						
RISK SHIFTING INCENTIVES	-0.1791	0.0549	-0.2970	0.0488	0	
UNDERINVESTM. INCENTIVES	-0.8178	0.0188	0.9790	0.0584	-0.9115	0.4549
Control rents						
LEGAL FORM	-0.1858	0.3364	-1.7006	0.0001	-1.1421	0.1248
Control variables						
MES	0.1572	0.0037	0		0	
FULLY PAID EQUITY	-0.3078	0.0048	0		0	
LNEQUITY	0		0.7029	0.0001	1.3599	0.0001
TANGIBLE ASSETS	-1.0029	0.2023	-2.9136	0.0184	-5.9103	0.0374
DEBT TAX SHIELDS	4.1445	0.3914	0		27.6485	0.1357
Jointly determined variables						
LEVERAGE	0		-1.8887	0.0084	-6.5232	0.0019
DEBT MIX	-0.2631	0.2705	0		-1.6860	0.1379
MATURITY STRUCTURE	-0.2432	0.0327	-0.4783	0.0086	0	

System Weighted R-Square: 16.77% (N = 244 observations)

Table 5: The determinants of leverage, debt mix and bank debt maturity structure for start-up firms: the impact of adverse selection problems on leverage

This table presents the 3SLS simultaneous equations estimates of the determinants of (1) leverage, (2) the debt mix, and (3) the maturity structure of bank debt in the start-up year for 244 industrial new firms founded in 1992. Compared to Table 4, this table emphasizes the impact of adverse selection problems on leverage by adding two additional variables in the leverage equation, both interactions terms with FAILURE RATE. LEASING is the industry mean ratio of leased assets to fixed tangible assets. TRADE CREDIT is the industry mean ratio of trade credit to purchases. The dependent variables are defined in Table 4 and the other explanatory variables are described in Table 3. Restrictions are denoted by zero in the columns of parameter estimates. Panel A presents the estimates for the entire sample. Panel B presents the results for the subsample of firms that do not use leasing.

	PANEL A: TOTAL SAMPLE (N = 244)						PANEL B: FIRMS WITHOUT LEASING (N = 174)					
	Leverage		Debt mix		Maturity structure		Leverage		Debt mix		Maturity structure	
	parameter estimate	p-value	parameter estimate	p-value	parameter estimate	p-value	parameter estimate	p-value	parameter estimate	p-value	parameter estimate	p-value
INTERCEPT	1.3067	0.1501	-1.6618	0.3356	2.1503	0.6125	1.3242	0.2797	-2.4614	0.2093	0.2175	0.9940
Adverse selection												
FAILURE RATE	-0.1321	0.5547	-0.7893	0.0152	0.8972	0.2409	0.2179	0.4903	-1.0661	0.0041	-0.2381	0.9511
FAILURE RATE* LEASING	0.6634	0.0001	0		0							
FAILURE RATE* TRADE CR	0.0671	0.2553	0		0		0.0858	0.0518	0		0	
CREDIT RATIONING	0		-0.3998	0.6674	-6.4040	0.0046	0		-1.6660	0.0198	-22.804	0.0001
TERMINATION THREAT	0		0.0261	0.8728	-2.3157	0.0001	0		0.0113	0.9276	-7.3019	0.0001
Moral hazard												
RISK SHIFTING INCENTIVES	-0.1652	0.0760	-0.2962	0.0494	0		-0.2670	0.0001	-0.0602	0.5150	0	
UNDERINVESTM. INCENTIVES	-0.6417	0.0649	0.9878	0.0561	-0.8937	0.4637	-0.8606	0.0726	1.2080	0.0304	0.6145	0.9166
Control rents												
LEGAL FORM	-0.3781	0.0526	-1.7613	0.0001	-1.2738	0.0870	-0.3042	0.2606	-1.3571	0.0001	-6.2531	0.0688
Control variables												
MES	0.1429	0.0075	0		0		0.1384	0.0033	0		0	
FULLY PAID EQUITY	-0.2362	0.0281	0		0		-0.1895	0.0414	0		0	
LNEQUITY	0		0.7500	0.0001	1.4618	0.0001	0		0.6733	0.0001	6.1076	0.0001
TANGIBLE ASSETS	-1.3231	0.0933	-2.9100	0.0185	-5.8782	0.0385	-0.7248	0.5458	-0.7145	0.6041	-2.6669	0.8559
DEBT TAX SHIELDS	2.0051	0.6733	0		27.6723	0.1354	5.5169	0.2324	0		75.3032	0.1526
Jointly determined variables												
LEVERAGE	0		-1.8552	0.0089	-6.3866	0.0024	0		-1.0933	0.1688	-29.386	0.1675
DEBT MIX	-0.2661	0.2616	0		-1.6602	0.1449	-0.9794	0.1071	0		-22.769	0.1983
MATURITY STRUCTURE	-0.2504	0.0275	-0.4797	0.0084	0		-0.0838	0.6829	-0.0024	0.9916	0	
System Weighted R-square	20.10%						19.76%					

Table 6: The determinants of leverage, debt mix and bank debt maturity structure for start-up firms: the impact of risk shifting incentives on leverage

This table presents the 3SLS simultaneous equations estimates of the determinants of (1) leverage, (2) the debt mix, and (3) the maturity structure of bank debt in the start-up year for 244 industrial new firms founded in 1992. Compared to Table 4, this table emphasizes the impact of risk shifting incentives by adding two additional variables in the leverage equation, both interactions terms with RISK SHIFTING INCENTIVES. LEASING is the industry mean ratio of leased assets to fixed tangible assets. TRADE CREDIT is the industry mean ratio of trade credit to purchases. The dependent variables are defined in Table 4 and the other explanatory variables are described in Table 3. Restrictions are denoted by zero in the columns of parameter estimates. Panel A presents the estimates for the entire sample. Panel B presents the results for the subsample of firms that do not use leasing.

