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SMALL BUSINESS FINANCE IN FINLAND

A DESCRIPTIVE STUDY

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ABSTRACT: Using new data originating from a recently conducted survey, this paper examines the financing of small and medium-sized enterprises (SMEs) in private equity and debt markets in Finland. We find that the three most important sources of funds are the principal owner's equity, trade credit provided by non-financial firms and debt provided by financial institutions (FIs). These account for about 2/3 of total debt and equity. The Finnish SMEs run a debt ratio of 54%, but it is lower for small than for large SMEs. The debt ratio also varies non-monotonically with the age of firms. Overall, the capital structure of the Finnish SMEs does not seem to fundamentally differ from that in the US (when the study of Berger and Udell (1998) is used as the US benchmark). There are however some evidence that as the Finnish SMEs age, they increase indebtness slowly compared to the US SMEs. The young SMEs also utilize less FI debt in Finland than in the US.

We also find that the financing of innovative and R&D-intensive SMEs differs in several aspects from that of other SMEs. The data shows that innovative firms, firms with R&D-activities and firms that own patents and/or intangible assets run a lower debt ratio than their counterparts. The difference is most notable for the most R&D-intensive SMEs, which also rely less on debt supplied by FIs than other firms do. SMEs with R&D-activities seem to resort more on inside equity than other SMEs do. The analysis suggests that a partially "reversed" pecking order may best characterize innovation finance. We also provide new evidence on main sources, concentration and interconnectedness of innovation finance.

KEYWORDS: Corporate finance, capital structure, SME, R&D, innovativeness.

TIIVISTELMÄ: Tutkimuksessa analysoidaan suomalaisten pienten ja keskisuurten (pk) yritysten rahoituksen lähteitä uuteen kyselyaineistoon perustuen. Kolmen tärkeimmän rahoituslähteen, pääomistajan osakesijoituksen, kauppaluottojen ja rahoituslaitosluotto-jen, osuus koko rahoituksesta on noin 2/3. Pk-yritysten velkasuhde on 54% ja se on kor-keampi suurilla kuin pienillä pk-yrityksillä. Velkasuhde vaihtelee epälineaarisesti yrityk-sen iän mukaan. Näyttää siltä, että suomalaisten pk-yritysten pääomarakennetta koskevat tulokset eivät poikkea merkittävästi yhdysvaltalaisista tuloksista. Joitain viitteitä on kui-tenkin siitä, että pk-yritysten velkasuhde kasvaa iän myötä hitaammin Suomessa kuin Yhdysvalloissa ja että Suomessa nuorilla yrityksillä rahoituslaitosluottojen osuus on pie-nempi.

Innovatiivisten, T&K-intensiivisten ja aineettomia oikeuksia omistavien pk-yritysten velkasuhde on alhaisempi verrattuna muihin pk-yrityksiin. Ero on huomattavin kaikkein T&K-intensiivisimpien yritysten kohdalla, joilla on lisäksi suhteellisesti vähemmän ra-hoituslaitosluottoja kuin muilla yrityksillä. T&K:ta harjoittavat yritykset näyttäisivät tur-vatuvan suhteellisesti vähemmän ulkopuoliseen osakerahoitukseen kuin muut pk-yritykset. Tutkimuksen valossa osittain käänteinen rahoituslähteiden "nokkimisjärjestys" voi kuvata parhaiten innovatiivisten pk-yritysten rahoitusta. Tutkimuksessa saadaan li-säksi uusia tuloksia innovatiivisten pk-yritysten päärahoittajista, rahoituksen keskittynei-syydestä ja eri rahoituslähteiden korrelaatiosta.

AVAINSANAT: Yritysrahoitus, pääomarakenne, pk-yritys, T&K, innovatiivisuus.

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1   Introduction

Small and medium sized enterprises (SMEs) are nowadays considered an engine of economic growth and a heart of national innovation capacity. Unlike on large firms, there is relatively little information available on SMEs and particularly on the private capital markets providing funding to them. SMEs are informationally opaque, because financial press does not systematically follow them, because they are not subject to equally demanding disclosure requirements as large firms and because commercial financial data vendors and credit rating services collect their data only to a limited extent (Berger and Udell 1998, BU for short). Innovative and R&D-intensive SMEs may be even more informationally opaque than the SMEs are on average because R&D projects are often beset with high uncertainty and secrecy. A consequential upshot of the informational opacity is that it reduces the availability of external finance to SMEs. Curiously enough, it also prevents policy makers, providers of public SME support and researchers from studying the determinants and availability of small business finance on the marketplace.

The private equity and debt markets that fund SMEs are different from the public markets that provide funding to transparent and well-known large businesses. In contrast to the public markets, the private markets are characterized by relationships, tailored financing solutions, combinations of explicit and implicit contracts and private information production and monitoring (see also BU 1998). These are market responses to the informational opacity and to asymmetric information that arises because the insiders of a firm typically know more than outside investors about the likelihood of the firm making a breakthrough or going bankrupt (adverse selection). They also are market responses to the frictions that arise because neither firms nor financiers can commit not to behave opportunistically (moral hazard).

Financial intermediaries (FIs), such as banks, finance companies, insurance companies and venture capital firms, play a special role as information producers in the private markets. Their specialized information production and monitoring are an important means to address the problems of adverse selection and moral hazard and to assess the quality of SMEs. How efficiently they perform the tasks determines FIs' ability to channel external finance to firms, be it equity or debt. Other sources of external finance, such as trade credit, private persons and family finance, are also important, as they may have a comparative advantage in provid

ing finance to some of the most opaque SMEs. The comparative advantage of these other sources of external finance is however based on their natural relationships and interaction with the SMEs rather than on specialization. Trade credit, for example, is a funding mechanism in which some firms act as intermediaries channeling funds from the financial institutions to their peers (Demirgüç-Kunt and Maksimovic 2001).

Using new data originating from a recently conducted survey, this paper aims at addressing two questions. First, what are the most important sources of finance to SMEs? Because Finland's financial sector has recently undergone a major restructuring in which a bank-centered financial system shifted from relationship-based debt finance towards a US type system with increasing influence of the stock market (Hyytinen and Pajarinen 2001, and Hyytinen, Kuosa and Takalo 2002), it is of particular interest to compare the sources of SME finance in Finland with those in the US.[1] Second, are the sources of finance different for innovative small businesses and/or for SMEs investing in R&D?

We proceed in Section 2 with a theoretical discussion of the determinants of the SME finance. We consider the financial growth cycle of SMEs in general and particularly the financing of R&D-intensive SMEs. In Section 3, we provide a detailed analysis of small business finance in Finland. Section 4 concludes.

2 Financing of Small Businesses and R&D: Theory

The traditional view of SME finance is descriptively captured by the notion of financial growth cycle of SMEs (BU 1998). In this section, we first describe the basic building blocks of the financial growth cycle view and the broad predictions it puts forward for the optimality of the different sources of finance. We then discuss briefly some theories of the financing of R&D-intensive SMEs, and consider how they contrast with the traditional view.

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[1]   We will use BU's study as the US benchmark.

2.1 The traditional view: The financial growth cycle of SMEs

The financial growth cycle view of SME finance posits that the less information-ally opaque the firm, the easier its access to frictionless capital markets. Typically, a firm characterized by severe informational asymmetries about its quality, with no track record or assets that it could pledge as collateral must rely primarily on insider finance. After insider finance has been exhausted, it is optimal to use debt. The optimality may be related to many things, such as asymmetric information between corporate insiders and outsiders. The received theory suggests that firms may wish to minimize issue costs by issuing the safest security first, as its value is least sensitive to the informational asymmetries. Because of adverse selection and other capital market imperfections, issue costs, including underpricing, may be smaller for debt than for equity. Leverage may also limit management's opportu-nities to use corporate resources opportunistically (Jensen 1986). After feasible borrowing opportunities have been exhausted, outside equity is raised. Outside equity is however a last resort, because its value is most sensitive to the informa-tional asymmetries.

The financial growth cycle view suggests that the financing needs and op-tions of an SME change as the firm grows. The youngest and smallest firms with limited track record and assets in place do not necessarily obtain significant amounts of debt finance from FIs. Because of this, these firms may be forced to rely disproportionately on "initial" insider finance. The initial insider finance con-sists of funds provided by the entrepreneur and start-up team. It may also include capital infusions by family and friends during the infant stages of the firm, though these should probably be considered as a form of angel finance. For entrepreneurs with limited wealth, angel finance and trade credit together with other financing from alternative providers of external finance, such as non-financial firms, are potentially an important source of funds. Because of their natural relationships and interaction with SMEs, the alternative providers of external finance may have a comparative advantage in providing finance to some of the most opaque SMEs.

As firms grow and become a bit more transparent, they gain access to intermediated debt finance.[2] FIs play a special role as information producers in the markets for intermediated finance. Their specialized information production and monitoring are an important means to address the informational and agency problems that SMEs with limited track record and assets in place are beset with. SMEs can sometimes obtain more and cheaper financing from FIs by establishing close relationships with them (Petersen and Rajan 1994, Boot 2000). The value of the securities of those firms that become medium-sized and have some track record and collateral available becomes less sensitive to the private information of the corporate insiders. They are therefore more likely to receive financing also from less specialized FIs. Private placements of debt and equity provide a financing option for firms that are relatively large and that can demonstrate a convincing track record. At this point, firms often cease belonging to the class of SMEs. Finally, the larger and more successful firms gain access to domestic public equity and debt markets and at some point also to international financial markets.

Because of its characteristics, the financial growth cycle view closely resembles the pecking order theory of (external) financing developed by Myers and Majluf (1984) and Myers (1984).[3] The pecking order implies that firms prefer internal to external finance, specifically when information asymmetries are prevalent. If external finance is required, firms will issue debt before equity. External equity is the most costly source of external finance. It is therefore a last resort. The pecking order theory suggests that if the need for external finance reduces, firms first trim down their use of equity and then use of risky debt. As summarized in Myers (2001), a consequence of this is that each firm's debt ratio reflects its cumulative need for external finance.

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[2]   There are several reasons to this. First, the longer the firm survives and the larger it grows, the more assets it can accumulate to back up the use of debt finance (Stiglitz and Weiss 1981, Bester 1985, Besanko and Thakor 1987). Second, the older the firm, the more time it has had to build reputation (Diamond 1991) and the more likely it is that the firm can demonstrate a history of interaction (i.e., a relationship) with the outside investors, such as FIs (Petersen and Rajan 1994, BU 1995).

[3]   As Myers (2001) has recently concluded, there is no universal theory of the capital structure choice. Besides the pecking order theory, the other two theories that have in recent times been put forward are the tradeoff theory and the free cash-flow theory. The tradeoff theory considers the balance between the tax advantages of additional debt and the costs of possible financial distress. It typically predicts moderate borrowing by tax-paying firms (Myers 2001). The free-cash flow theory of Jensen (1986) focuses on agency problems and applies best to firms with plenty of internal finance available.

2.2   Financing of innovative and R&D-intensive SMEs

It is a widely held view that the financing of R&D investments and technological innovations is characterized by a number of market failures (Hall 2002). Besides uncertainty over technological opportunities, investments in technological innovations are beset by appropriability problems (i.e., by difficulties in extracting the social value of innovations)[4] and capital constraints. Capital constraints are directly related to an innovative firm's access to external finance. The access depends on how effectively the problems of adverse selection and moral hazard are addressed on the marketplace. Adverse selection arises because the insiders of the innovative firm know more about the likelihood of the firm delivering an innovation than outside investors. Moral hazard arises because the insiders may have an incentive to engage in opportunistic behavior at the expense of the outside investors (Stultz and Johnson 1985).

The conventional wisdom underlying the financial growth cycle view need not apply to innovative small businesses investing heavily in R&D. There are several reasons to this. First, moral hazard rather than adverse selection (underlying especially the pecking order theory) may be the main problem in innovation finance. Moral hazard may disproportionately characterize innovation finance because, if anything, the exact nature of an innovation is ill-defined ex ante.[5] Holmström's (1989) analysis for example suggests that the market for innovation finance may fail because of the agency costs that stem from the forward-looking, high-risk, labor-intensive and idiosyncratic nature of innovative activities and because designing appropriate incentive schemes for such activities is difficult. Another related source of moral hazard is the incompleteness of R&D contracts

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[4]   R&D-intensive SMEs may face more severe appropriability problems than the SMEs face on average, as it is sometimes prohibitively costly to obtain intellectual property rights for innovations and as SMEs are not likely to own complementary assets, such as reputation and existing distribution channels, to enhance the appropriability (see Gans and Stern 2000)

[5]   If the amount of external finance needed to finance the invention (research) and innovation (development) is large relative to the amount of committed insider finance, moral hazard problems can become more severe. Moreover, there is a potential hold-up problem in the relationship between the firm/researchers performing R&D and the providers of external finance (Anand and Galetovic 2000). The hold-up problems arise because the knowledge acquired through costly research becomes embodied in the human capital of researchers and because the researchers can commercialize the knowledge on their own. This may allow the researchers to act opportunistically and thus worsen the moral hazard problem further.

(Aghion and Tirole 1994), as it is difficult, if not impossible, to contract for a delivery of a specific innovation.

Second, R&D-intensive SMEs may have a limited amount of assets in place to back up their debt and to reduce the risk of the debt securities they issue. More generally, it is often argued that the debt capacity of growth opportunities, defined as the amount of debt that firms optimally raise for an incremental project, is smaller than that of assets in place (see, e.g., Smith and Watts 1992). Recently, Barclay, Morellec and Smith (2001) have shown that because more growth options increase the under-investment cost of debt (Myers 1977) and reduce the benefits of debt in controlling over-investment by corporate management (Jensen 1986), the debt capacity of growth opportunities can even be negative.

Finally, R&D-intensive SMEs may find it difficult to reveal the quality of their projects to the providers of external finance due to confidential nature of the projects (Anton and Yao 1994, Bhattacharya and Chiesa 1995). Partly for this reason, R&D-intensive SMEs cannot necessarily rely on relationship banking as a source of debt finance as much as other SMEs can. The costs of relationship banking are potentially high to R&D-intensive SMEs, because banks obtain proprietary information about them as part of their relationships and because the proprietary information may allow the banks to charge (ex post) high loan interest rates (see Boot 2000). It is this threat of being "locked-in" which reduces the benefits of relationship banking to R&D-intensive SMEs.

The above considerations suggest that a partially "reversed" pecking order theory may best apply to innovative small businesses, especially to those investing heavily in R&D. In the reversed pecking order, firms resort to outside equity finance before they (can) obtain significant amounts of debt.[6] Data would be consistent with the partially reversed pecking order if

- leverage decreases and the use of equity-linked securities (i.e. capital loans) increases with "innovativeness"; and if
- R&D-intensive firms rely less on debt than the firms that can already demonstrate a degree of innovativeness do.

However, as many have observed, tapping the market for outside equity may be difficult. Myers (2000) and Zingales (2000) argue for example that tapping the

market may require co-investment of both human and financial capital by the corporate insiders. Data would be consistent with these views, i.e. that it is relatively expensive to issue outside equity, if

- R&D-intensive firms disproportionately rely on inside equity (holding the debt ratio constant).

3 Financing of Small Businesses and R&D: Evidence

3.1 Raw data and sample weights

The empirical evidence in this paper is based on new data originating from a recently conducted private survey. The survey covered SMEs from most major sectors of the Finnish economy as only farm (agricultural), financial, and real-estate sectors were fully excluded.[7]

The survey resulted in an original sample that consists of 936 firms. Because initially 2600 firms were contacted, this implies a response rate of 36 percent. For this paper we use a smaller sample of 754 SMEs. The sample is smaller because some of the firms in the original sample are not SMEs and because some answers to certain key questions (from the viewpoint of this paper's analysis) were missing or inconsistent.

The data are book values and unless otherwise indicated, the data are weighted to adjust for our sampling design (see Appendix 1) and to permit rough inferences about the capital structure of the population of the Finnish SMEs. However, because there is no data available to us against which we could check the accuracy or consistency of our data, we caution the reader that the estimates should be considered to give only a general idea of the financing sources of the Finnish SME sector.

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[6] Other factors influencing the use of external equity finance by a firm are the desire of founding entrepreneurs to keep ownership and control of the firm, the founding entrepreneurs' need for risk-sharing and the amount of unused interest tax shields that the firm has.

[7] We also excluded SMEs that are proprietorships, partnerships, or subsidiaries. A detailed description of the survey and data is presented in Appendix 1.

Table 3.1   Description of unweighted and weighted data

		Unweighted		Weighted	
		n	%	n	%
Net sales, mill. €	< 0.2	136	18%	112	15%
	0.2-1.5	378	50%	426	56%
	1.6-8	205	27%	181	24%
	>8	35	5%	35	5%
Number of employees	<5	257	34%	330	44%
	5-20	329	44%	312	41%
	>20	168	22%	112	15%
Age of firm, years	0-2	38	5%	35	5%
	3-4	75	10%	69	9%
	5-24	526	70%	527	70%
	>24	115	15%	123	16%
Exports / net sales	0%	438	58%	527	70%
	1-25%	194	26%	167	22%
	26-50%	44	6%	27	4%
	51-75%	26	3%	14	2%
	76-100%	51	7%	19	3%
	N/A	1	0%	0	0%
R&D expenditure / net sales	0%	242	32%	399	53%
	0-1%	145	19%	175	23%
	2-5%	137	18%	97	13%
	6-10%	81	11%	24	3%
	>10%	124	16%	46	6%
	N/A	25	3%	13	2%
Predicted annual growth rate for the next three years	<0%	4	1%	5	1%
	0-1%	152	20%	235	31%
	2-5%	133	18%	149	20%
	6-10%	169	22%	170	23%
	>10%	269	36%	157	21%
	N/A	27	4%	38	5%
Has patents	Yes	99	13%	49	6%
	No	654	87%	705	94%
	N/A	1	0%	0	0%
Has other intangible assets	Yes	169	22%	108	14%
	No	582	77%	645	86%
	N/A	3	0%	1	0%
Total number of obs.		754		754	

Note: The data are drawn from a primary survey administrated by the Research Institute of the Finnish Economy (ETLA) and Etlatieto Ltd and conducted between December 2001 and January 2002. The data have been weighted to replicate the Finnish small business population as a whole, excluding farm, real-estate and financial businesses as well as subsidiaries, partnerships and proprietorships. The data refer to 2000/2001 and the financial data are book values. Because of the small sample size and measurement problems, we caution that these data are not necessarily completely accurate or consistent. The numbers we present should be considered rough estimates intended only to give a general idea of the Finnish small business sector and its characteristics.

Table 3.1 illustrates un-weighted and weighted data. Firms in the un-weighted data are younger, more R&D-intensive and more growth-oriented than in the weighted data. Moreover, in the un-weighted data firms have more patents and other intangible assets than in the weighted data. These patterns are expected, as they reflect our desire to over-sample technology-based SMEs.

3.2 Distributions of equity and debt by firm age and size

Small size and young age are often considered a potential source of financial constraints for SMEs. In this section, we document how the distribution of sources of funds depends on firm size and age. We also compare the distribution to that of the US SMEs using Table 1 from BU (1998, p. 620) as the benchmark.[8]

3.2.1 Overview

Table 3.2 - Table 3.6 show the estimated distribution of the sources of funds for the Finnish small businesses as well as their decomposition by firm size and age.[9] The size and age categories roughly follow BU (1998); we will explain them in more detail shortly.

In Table 3.2 the funding sources are displayed for two sources of equity, two sources of capital loans and three sources of debt.[10] "Principal owner" is defined either as a shareholder who is one of the five largest owners with significant control over the firm's capital structure and governance or, for some firms, as the largest shareholder if such a shareholder unambiguously exists. "Other equity" consists of the remaining shareholders' equity. "Private" capital loans are supplied by FIs and other private sources, while "Public" capital loans include capital loans supplied by the National Technology Agency (Tekes), Finnvera plc (a specialised

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[8]   It is very important to note that the US numbers refer to early 1990s, so the comparison is indicative at best.

[9]   The size of the sample for which the entries in the tables have been calculated is reported on the top row of Panel A. Firms were dropped from the analysis in this section if they had responded incompletely in the questions regarding the sources of funds and if these missing observations could not be replaced by the authors' own calculations using available data.

[10]   Capital loans are loans that satisfy the regulations set out in the Finnish Companies Act. Because of their special treatment in the Companies Act, capital loans must in the financial statements be included in the shareholders' equity. However, because their economic nature resembles that of debt, we have included them neither in equity nor in debt.

financing company owned entirely by the Finnish state), the Finnish National Fund for Research and Development (Sitra), and other governmental bodies.[11] The sources of debt are "Financial institutions" that include banks, finance companies, insurance companies, pension funds, foreign financial institutions and other credit institutions. "Other institutions" are defined as government sources and non-financial firms. "Other debt" consists of commercial papers and bonds, which, as we will see, are a negligible source of debt in our data, as well as unidentifiable sources of debt. More detailed categorizations are presented in tables that we will discuss in a moment.