	PANEL A: TOTAL SAMPLE (N = 244)						PANEL B: FIRMS WITHOUT LEASING (N = 174)					
	Leverage		Debt mix		Maturity structure		Leverage		Debt mix		Maturity structure	
	parameter estimate	p-value	parameter estimate	p-value	parameter estimate	p-value	parameter estimate	p-value	parameter estimate	p-value	parameter estimate	p-value
INTERCEPT	1.6787	0.0667	-1.3584	0.4530	3.1647	0.4738	1.3185	0.2802	-2.4554	0.2107	0.4334	0.9881
Adverse selection												
FAILURE RATE	0.1519	0.4669	-0.7749	0.0173	0.9217	0.2290	0.2450	0.4358	-1.0652	0.0041	0.2497	0.9487
CREDIT RATIONING	0		-0.4205	0.6803	-6.5476	0.0064	0		-1.6494	0.0216	-22.638	0.0001
TERMINATION THREAT	0		-0.0079	0.9650	-2.4075	0.0001	0		0.0102	0.9350	-7.3180	0.0001
Moral hazard												
RISK SHIFTING INCENTIVES	-0.3587	0.0003	-0.2947	0.0507	0		-0.2812	0.0001	-0.0601	0.5155	0	
RISK SHIFTING*LEASING	0.7838	0.0001	0		0						0	
RISK SHIFTING*TRADE CR	0.0572	0.2039	0		0		0.0520	0.0833	0		0	
UNDERINVESTM. INCENTIVES	-0.7023	0.0344	0.9667	0.0619	-0.9316	0.4454	-0.8489	0.0755	1.2069	0.0305	0.6016	0.9183
Control rents												
LEGAL FORM	-0.3054	0.1017	-1.7800	0.0001	-1.3461	0.0747	-0.3024	0.2617	-1.3568	0.0001	-6.2538	0.0688
Control variables												
MES	0.1365	0.0165	0		0		0.1373	0.0036	0		0	
FULLY PAID EQUITY	-0.2864	0.0118	0		0		-0.1902	0.0408	0		0	
LNEQUITY	0		0.7659	0.0001	1.5246	0.0001	0		0.6733	0.0001	6.1117	0.0001
TANGIBLE ASSETS	-1.5270	0.0439	-3.0073	0.0154	-6.2411	0.0289	-0.7064	0.5546	-0.7158	0.6034	-2.6749	0.8554
DEBT TAX SHIELDS	4.4234	0.3729	0		27.9089	0.1321	5.5249	0.2321	0		75.3821	0.1521
Jointly determined variables												
LEVERAGE	0		-2.0678	0.0058	-7.2212	0.0010	0		-1.0961	0.1678	-29.608	0.1644
DEBT MIX	-0.1288	0.5883	0		-1.8491	0.1049	-0.9728	0.1083	0		-22.939	0.1949
MATURITY STRUCTURE	-0.1916	0.0939	-0.4742	0.0092	0		-0.0796	0.6969	-0.0004	0.9984	0	
System Weighted R-square	19.82%						19.74%					

Table 7: The determinants of leverage, debt mix and bank debt maturity structure for start-up firms: the impact of control rents on leverage

This table presents the 3SLS simultaneous equations estimates of the determinants of (1) leverage, (2) the debt mix, and (3) the maturity structure of bank debt in the start-up year for 244 industrial new firms founded in 1992. Compared to Table 4, this table emphasizes the impact of control rents by adding two additional variables in the leverage equation, both interactions terms with LEGAL FORM. LEASING is the industry mean ratio of leased assets to fixed tangible assets. TRADE CREDIT is the industry mean ratio of trade credit to purchases. The dependent variables are defined in Table 4 and the other explanatory variables are described in Table 3. Restrictions are denoted by zero in the columns of parameter estimates.

	Leverage		Debt mix		Maturity structure	
	parameter estimate	p-value	parameter estimate	p-value	parameter estimate	p-value
INTERCEPT	2.0432	0.0277	-1.6168	0.3591	2.3676	0.5778
Adverse selection						
FAILURE RATE	0.2288	0.2853	-0.7774	0.0169	0.9196	0.2296
CREDIT RATIONING	0		-0.0747	0.9388	-5.7422	0.0115
TERMINATION THREAT	0		0.0013	0.9938	-2.3904	0.0001
Moral hazard						
RISK SHIFTING INCENTIVES	-0.2012	0.0303	-0.2965	0.0493	0	
UNDERINVESTM. INCENTIVES	-0.8224	0.0159	0.9726	0.0601	-0.9223	0.4497
Control rents						
LEGAL FORM	-1.2775	0.0003	-1.7332	0.0001	-1.2382	0.0969
LEGAL FORM * LEASING	0.7643	0.0001	0		0	
LEGAL FORM * TRADE CR	3.8923	0.0095	0		0	
Control variables						
MES	0.0927	0.0936	0		0	
FULLY PAID EQUITY	-0.2804	0.0101	0		0	
LNEQUITY	0		0.7321	0.0001	1.4450	0.0001
TANGIBLE ASSETS	-1.4973	0.0546	-2.8893	0.0196	-5.8996	0.0378
DEBT TAX SHIELDS	3.6957	0.4471	0		27.7880	0.1338
Jointly determined variables						
LEVERAGE	0		-1.8550	0.0107	-6.5640	0.0018
DEBT MIX	-0.2255	0.3417	0		-1.7477	0.1229
MATURITY STRUCTURE	-0.2325	0.0374	-0.4784	0.0086	0	

System Weighted R-Square: 18.67% (N = 244 observations)