Table 3.2 shows that like large companies, SMEs depend heavily on both equity and debt.[12] The (capital loans inclusive) debt ratio, i.e., the ratio of the sum of debt and capital loans to the sum of debt, capital loans and equity financing, is 54%. Finnish SMEs are somewhat more indebted that their US counterparts who run a debt ratio of 50% (BU 1998). However, treating capital loans as a part of debt increases the debt ratio of the Finnish SMEs by 2 percentage points. The most important source of funds is unsurprisingly the principal owner's equity that accounts for 29% of the total debt and equity. The same holds for the US, as there the principal owner's equity accounts for 31% of the total equity plus debt (BU 1998). The second most important source of funds for Finnish SMEs with 26% proportion of the total debt and equity is the debt provided by non-financial institutions ("Other Instit." in Table 3.2); however, as we will show in a moment, the prevalent use of trade credit explains to a large extent this finding. This finding is in contrast to BU's findings for the US, where trade credit is the third most important source of funds. Finally, the third most important source of funds to Finnish SMEs is the debt provided by FIs (17%). The share is somewhat lower than the corresponding share in the US where according to BU (1998), FIs are the sec

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[11]   Tekes, Sitra and Finnvera are the most prominent sources of public support to firms in Finland. Tekes finances R&D projects of companies and universities and its funds are awarded from state budget via the Ministry of Trade and Industry. Sitra provides government venture capital funding for early stage technology companies and for commercialization of innovations. Finnvera offers financing services, such as subsidized loans and quarantines, to promote the domestic operations and internationalization of Finnish SMEs. In addition to Tekes, Sitra and Finnvera, there are 16 Regional Employment and Economic Development Centres ('TE Centres') that provide public support, both financial and non-financial, to SMEs.

[12]   Note that total debt and equity does not necessarily equal to the balance sheet total because there are items in the balance sheet not reported in the tables, such as provisions and accumulated closing entries.

ond most important source of funds to SMEs. They account for about 27% of the total debt and equity.

A breakout by the size of SMEs is presented in Panel B. "Larger SMEs" are defined to have at least 20 employees or one million euros in sales. Panel C displays the sources of funds over the lifecycle of firms. In this panel, SMEs are divided into four categories by their age. The categories are "Infant (0-4 years)", which approximates the seed and start-up stages, "Adolescent (5-8 years)", "Middle-aged (9-24 years)" and "Old (25 or more years)", which correspond to the later stages of the firms lifecycle.[13]

Panel B of the table reveals that large SMEs are more indebted than small ones. Despite small SMEs relying more on capital loans than large SMEs (3% vs. 1%), the debt ratio of the large SMEs is 59% while that of the small SMEs is 43%. This finding is in line with the results reported by BU (1998) for the US. Principal owner's equity is the most important source of funds both for small SMEs and for large SMEs, but it is relatively more important for the former (35% vs. 26%). These findings are in line with the US results (BU 1998), too.

The age categorization of Table C shows that that the debt ratio is *non-monotonic* over the lifecycle of firms. It is first high at 56% when SMEs are "Infant", i.e., 0-4 years old, decreases thereafter somewhat, and reaches its peak at 61% when firms become middle-aged. The high debt ratio of the "Infant" SMEs is explained by the prevalent use of capital loans. They represent nearly 9% of the total debt and equity in the "Infant" category and seem to be a substitute for the (standard) debt provided by FIs. The life-cycle closes when firms become old. The table reveals that at that stage the debt ratio again decreases. One explanation for this phenomenon may be the accumulation of retained earnings, as it may be that SMEs that survive to become "Old" are those that are able to generate internal funds.

The non-monotonic development of the debt ratio over the lifecycle of SMEs is qualitatively identical to BU's (1998) findings regarding the evolution of the capital structure of the US small businesses. The Finnish data is also consis

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[13] The size category is the same that BU (1998) uses. The age categories differ, because we did not have enough observations in the younger end of the age distribution. Our "Infant" corresponds to what would result if BU's "Infant" and "Adolescent" were combined. As a result, "Adolescent" in this paper is a subset of BU's "Middle-aged". We take these differences in the definitions into account when commenting differences in financing patterns between Finland and the US.

tent with that of the US regarding the role of principal owner as a holder of share-holders' equity: the principal owner accounts for a relatively low fraction of total funds among the "Infant" SMEs. The fact that the principal owner's equity increases after the infant years more than the total equity indicates that the principal owner is perhaps buying shares from other shareholders.

Overall, we can conclude that the capital structure of Finnish SMEs does not fundamentally differ from that of the US SMEs when the study by BU (1998) is used as the US benchmark. There however are some differences between Finland and the US in addition to the difference in the relative importance of trade credit documented earlier. We discuss them next.

Comparing Panel C to BU (1998) shows that the Finnish SMEs start with about the same level of debt than their US counterparts do. However, it seems that

- the Finnish SMEs increase the level of indebtness slowly compared to the US SMEs (according to BU, the debt ratios of SMEs in the US peak when firms are from 3 to 4 years old while in Finland they peak when firms become middle-aged, i.e., older than 9 years);

- the youngest SMEs (that are 0-4 years old) utilize less debt provided by FIs in Finland than in the US (according to BU, the ratio of FI debt to total equity and debt is in the US over 30%, while in Finland the corresponding ratio is around 22% even if capital loans supplied by FIs are taken into account).

The raw data provide us with no good explanation for these differences. However, if the differences are not entirely attributable to differences in demand, they suggest that the debt market in Finland is perhaps not as conducive for entrepreneurship and start-ups as it is in the US.

3.2.2   Sources of equity

Table 3.3 - Table 3.5 report the sources of equity in more detail. Concentrating first on Table 3.3, Panel A reveals that following the principal owner's contribution of 64% (of total equity), the second largest source of equity (with 24% share of the total equity) are managers and employees who are actively involved in the daily business of firms (but who do not have control over the firm as required by the definition of the principal owner). Other individuals, which include "business angels" and other individual investors who do not participate in the daily business

or have control over the firm, are the third largest source of equity (about 5%), followed by non-financial firms (about 4%).[14] Venture capital firms' (VCs) contribution to the total equity of SMEs is modest, about 1%, but it is well known that they invest very selectively and the overwhelming majority of SMEs are not candidates for venture capital. Finally, "Other equity" in Table 3.3 includes residual shareholders' equity, which we were unable to assign to any specific investor category (2% of total equity).

Breakout by the size of SMEs in Panel B reveals, on the one hand, that the principal owner has a slightly lower proportion of the total equity in small SMEs than in large ones (62% vs. 65%). On the other hand, managers and employees are a more significant source of equity in small SMEs than in large ones (33% and 17%, respectively).[15] Panel C of Table 3.3 illustrates the sources of equity by the age of SMEs. It tells us that the principal owner is the dominant source of equity in all age categories but "Infants". In this category, managers and employees contribute more to the equity capital than the principal owner. Panel C also illustrates that VCs and other non-financial firms ("Other firms") are important holders of equity in the youngest SMEs in Finland.[16]

Table 3.3 and Table 3.4 allow us to track the relative importance of "inside" and "outside" equity for the Finnish SMEs. From Table 3.3 we can compute "broad inside equity" as the sum of the equity owned by the principal owner and that owned by managers and employees. The remaining equity in the firm is a proxy for "outside equity". In Table 3.4 the category of principal owner is disaggregated into categories according to the identity of owners. From this table, we can identify "narrow inside equity" as the equity held by individuals that are actively involved in a firm's daily business, such as management and employees. Again, the remaining equity is a proxy for "outside equity".

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[14]   It is important to note that these data are not in "reduced form", as the identity of the principal owner is not restricted in any way. The category for the principal owner can therefore include capital contributions both by individuals and by institutional investors.

[15]   Somewhat surprisingly, other individuals, including business angels, are more important owners in large SMEs than in small SMEs (7% vs. 2%). As expected, public VCs invest proportionally more heavily in small SMEs than private VCs albeit the difference seems to be small. In addition, nonfinancial companies seem to be quite a significant source of equity in large SMEs with a 6% share of total equity. This source of equity may include minority stakes in spin-offs, joint ventures, etc.

[16]   In addition, it reveals that passive non-controlling individuals ("Other individuals") are a significant group of investors only for the category of "Old" SMEs (11%).

Taken together, we can infer from Table 3.3 and Table 3.4 that the equity provided by corporate insiders is a very important source of funds for Finnish SMEs. Specifically, on the basis of Table 3.3, we find that the broad inside equity

- accounts for about 88% of the total shareholders' equity among the Finnish SMEs;
- is more important for small SMEs than for large SMEs (95% vs. 82%);
- is used non-monotonically over the life-cycle of SMEs, as it accounts for about 80% in the "Infant", 88% in the "Adolescent", 86% in the "Middle-Aged" and 85% in the "Old" category.

Table 3.4 confirms the above findings, as narrow inside equity behaves similarly as the broad insider equity does. Specifically, it confirms that outside equity is in relative terms most important for the youngest SMEs. Finally, the tables show that, VCs and "Other firms", i.e. non-financial firms, are a disproportionately important source of outside equity to the youngest SMEs.

Finally, Table 3.5 provides information about the identity of the principal owner by disaggregating the category of principal owners into two types of individuals and three types of institutions. The table provides us with a rough distribution of control in Finnish SMEs. Panel A shows that over 92% of the principal owner's equity originates from entrepreneurs and other individuals active in the daily business of firms. The breakouts by the size and age of SMEs in Panel B and Panel C depict that the share of the individuals that are active in business increases as SMEs grow and mature. The fact that individuals that are active in business account for a smaller fraction of the principal owner's equity in the smallest and youngest firms indicates that these firms may have been forced to relinquish control in order to receive financing from FIs and other institutional investors.

3.2.3   Sources of debt

Table 3.6 sheds light on the sources of SME debt by dividing institutional creditors into nine categories.[17] The nine categories consist of four types of financial institution debt, four types of debt from non-financial business and governmental bodies, and an aggregate of public debt instruments (commercial papers and cor

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[17]   Note that these debt data do not cover capital loans.

porate bonds). The four types of FIs are self-explanatory. The debt provided by non-financial firms is either "Trade credit" or other lending by "Other nonfin. Business". The governmental bodies are either "Govt.: Finnvera", which refers to Finnvera plc and "Other govt.", which includes all the other governmental sources. A tenth category in the table is "Other debt". This category includes debt from individuals and also some residual debt provided by sources that the survey data did not allow us to identify.

Panel A in Table 3.6 shows that the most important source of debt for SMEs is trade credit that accounts for 45% of total debt. Although high, this finding is expected. BU (1998) for example reports that trade credit represents 31% of the total debt among the U.S. SMEs.[18] Domestic banks are the second most important source of debt finance, as they supply 26% of the total debt. "Other debt", coming mainly from individuals, is the third largest category of debt, while governmental bodies are the fourth largest creditors. They supply 5% of the total debt, but note that over 90% of the debt comes from one source, Finnvera. As expected, commercial papers and other instruments of public debt account for a negligible proportion of total small business debt.

Breakout by the size of SMEs in Panel B reveals that trade credit is the most important source of debt finance for small and large SMEs, although for the latter, the share is higher. Banks are unsurprisingly the second most significant source of debt in both size categories, though small SMEs rely relatively more on it than large SMEs do. The governmental bodies are only a slightly more important source of debt for small SMEs than for large SMEs.

Panel C shows the distribution of debt finance by firm age. It shows that the only age category in which trade credit is *not* the most important source of funds is "Old", i.e., firms older than 25 years. The ratio of bank loans to total debt increases as firms mature from the "Infant" category to "Adolescent", then decreases significantly in the "Middle-age" category and increases again when firms mature to the "Old" category. The drop in the share of bank loans among the mid

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[18]   The finding that Finnish firms rely more on trade credit than their US counterparts is by no means new. Mörttinen (2000) reports that between 1970 and 1985, trade credit accounted for 17% of total financing sources of the Finnish non-financial enterprises and that the corresponding figure in the U.S. was 8.4%. The figure for Finland is nicely in line with our more recent survey data, as in our data set trade credit represents 23% of the total debt and equity. Niskanen and Niskanen (2000) reports a similar difference between the Finnish and US firms using more recent data on accounts payable.

dle-aged SMEs is related to the simultaneous increase in the proportion of trade credit. Panel C also shows that the proportion of debt from finance firms, other non-financial firms as well as from the governmental bodies is the highest during the early stages of SMEs' lifecycle. In particular, the share of the debt provided by finance companies is high among the "Infant" but decreases monotonically when firms mature.

In summary, the two most important sources of (standard) debt - trade credit and loans from domestic deposit banks - account for about 71% of the total debt held by the Finnish SMEs. However, sources of debt are more heterogeneous for the smallest and especially youngest ("Infant") SMEs than they are for the older and larger SMEs.

Table 3.2   Estimated distributions of equity, capital loans and debt by firm size and age

	Sources of equity			Capital loans			Sources of debt				Total debt and equity
	Principal owner	Other equity	Total equity	Private	Public	Total cap. loans	Financial instit.	Other instit.	Other debt	Total debt	
A: All nonfarm, nonfinancial, nonreal-estate small businesses, subsidiaries excluded (n = 754)											
%	29.4%	16.8%	46.3%	1.4%	0.5%	1.9%	16.6%	26.1%	9.1%	51.9%	100.0%
(amount, mill. €)											(52,097)
B: Breakout by size of small business											
"Smaller" [less than 20 empl. and 1 mill. € sales]	35.4%	21.3%	56.7%	1.9%	0.9%	2.8%	14.8%	16.2%	9.6%	40.6%	100.0% (18,689)
"Larger" [at least 20 empl. or 1 mill. € sales]	26.1%	14.4%	40.5%	1.1%	0.2%	1.3%	17.6%	31.7%	8.8%	58.2%	100.0% (33,407)
C: Breakout by age of small business											
"Infant" [0-4 years]	9.7%	33.8%	43.5%	4.7%	4.0%	8.7%	16.9%	22.5%	8.4%	47.8%	100.0% (2,294)
"Adolescent" [5-8 years]	33.0%	17.5%	50.5%	0.6%	0.3%	1.0%	19.5%	19.8%	9.2%	48.5%	100.0% (8,722)
"Middle-Aged" [9-24 years]	22.3%	16.2%	38.6%	0.9%	0.3%	1.2%	16.4%	37.6%	6.2%	60.2%	100.0% (24,543)
"Old" [25 or more years]	40.9%	15.1%	55.9%	2.0%	0.3%	2.3%	15.5%	13.0%	13.4%	41.8%	100.0% (16,538)

Note: The table reports percents of total equity and debt. For more information about the data, see Table 3.1.

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Table 3.3   Estimated distribution of equity by firm size and age

	Individuals			Institutions				Other Equity	Total sources of equity
	Principal owner	Managers & empl.	Other individ.	Public VC	Private VC	Financial instit.	Other firms		
A: All nonfarm, nonfinancial, nonreal-estate small businesses, subsidiaries excluded (n = 754)									
%	63.6%	24.3%	4.7%	0.3%	0.8%	0.1%	3.9%	2.4%	100.0%
(amount, mill. €)									(24,116)
B: Breakout by size of small business									
"Smaller" [less than 20 empl. and 1 mill. € sales]	62.4%	33.0%	1.7%	0.5%	0.7%	0.1%	1.0%	0.5%	100.0% (10,589)
"Larger" [at least 20 empl. or 1 mill. € sales]	64.5%	17.4%	7.0%	0.1%	0.8%	0.1%	6.2%	3.8%	100.0% (13,527)
C: Breakout by age of small business									
"Infant" [0-4 years]	22.2%	58.2%	1.3%	4.1%	5.7%	0.5%	8.0%	0.0%	100.0% (998)
"Adolescent" [5-8 years]	65.3%	33.3%	0.6%	0.2%	0.3%	0.0%	0.3%	0.0%	100.0% (4,403)
"Middle-Aged" [9-24 years]	57.9%	28.3%	0.4%	0.1%	0.9%	0.1%	8.4%	3.9%	100.0% (9,467)
"Old" [25 or more years]	73.1%	12.2%	11.4%	0.1%	0.4%	0.0%	0.7%	2.2%	100.0% (9,248)

Note: The table reports percents of total equity. For more information about the data, see Table 3.1.

Table 3.4   Estimated distribution of equity (principal owner disaggregated) by firm size and age

	Individuals		Institutions					Total sources of equity
	Active in business	Other individ.	Public VC	Private VC	Financial instit.	Other firms	Other Equity	
A: All nonfarm, nonfinancial, nonreal-estate small businesses, subsidiaries excluded (n = 754)								
%	83.1%	6.6%	0.4%	1.0%	0.1%	4.7%	4.1%	100.0%
(amount, mill. €)								(24,116)
B: Breakout by size of small business								
"Smaller" [less than 20 empl. and 1 mill. € sales]	87.7%	5.4%	0.6%	0.8%	0.1%	2.3%	3.2%	100.0% (10,589)
"Larger" [at least 20 empl. or 1 mill. € sales]	79.5%	7.5%	0.1%	1.2%	0.1%	6.6%	4.8%	100.0% (13,527)
C: Breakout by age of small business								
"Infant" [0-4 years]	77.2%	2.2%	4.1%	6.5%	0.5%	9.1%	0.6%	100.0% (998)
"Adolescent" [5-8 years]	91.1%	7.9%	0.2%	0.3%	0.0%	0.4%	0.2%	100.0% (4,403)
"Middle-Aged" [9-24 years]	85.2%	0.9%	0.3%	0.9%	0.1%	8.7%	4.0%	100.0% (9,467)
"Old" [25 or more years]	77.8%	12.3%	0.1%	0.9%	0.0%	2.3%	6.5%	100.0% (9,248)

Note: The table reports percents of total equity. For more information about the data, see Table 3.1.

Table 3.5   Estimated distribution of principal owner's equity by firm size and age

	Individuals		Institutions			Total
	Active in business	Other individ.	Venture Capital	Other firms	Other instit.	principal owner
A: All nonfarm, nonfinancial, nonreal-estate SMEs, subsidiaries excluded						
%	92.5%	3.0%	0.5%	1.3%	2.7%	100.0%
(amount, mill. €)						(15,341)
B: Breakout by size of small business						
"Smaller" [less than 20 empl. and 1 mill. € sales]	87.6%	5.8%	0.3%	2.0%	4.2%	100.0% (6,612)
"Larger" [at least 20 empl. or 1 mill. € sales]	96.3%	0.8%	0.6%	0.7%	1.6%	100.0% (8,730)
C: Breakout by age of small business						
"Infant" [0-4 years]	85.3%	4.3%	3.2%	4.8%	2.4%	100.0% (222)
"Adolescent" [5-8 years]	88.5%	11.1%	0.0%	0.1%	0.3%	100.0% (2,876)
"Middle-Aged" [9-24 years]	98.2%	0.8%	0.3%	0.6%	0.1%	100.0% (5,485)
"Old" [25 or more years]	89.9%	1.2%	0.8%	2.2%	6.0%	100.0% (6,758)

Note: The table reports percents of total principal owner's equity. For more information about the data, see Table 3.1.

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Table 3.6   Estimated distribution of debt by firm size and age

	Financial institutions				Nonfinancial business and government						Total sources of debt
	Domestic banks	Domestic finance firms	Other dom. fin. inst.	Foreign financial instit.	Trade credit	Other nonfin. business	Govt.: Finnvera	Other govt.	CPs and bonds	Other Debt	
A: All nonfarm, nonfinancial, nonreal-estate small businesses, subsidiaries excluded (n = 754)											
%	26.4%	3.3%	2.1%	0.3%	45.0%	0.3%	4.7%	0.5%	0.0%	17.5%	100.0%
(amount, mill. €)											(27,016)
B: Breakout by size of small business											
"Smaller" [less than 20 empl. and 1 mill. € sales]	30.9%	3.9%	1.7%	0.1%	33.6%	0.6%	4.8%	0.9%	0.0%	23.5%	100.0% (7,585)
"Larger" [at least 20 empl. or 1 mill. € sales]	24.6%	3.0%	2.2%	0.4%	49.4%	0.2%	4.6%	0.3%	0.0%	15.2%	100.0% (19,432)
C: Breakout by age of small business											
"Infant" [0-4 years]	25.8%	6.9%	1.9%	0.7%	34.4%	2.6%	8.9%	1.1%	0.2%	17.4%	100.0% (1,097)
"Adolescent" [5-8 years]	34.8%	5.0%	0.3%	0.0%	35.3%	0.4%	4.8%	0.4%	0.0%	19.0%	100.0% (4,234)
"Middle-Aged" [9-24 years]	21.9%	2.7%	2.0%	0.6%	58.2%	0.1%	3.8%	0.4%	0.0%	10.4%	100.0% (14,775)
"Old" [25 or more years]	30.8%	2.8%	3.4%	0.0%	24.3%	0.3%	5.9%	0.5%	0.0%	32.0%	100.0% (6,911)

Note: The table reports percents of total debt. The debt data do not include capital loans. For more information about the data, see Table 3.1.

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3.3 Distributions of equity and debt by firm innovativeness and R&D-intensity

Besides small size and young age, innovativeness and investments in R&D are often considered sources of financial constraints for SMEs. In this section, we document how the distribution of sources of funds depends on SMEs' innovativeness and R&D-activities.

3.3.1 Overview

Table 3.7 displays the estimated distribution of sources of funds for the Finnish small businesses by their innovativeness and R&D-activities. Whereas Panel A of the table displays the unconditional distribution, the distribution in Panel B has been conditioned on SMEs' innovativeness.[19] The definition for an "Innovative firm" is taken from Statistics Finland's (1998) innovation survey and Detragiache, Garella and Guiso (2000): a firm is innovative if it has innovated its products, production processes, or both during the last three years. The proportion of firms fulfilling the criterion is about 33%. In Panel C we have divided SMEs into three categories by their R&D-intensity, which is defined as the ratio of R&D expenditure to sales during the last fiscal period. A firm has "High R&D intensity" if the ratio is over 5%, "Low R&D intensity" if it is positive but less than 5% and "No R&D expenditure" if the firm reports no R&D expenses. The proportion of firms falling in "High R&D intensity", "Low R&D intensity" and "No R&D expenditure" categories are 9%, 36% and 53%, respectively. Finally, Panels D and E of Table 3.7 categorize SMEs by the "output" of their R&D activity. In Panel D SMEs are classified according to whether they own patents (6% of SMEs report that they own patents) while in Panel E the classification is based on whether they own other valuable intangible assets besides patents (14% of SMEs report that they own such intangible assets).

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[19]   The sample on which we rely in this section includes only firms which responded to the survey questions regarding innovativeness and R&D-activities; we applied no statistical method to "impute" values for the non-respondents or to match the totals with the preceding tables. As a result, the sample size is in this section about 2% smaller than in the previous sections. Panel A of Table 3.7 summarizes the current sample. The table reveals that the current sample has a debt ratio that is only slightly higher than that reported in Panel A of Table 3.2 (55% vs. 54%). This suggests that the firms that did not respond to the questions regarding innovativeness and R&D-activities were no different from the ones that did.

Panels B, C, D and E provide us with the following findings:

- Innovative firms, firms with R&D-activities (those with "High R&D intensity" or "Low R&D intensity"), and firms that own patents and/or intangible assets run a lower debt ratio than their counterparts. The difference is most notable for the most R&D-intensive SMEs ("High R&D intensity").

- Unlike for their (non-innovative) counterparts, the most important source of funds for innovative firms, firms with R&D-activities, and firms that own patents and/or intangible assets is equity attributable to the principal owner.

- Despite the low leverage, innovative firms, firms with R&D-activities and firms that own patents and/or intangible assets resort quite a lot to capital loans. For example, the most R&D-intensive firms have 5% of total debt and equity provided in the form of capital loans.[20]

- The most R&D-intensive firms are less leveraged than firms that can already demonstrate a degree of innovativeness.

The Finnish SME data is thus not inconsistent with the partially reversed pecking order theory (that we loosely outlined in Section 2.2.): innovative small businesses investing in R&D emphasize equity over debt. The evidence is also consistent with the cross-sectional evidence for the US that R&D-intensity and leverage are negatively correlated across firms (Smith and Watts 1992, Bhagat and Welch 1995, Barclay, Morellec and Smith 2001, see also the discussion in Hall 2002).

3.3.2   Sources of equity

Table 3.8 - Table 3.10 provide more detailed information on the sources of equity by firm innovativeness and R&D-intensity. Panels B, C, D, and E of Table 3.8 and Table 3.9 show that

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[20]   Thus, had we included capital loans into equity, we would find an even lower debt ratio.

- SMEs with R&D-activities rely clearly more on (both broad and narrow) inside equity than other SMEs do.[21] As the other classifications of innovativeness reveal, insider equity is not, in relative terms, as important for firms that can demonstrate a degree of innovativeness as it is for SMEs with R&D-activities.

- For the most R&D-intensive SMEs, the most important sources of outside equity are venture capital and other non-financial firms ("Other firms").

- For SMEs with some but low R&D-intensity, innovations, patents and/or intangible assets, the most important source of outside equity are other individuals (that are neither principal owners nor otherwise active in the firms' daily business), i.e., business angles.

What we find is that holding the amount of equity constant, especially R&D-intensive firms resort heavily to inside equity. Demand side considerations may explain the finding to a large extent, but it may also reflect deficiencies in the market for innovation finance. In particular, the finding is consistent with the view that the most R&D-intensive firms find it expensive to issue outside equity.

Table 3.10 finally decomposes the sources of principal owners' equity by innovativeness and R&D-intensity. The table indicates that holding the amount of equity contributed by the principal owner constant, individuals active in the daily business of firms account for a larger proportion of the principal owner's equity in innovative firms, firms with R&D-activities, and firms that own patents and/or intangible assets than in other firms. This fact suggests that retaining control by individuals active in business is disproportionately important in innovative firms, firms with R&D-activities, and firms that own patents and/or intangible assets.

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[21]   Recall that the sum of the equity held by a firm's principal owner and its managers and employees constitutes the broadly defined insider equity in Table 3.8. The narrowly defined insider equity equals the equity held by individuals active in a firm's daily business ("Active in business") in Table 3.9. The tables show that the broad inside equity increases from around 83% of the total equity in firms with no R&D to 90% in the most R&D intensive SMEs, while the corresponding numbers for the narrow inside equity are 74% and 89%.

3.3.3 Sources of debt

Table 3.11 provides information on the sources of debt by firm innovativeness and R&D-intensity. Panels B, C, D, and E of the table show that:

- The *most* R&D-intensive SMEs rely less on debt from domestic banks than other firms do. For them, the most important source of debt is trade credit that together with other credit from non-financial firms account for 36% of the total debt.

- Domestic banks are the largest source of debt for small businesses which are able to report "output" for their innovative activity, i.e., they have innovated or hold patents and/or other intangible assets. The same holds for SMEs with low R&D-intensity. The use of trade credit is clearly less prevalent among these SMEs than among their counterparts.

- Debt other than trade credit provided by non-financial firms is systematically more important for innovative firms, firms with R&D-activities, and firms that own patents and/or intangible assets than for their counterparts.

- The debt provided by governmental bodies and specifically by Finnvera seems to be an important source of debt for innovative firms, firms with R&D-activities and firms that own patents and/or intangible assets. Specifically, the debt provided by Finnvera accounts for about 10% of the total debt of the most R&D-intensive firms.

The data shows that there are systematic differences in the sources of debt between the most R&D-intensive and other SMEs. Provided that the differences are not entirely attributable to differences in demand, it seems that the deposit banks in Finland are less willing to finance R&D-intensive SMEs than SMEs with signs of innovativeness. The other side of the finding is that the SMEs with signs of innovativeness seem to be able to raise non-negligible amounts of standard debt from domestic banks.

Table 3.7   Estimated distributions of equity, capital loans and debt by innovation activity

	Sources of equity			Capital loans			Sources of debt				Total debt and equity
	Principal owner	Other equity	Total equity	Private	Public	Total cap. loans	Financial instit.	Other instit.	Other debt	Total debt	
A: All small businesses which responded to questions related to innovation activity (n =728)											
%	26.6%	17.9%	44.6%	1.5%	0.5%	1.9%	17.7%	26.4%	9.5%	53.5%	100.0%
(amount, mill. €)											(48,382)
B: Breakout by innovations of small business											
"Innovative firms"	29.2%	18.7%	48.0%	2.1%	1.0%	3.1%	20.8%	18.8%	9.4%	49.0%	100.0% (19,446)
"Non-innovative firms"	24.9%	17.4%	42.3%	1.0%	0.1%	1.1%	15.6%	31.5%	9.5%	56.6%	100.0% (28,936)
C: Breakout by R&D intensity of small business											
"High R&D intensity"	33.2%	26.6%	59.8%	2.0%	3.0%	5.0%	9.8%	17.9%	7.4%	35.1%	100.0% (4,290)
"Low R&D intensity"	33.8%	17.8%	51.6%	1.2%	0.1%	1.4%	17.7%	16.2%	13.1%	47.0%	100.0% (22,033)
"No R&D expenditure"	18.2%	16.3%	34.6%	1.6%	0.3%	1.9%	19.2%	38.2%	6.2%	63.6%	100.0% (22,058)
D: Breakout by patenting activity of small business											
"Has patents"	29.7%	25.8%	55.5%	1.2%	1.9%	3.1%	20.4%	13.9%	7.1%	41.4%	100.0% (5,346)
"No patents"	26.2%	17.0%	43.2%	1.5%	0.3%	1.8%	17.3%	27.9%	9.8%	55.0%	100.0% (43,036)
E: Breakout by other intangible assets of small business											
"Has intangible assets"	31.7%	14.3%	46.1%	4.9%	1.6%	6.5%	25.3%	13.5%	8.6%	47.4%	100.0% (7,591)
"No intagible assets"	25.7%	18.6%	44.3%	0.8%	0.3%	1.1%	16.3%	28.8%	9.6%	54.7%	100.0% (40,791)

Note: The table reports percents of total equity and debt. For more information about the data, see Table 3.1.

Table 3.8   Estimated distribution of equity by innovation activity

| | Individuals | | | Institutions | | | | | | Total |
	Principal owner	Managers & empl.	Other individ.	Public VC	Private VC	Financial instit.	Other firms	Other Equity		sources of equity
A: All small businesses which responded to questions related to innovation activity										
%	59.8%	26.9%	5.3%	0.3%	0.8%	0.1%	4.4%	2.6%		100.0%
(amount, mill. €)										(21,558)
B: Breakout by innovations of small business										
"Innovative firms"	60.9%	24.3%	9.0%	0.6%	1.6%	0.1%	0.9%	2.6%		100.0% (9,325)
"Non-innovative firms"	58.9%	28.9%	2.4%	0.1%	0.1%	0.0%	7.1%	2.6%		100.0% (12,233)
C: Breakout by R&D intensity of small business										
"High R&D intensity"	55.5%	34.8%	1.5%	2.3%	2.3%	0.5%	2.0%	1.2%		100.0% (2,567)
"Low R&D intensity"	65.5%	22.8%	9.3%	0.0%	0.8%	0.0%	0.5%	1.1%		100.0% (11,370)
"No R&D expenditure"	52.7%	30.3%	0.5%	0.0%	0.1%	0.0%	11.1%	5.3%		100.0% (7,622)
D: Breakout by patenting activity of small business										
"Has patents"	53.6%	33.1%	8.2%	1.6%	1.6%	0.0%	0.6%	1.4%		100.0% (2,966)
"No patents"	60.8%	25.9%	4.8%	0.1%	0.6%	0.1%	5.0%	2.8%		100.0% (18,592)
E: Breakout by other intangible assets of small business										
"Has intangible assets"	68.9%	17.2%	7.7%	1.4%	1.8%	0.2%	0.3%	2.4%		100.0% (3,497)
"No intagible assets"	58.0%	28.8%	4.8%	0.1%	0.5%	0.0%	5.2%	2.6%		100.0% (18,061)

Note: The table reports percents of total equity. For more information about the data, see Table 3.1.

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Table 3.9   Estimated distribution of equity (principal owner disaggregated) by innovation activity

	Individuals		Institutions				Other Equity	Total sources of equity
	Active in business	Other individ.	Public VC	Private VC	Financial instit.	Other firms		
A: All small businesses which responded to questions related to innovation activity								
%	81.5%	7.4%	0.3%	1.0%	0.1%	5.2%	4.5%	100.0%
(amount, mill. €)								(21,558)
B: Breakout by innovations of small business								
"Innovative firms"	81.0%	10.7%	0.6%	2.2%	0.1%	1.3%	4.1%	100.0% (9,325)
"Non-innovative firms"	81.9%	4.8%	0.1%	0.1%	0.0%	8.2%	4.9%	100.0% (12,233)
C: Breakout by R&D intensity of small business								
"High R&D intensity"	87.9%	2.0%	2.3%	3.0%	0.5%	3.2%	1.2%	100.0% (2,567)
"Low R&D intensity"	85.1%	10.0%	0.0%	1.2%	0.0%	1.4%	2.3%	100.0% (11,370)
"No R&D expenditure"	74.0%	5.2%	0.0%	0.1%	0.0%	11.7%	9.0%	100.0% (7,622)
D: Breakout by patenting activity of small business								
"Has patents"	85.9%	8.2%	1.6%	2.0%	0.0%	0.8%	1.5%	100.0% (2,966)
"No patents"	80.8%	7.2%	0.1%	0.9%	0.1%	5.9%	5.0%	100.0% (18,592)
E: Breakout by other intangible assets of small business								
"Has intangible assets"	81.3%	8.1%	1.4%	2.3%	0.2%	0.4%	6.2%	100.0% (3,497)
"No intagible assets"	81.5%	7.2%	0.1%	0.8%	0.0%	6.2%	4.2%	100.0% (18,061)

Note: The table reports percents of total equity. For more information about the data, see Table 3.1.

Table 3.10   Estimated distribution of principal owner's equity by innovation activity

	Individuals		Institutions			Total
	Active in business	Other individ.	Venture Capital	Other firms	Other instit.	principal owner
A: All SMEs which responded to questions related to innovation activity						
%	91.4%	3.5%	0.5%	1.4%	3.3%	100.0%
(amount, mill. €)						(12,884)
B: Breakout by innovations of small business						
"Innovative firms"	93.0%	2.8%	1.1%	0.7%	2.4%	100.0% (5,679)
"Non-innovative firms"	90.1%	4.1%	0.0%	1.9%	3.9%	100.0% (7,204)
C: Breakout by R&D intensity of small business						
"High R&D intensity"	95.6%	0.9%	1.3%	2.2%	0.0%	100.0% (1,424)
"Low R&D intensity"	95.1%	1.1%	0.6%	1.3%	1.9%	100.0% (7,445)
"No R&D expenditure"	83.0%	8.9%	0.0%	1.1%	7.0%	100.0% (4,015)
D: Breakout by patenting activity of small business						
"Has patents"	98.5%	0.1%	0.8%	0.5%	0.2%	100.0% (1,589)
"No patents"	90.4%	4.0%	0.4%	1.5%	3.7%	100.0% (11,295)
E: Breakout by other intangible assets of small business						
"Has intangible assets"	93.1%	0.6%	0.7%	0.1%	5.4%	100.0% (2,410)
"No intagible assets"	91.0%	4.2%	0.4%	1.7%	2.8%	100.0% (10,474)

Note: The table reports percents of total principal owner's equity. For more information about the data, see Table 3.1.

Table 3.11   Estimated distribution of debt by innovation activity

	Financial institutions				Nonfinancial business and government						Total sources of debt
	Domestic banks	Domestic finance firms	Other dom. fin. inst.	Foreign financial instit.	Trade credit	Other nonfin. business	Govt.: Finnvera	Other govt.	CPs and bonds	Other Debt	
A: All small businesses which responded to questions related to innovation activity											
%	27.2%	3.4%	2.2%	0.3%	43.7%	0.3%	4.8%	0.4%	0.0%	17.7%	100.0%
(amount, mill. €)											(25,894)
B: Breakout by innovations of small business											
"Innovative firms"	33.8%	4.0%	4.4%	0.4%	27.2%	0.6%	9.5%	1.1%	0.0%	19.1%	100.0% (9,520)
"Non-innovative firms"	23.3%	3.0%	0.9%	0.3%	53.4%	0.1%	2.1%	0.0%	0.0%	16.9%	100.0% (16,374)
C: Breakout by R&D intensity of small business											
"High R&D intensity"	22.1%	1.7%	2.1%	2.1%	33.2%	2.8%	10.6%	4.3%	0.0%	21.1%	100.0% (1,507)
"Low R&D intensity"	30.6%	3.6%	3.3%	0.1%	27.7%	0.3%	6.3%	0.2%	0.0%	27.9%	100.0% (10,362)
"No R&D expenditure"	25.1%	3.3%	1.3%	0.4%	56.7%	0.0%	3.1%	0.2%	0.0%	9.8%	100.0% (14,024)
D: Breakout by patenting activity of small business											
"Has patents"	45.7%	1.1%	1.5%	1.0%	23.3%	1.4%	7.8%	1.0%	0.0%	17.2%	100.0% (2,214)
"No patents"	25.4%	3.6%	2.2%	0.3%	45.6%	0.2%	4.5%	0.4%	0.0%	17.7%	100.0% (23,680)
E: Breakout by other intangible assets of small business											
"Has intangible assets"	43.7%	3.9%	5.2%	0.6%	16.1%	1.6%	10.2%	0.6%	0.0%	18.1%	100.0% (3,597)
"No intagible assets"	24.5%	3.3%	1.7%	0.3%	48.2%	0.1%	3.9%	0.4%	0.0%	17.6%	100.0% (22,296)

Note: The table reports percents of total debt. The debt data do not include capital loans. For more information about the data, see Table 3.1.

3.4 Equity and debt in R&D-intensive SMEs: New perspectives

So far, we have examined the financing patterns of SMEs from the viewpoint of conventional capital structure studies. In this section, our aim is to provide new perspectives on the financing patterns of SMEs by examining main sources, concentration and interconnectedness of finance.

We look at the main sources of finance, because recent research on relationship banking suggests that SMEs can sometimes obtain more and cheaper financing by resorting to a single source of finance and by establishing a close relationship with it (Petersen and Rajan 1994, Boot 2000). If the main sources of funds are more heterogeneous for the R&D-intensive firms, it may suggest that the costs of relationship finance are high for them. We look at the concentration of finance because it can point to the presence of capital market failures (Gans and Stern 2000). For example, the concentrated use of, say, FI debt may be a sign of credit rationing (Stiglitz and Weiss 1981). Concentration may, of course, also point to the clustering of technological opportunities and to cross-sectional variation in appropriability of the returns from innovations. Finally, we look at the interconnectedness of finance because it may be related to the existence and, especially, transmission of capital market frictions. Interconnectedness stems from the possibility that the various sources of funds may be substitutes or complements (BU 1998). With complementary sources, a capital market failure originating from one source hinders the availability of the other. However, with substitute sources, a capital market failure originating from one source forces SMEs to substitute the available source for the unavailable.[22] Thus, if anything, interconnectedness is an indication of a more complex system of SME finance where the functioning of one segment of the private capital market affects that of the other segments. We therefore specifically examine if interconnectedness is more prevalent among R&D firms than among other firms.

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[22] For example, not receiving angel finance may decrease the probability of obtaining venture capital finance (complements), while firms may substitute trade credit for intermediated debt finance if FIs ration credit (substitutes).
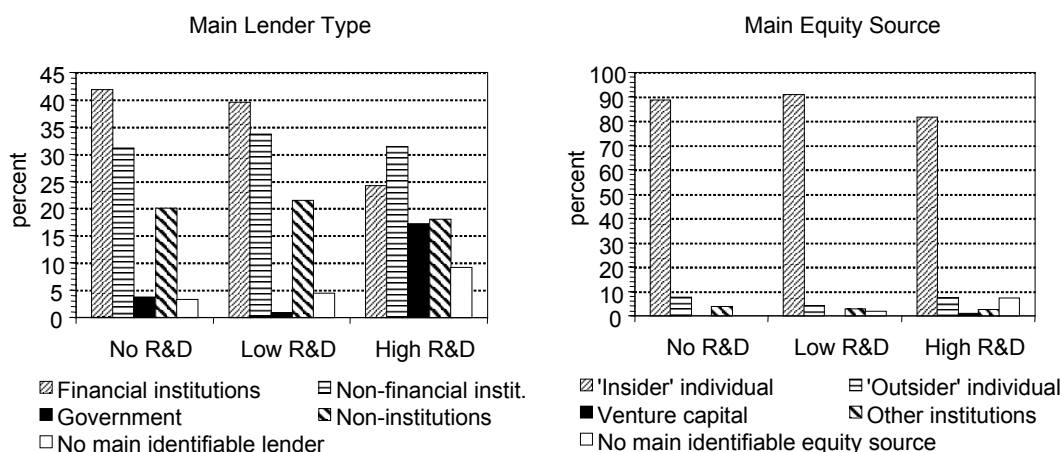
3.4.1   Main sources

Figure 3.1 presents the main lenders and equity sources of SMEs by R&D inten-
sity. In this figure, a firm is recorded to have, say, a financial institution as its
main lender if the largest provider of credit to it is a financial institution. A similar
rule also identifies main equity sources.

Figure 3.1 reveals that the importance of FIs as the main lender decreases as
firms' R&D intensity increases. Over 40% of the SMEs with no R&D have a fi-
nancial institution as their main lender, while the corresponding percentage for the
most R&D-intensive firms is below 25%. The finding echoes our previous result,
as it shows that FIs provide disproportionately more credit to less R&D-intensive
firms. A reverse pattern is found to apply to the credit supplied by governmental
bodies, while the role of non-financial institutions, such as other non-financial
firms, as the main lender of SMEs does not seem to depend on the R&D-intensity.
Interestingly, the most R&D-intensive firms have many kinds of main lenders.
They also have more frequently than other SMEs two equally significant sources
of debt, which amounts to saying that there is a tie between the two largest
sources of debt (see the white bars in the figure). The findings are not inconsistent
with the view that the costs of relationship finance are high for R&D-intensive
firms.

Figure 3.1 also shows that the narrowly defined insiders are the main equity
holders in more than 80% of the SMEs irrespectively of the level of R&D-
intensity. This may seem to be in contrast with our earlier finding that R&D-
intensive SMEs depend more on insider equity than other SMEs do. However, it
is not, because the firms with R&D-activities run lower debt ratios and because
the insiders of these firms hold on average larger stakes of equity. These imply
that the insiders can be a disproportionately important source of equity in the
R&D-intensive firms even though they are not as frequently as one would expect
the main source of equity funds. As a final remark it is of interest to note that
venture capital is the *main* source of equity in a small number of the most R&D-
intensive SMEs (1.1%).

Figure 3.1   Main lenders and equity sources by R&D-intensity of SMEs

Note: The charts report the proportion of SMEs in which the selected providers of finance are the main source of debt or equity finance.

3.4.2   Concentration

Our starting point in this subsection is the possibility that the distribution of debt and equity may be concentrated.[23] As an example of such concentration consider SMEs with R&D-activities. Whereas they were found to rely less on debt than other SMEs, it may be that some of the SMEs with R&D-activities use no debt and that some use a disproportionately large fraction of it.

To study the patterns of concentration, we rely on Lorenz curves that are typically used to measure (income) inequality. The Lorenz curves measure how evenly a characteristic of firms is distributed across the SMEs. Following Gans and Stern (2000), we modify the basic Lorenz curve so that it plots cumulative percentages of the characteristic in question against cumulative percentages of a scale variable. SMEs are ranked along the *x*-axis of the Lorenz curve in terms of their rank of the ratio of the characteristic to the scale variable. The ranking implies that SMEs with a large "amount" of the characteristic relative to the scale variable contribute to the Lorenz curve first. The Lorenz curve thus assumes the position of the 45-degree line if all SMEs have an equal "amount" of the characteristic relative to the scale variable. The extent to which the estimated Lorenz

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[23]   A characteristic feature of the US private equity market is, for example, that venture financing is concentrated heavily on certain industrial segments (see, e.g., Gans and Stern 2000). On the US private debt market, observably riskier borrowers tend to rely more on finance companies than on banks (Carey, Post and Sharpe 1998).

curves deviate from the hypothetical line of no concentration indicates the degree of concentration of the characteristic within the SMEs.

Concentration relative to assets in place (firm size)

In what follows, we distinguish firms that have a positive ratio of R&D expenditures to sales ("R&D>0") and that have innovated their products, production processes, or both ("Innovative firms") from the SMEs that do not satisfy these criteria. The firms satisfying (either or both of) the criteria are collectively called "the R&D/innovative firms".

Figure 3.2 presents the Lorenz distribution of bank loans, FI loans and total debt relative to assets in place, measured by firms' total assets. The charts reveal that relative to the distribution of assets in place, 50% of SMEs accounts for most (around 75%) of the total debt. The use of bank and FI debt is much more concentrated than that of the total debt. That is, even after controlling for firm size, a very small subset of SMEs exhausts most of the debt provided by banks and FIs. However, it seems that the concentration of the FI or total debt among the R&D/innovative firms is not qualitatively different from that among their counterparts.

Figure 3.3 presents the Lorenz distribution of outside and inside equity relative to assets in place.[24] The charts reveal that relative to the distribution of assets in place, a very small share of SMEs account for most of the outside equity. The outside equity is also a lot more concentrated than total equity; most of the SMEs have no outside equity at all. Moreover, the concentration of outside equity among the R&D/innovative firms is stronger than among their counterparts.

Concentration relative to R&D-expenditures

Figure 3.4 and Figure 3.5 present the Lorenz distribution of financial institutions' loans, total debt as well as outside and inside equity relative to firms' R&D-expenditure. The figures apply only to SMEs with R&D-activities and they contrast the relative distribution of the different sources of finance to the distribution

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[24]   The inside equity is here measured using the narrow definition of inside equity; specifically, it consists of the equity held by individuals active in a firm's daily business, including management and employees. We use the narrow definition because to examine the concentration of "non-entrepreneurial" equity.

of R&D-investments. For completeness, we present separate curves for small and large firms, as well as for young and old firms.

The figures show that FI loans are more concentrated than total debt relative to the distribution of R&D-investments. The same applies to outside equity, which is more concentrated than the total equity. The figures specifically reveal that
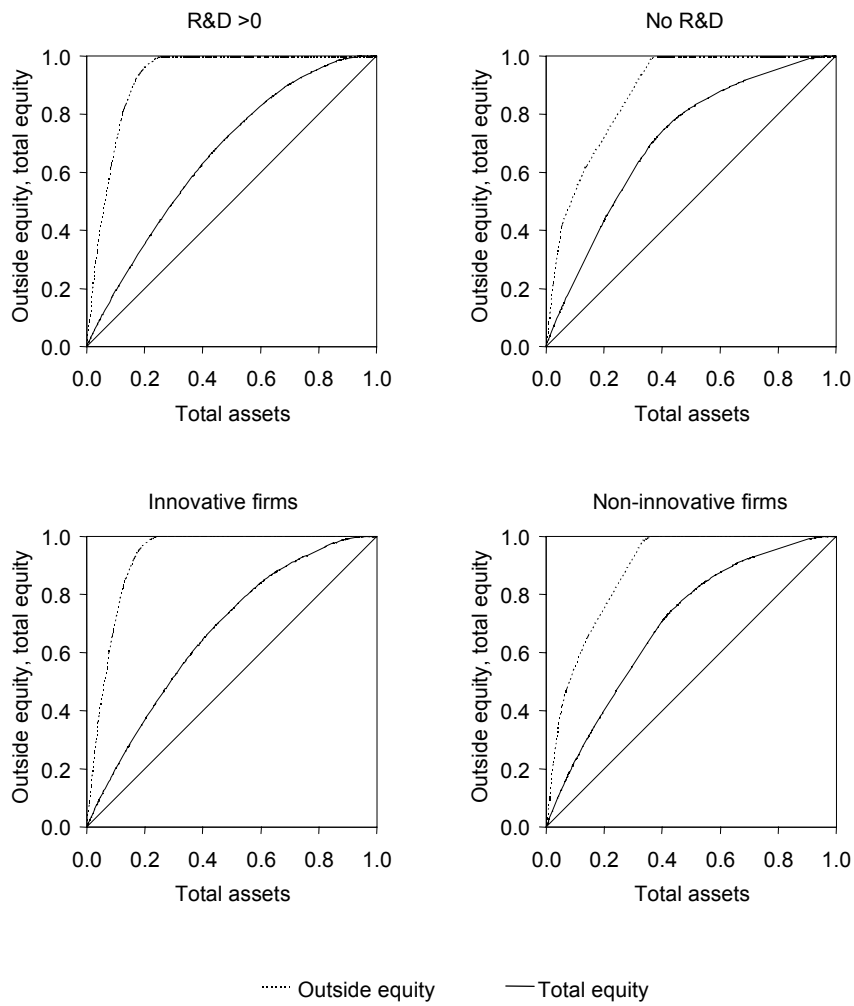
- FI loans are concentrated even among the SMEs with R&D-activities, as a very small number of SMEs receive a high share of the overall credit provided by FIs (Figure 3.4).

- Outside equity is very concentrated even among the SMEs with R&D-activities, as a very small number of SMEs receive a high share of the overall outside equity (Figure 3.5).

Figure 3.2   Concentration of debt vs. total assets
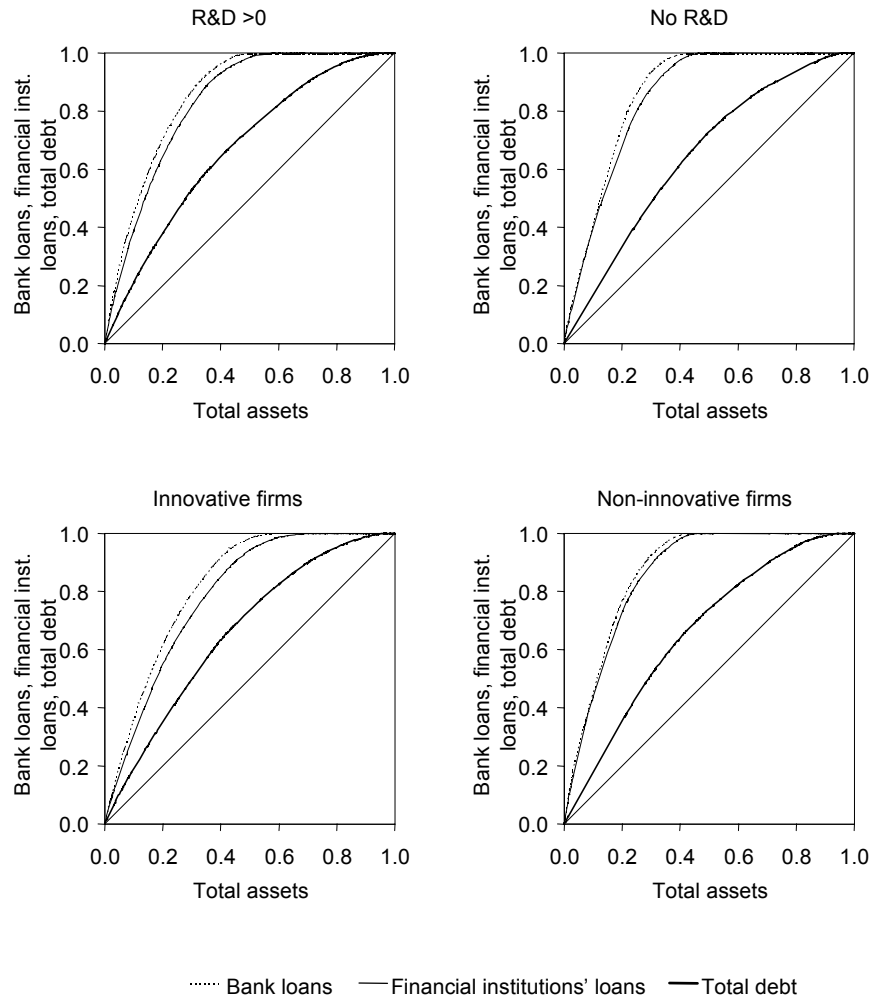
Note: The Lorenz curves measure how evenly a characteristic of firms is distributed across the SMEs. Lorenz curve plots cumulative percentages of a characteristic in question (bank loans, say) against cumulative percentages of a scale variable. SMEs are ranked along the x-axis of the Lorenz curve in terms of their rank of the ratio of the characteristic to the scale variable. The Lorenz curve would assume the characteristic of the 45-degree line if all SMEs had an equal "amount" of the characteristic relative to the scale variable. The extent to which the estimated Lorenz curves deviate from the hypothetical line of no concentration indicates the degree of concentration of the characteristic within the SMEs. For more information about the data, see Table 3.1.

Figure 3.3   Concentration of equity vs. total assets

R&D >0

Outside equity, total equity

Total assets

No R&D

Outside equity, total equity

Total assets

Innovative firms

Outside equity, total equity

Total assets

Non-innovative firms

Outside equity, total equity

Total assets

······ Outside equity   —— Total equity

Note: See Figure 3.2.

Figure 3.4   Concentration of debt vs. R&D-expenditures

Size

Age

Note: See Figure 3.2.

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Figure 3.5   Concentration of equity vs. R&D-expenditures

Size

Outside equity, total equity (y-axis)
R&D expenditure (x-axis)

······ Outside equity, small SMEs   ▪ ▪ ▪ Total equity, small SMEs
——— Outside equity, large SMEs   ▬▬ Total equity, large SMEs

Age

Outside equity, total equity (y-axis)
R&D expenditure (x-axis)

······ Outside equity, young SMEs   ▪ ▪ ▪ Total equity, young SMEs
——— Outside equity, old SMEs   ▬▬ Total equity, old SMEs
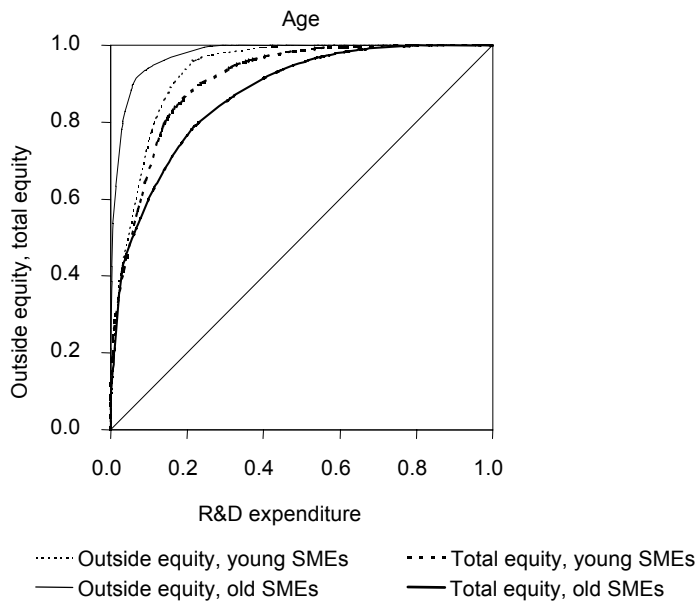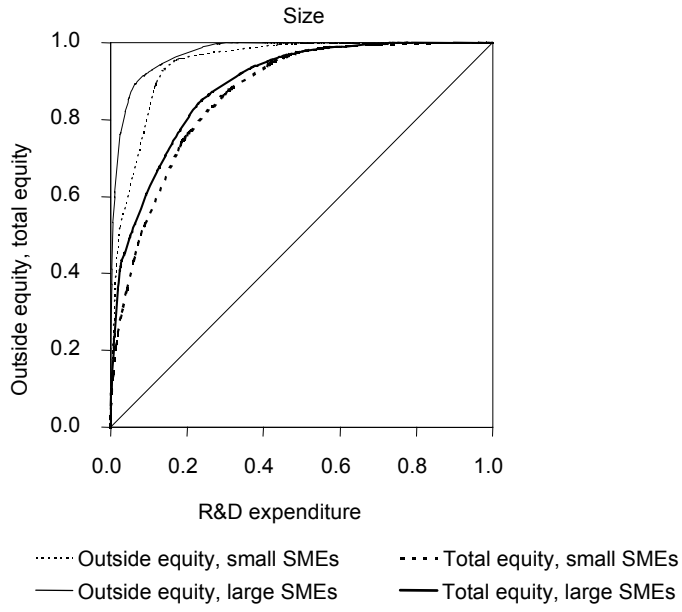
Note: See Figure 3.2.

3.4.3   Interconnectedness

Empirically, the hypothesis of interconnectedness translates into a (generally un-known) correlation structure that characterizes the relationships of the intercon-nected sources of finance. Table 3.12 and Table 3.13 report the coefficients of correlation for the different sources of finance. The sources of equity finance are the same as those used in Table 3.4. The sources of debt finance are the same as those used in Table 3.6, with the minor modification that we report no results for "CPs and Bonds" because of their insignificance as the source of debt finance. We have computed the correlations separately for firms with no R&D-activity and for firms with a positive R&D-intensity.

The tables reveal that there are more statistically significant coefficients of correlation across the sources of funds of SMEs with R&D-activities than with no R&D.[25] This implies that the different sources of funding are more often substi-tutes or complements for SMEs with R&D-activities than for SMEs with no R&D-activity. It also implies that the hypothesis of the interconnected SME fi-nance applies better to firms that do R&D. The following also characterizes the data:

- SMEs substitute (the narrowly defined) insider equity for outside equity irrespectively of the source of the outside equity.
- Trade credit is a substitute source of finance, particularly for SMEs with R&D-activities.
- Among SMEs with R&D-activities, the debt provided by Finnvera and other governmental bodies is a complement to the equity provided by venture capitalists, while it is a substitute to trade credit and "Other debt", which comes from individuals and unknown sources.[26]

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[25]   The coefficients of correlation that are in **bold** are statistically significant at the 5% level.

[26]   The debt from governmental bodies other than Finnvera is additionally a complement to the equity provided FIs and non-financial firms and a substitute to the equity provided by the (nar-rowly defined) insiders.

Table 3.12   Coefficients of correlation between selected sources of finance (SMEs with R&D-activities)

	Debt									Equity					
	Domestic banks	Domestic finance firms	Other dom. fin. instit.	Foreign financial instit.	Trade credit	Other nonfin. business	Govt.: Finnvera	Other govt.	Other debt	Individuals active in business	Other individuals	Venture capital	Financial instit.	Other firms	Other equity
Domestic banks	1.000														
Domestic finance f.	-0.017 (0.706)	1.000													
Other dom. fin. instit.	-0.004 (0.936)	0.035 (0.449)	1.000												
Foreign fin. instit.	-0.057 (0.211)	0.022 (0.623)	0.002 (0.972)	1.000											
Trade credit	**-0.368** (**0.000**)	**-0.145** (**0.001**)	**-0.136** (**0.003**)	-0.063 (0.169)	1.000										
Other nonfin. b.	-0.083 (0.069)	-0.038 (0.403)	-0.037 (0.416)	-0.017 (0.717)	-0.086 (0.058)	1.000									
Govt.: Finnvera	-0.060 (0.184)	-0.034 (0.457)	0.068 (0.134)	-0.007 (0.885)	**-0.235** (**0.000**)	-0.030 (0.515)	1.000								
Other govt.	-0.087 (0.055)	-0.057 (0.207)	-0.044 (0.338)	-0.021 (0.644)	**-0.136** (**0.003**)	-0.033 (0.465)	0.029 (0.523)	1.000							
Other debt	**-0.335** (**0.000**)	**-0.115** (**0.019**)	-0.090 (0.068)	-0.065 (0.191)	**-0.303** (**0.000**)	-0.084 (0.089)	**-0.211** (**0.000**)	**-0.114** (**0.021**)	1.000						
Individuals active in b.	0.000 (0.998)	0.039 (0.391)	-0.015 (0.749)	-0.070 (0.124)	0.017 (0.704)	**-0.099** (**0.029**)	-0.073 (0.106)	**-0.096** (**0.035**)	0.031 (0.531)	1.000					
Other individuals	0.006 (0.902)	-0.017 (0.705)	0.012 (0.794)	-0.037 (0.422)	-0.022 (0.634)	0.047 (0.300)	0.039 (0.388)	-0.038 (0.399)	0.085 (0.085)	**-0.671** (**0.000**)	1.000				
Venture capital	-0.011 (0.807)	0.004 (0.927)	-0.024 (0.601)	-0.027 (0.548)	-0.061 (0.178)	**0.098** (**0.032**)	**0.127** (**0.005**)	**0.152** (**0.001**)	-0.076 (0.123)	**-0.329** (**0.000**)	-0.009 (0.844)	1.000			
Financial instit.	**0.114** (**0.012**)	-0.025 (0.585)	-0.024 (0.596)	-0.010 (0.828)	-0.059 (0.192)	-0.012 (0.797)	-0.042 (0.362)	**0.104** (**0.022**)	-0.022 (0.656)	**-0.129** (**0.005**)	0.001 (0.977)	0.047 (0.303)	1.000		
Other firms	-0.002 (0.960)	-0.034 (0.454)	-0.009 (0.851)	0.060 (0.186)	0.069 (0.131)	-0.025 (0.590)	0.010 (0.832)	**0.112** (**0.014**)	**-0.098** (**0.048**)	**-0.459** (**0.000**)	-0.045 (0.327)	-0.022 (0.632)	0.043 (0.342)	1.000	
Other equity	-0.023 (0.613)	-0.021 (0.648)	0.049 (0.279)	**0.180** (**0.000**)	-0.020 (0.663)	**0.103** (**0.024**)	-0.001 (0.977)	0.009 (0.836)	-0.027 (0.586)	**-0.376** (**0.000**)	-0.052 (0.249)	-0.031 (0.500)	-0.011 (0.803)	-0.004 (0.925)	1.000

Note: The table reports the coefficients of correlation and p-values that are in parentheses. The coefficients of correlation that are in **bold** are statistically significant at the 5% level.

Table 3.13   Coefficients of correlation between selected sources of finance (SMEs with no R&D expenditure)

	Debt									Equity					
	Domestic banks	Domestic finance firms	Other dom. fin. instit.	Foreign financial instit.	Trade credit	Other nonfin. business	Govt.: Finnvera	Other govt.	Other debt	Individuals active in business	Other individuals	Venture capital	Financial instit.	Other firms	Other equity
Domestic banks	1.000														
Domestic finance f.	-0.001 (0.988)	1.000													
Other dom. fin. instit.	-0.046 (0.479)	-0.009 (0.893)	1.000												
Foreign fin. instit.	-0.009 (0.887)	-0.020 (0.757)	0.103 (0.113)	1.000											
Trade credit	**-0.411** (**0.000**)	**-0.131** (**0.044**)	-0.100 (0.125)	-0.053 (0.415)	1.000										
Other nonfin. b.	-0.006 (0.921)	-0.019 (0.769)	-0.009 (0.889)	-0.009 (0.896)	-0.073 (0.262)	1.000									
Govt.: Finnvera	-0.093 (0.152)	-0.031 (0.635)	-0.052 (0.423)	0.044 (0.498)	**-0.160** (**0.013**)	-0.037 (0.569)	1.000								
Other govt.	-0.025 (0.697)	**0.151** (**0.020**)	0.000 (0.998)	-0.005 (0.940)	-0.030 (0.641)	-0.010 (0.880)	-0.027 (0.681)	1.000							
Other debt	**-0.403** (**0.000**)	-0.107 (0.138)	-0.100 (0.169)	-0.050 (0.487)	**-0.292** (**0.000**)	-0.001 (0.990)	**-0.222** (**0.002**)	-0.037 (0.609)	1.000						
Individuals active in b.	-0.080 (0.219)	0.015 (0.818)	0.088 (0.178)	0.027 (0.678)	-0.024 (0.713)	0.055 (0.402)	0.104 (0.110)	-0.110 (0.092)	-0.021 (0.770)	1.000					
Other individuals	0.049 (0.451)	-0.021 (0.744)	-0.061 (0.347)	-0.020 (0.759)	0.014 (0.829)	-0.040 (0.536)	-0.101 (0.119)	**0.159** (**0.014**)	-0.002 (0.975)	**-0.737** (**0.000**)	1.000				
Venture capital	-0.044 (0.497)	-0.026 (0.688)	-0.020 (0.763)	-0.006 (0.933)	0.127 (0.050)	-0.011 (0.865)	-0.009 (0.886)	-0.006 (0.923)	-0.055 (0.452)	-0.118 (0.069)	-0.026 (0.691)	1.000			
Financial instit.	0.047 (0.473)	-0.020 (0.757)	-0.015 (0.816)	-0.004 (0.948)	0.034 (0.607)	-0.009 (0.896)	-0.023 (0.723)	-0.005 (0.940)	-0.050 (0.487)	**-0.193** (**0.003**)	-0.020 (0.759)	-0.006 (0.933)	1.000		
Other firms	0.013 (0.842)	0.014 (0.825)	-0.046 (0.479)	-0.013 (0.844)	0.033 (0.613)	-0.026 (0.690)	-0.028 (0.672)	-0.015 (0.819)	0.035 (0.629)	**-0.442** (**0.000**)	-0.020 (0.759)	-0.017 (0.798)	**0.412** (**0.000**)	1.000	
Other equity	0.086 (0.187)	0.002 (0.982)	-0.038 (0.565)	-0.011 (0.864)	-0.044 (0.500)	-0.023 (0.729)	-0.025 (0.707)	-0.013 (0.842)	0.038 (0.597)	**-0.469** (**0.000**)	-0.053 (0.416)	-0.015 (0.824)	-0.011 (0.864)	0.084 (0.197)	1.000

Note: The table reports the coefficients of correlation and p-values that are in parentheses. The coefficients of correlation that are in **bold** are statistically significant at the 5% level.

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4 Conclusions

Inspired by a recent study of BU (1998), this paper explores a number of facets of the Finnish SME finance. We specifically explore two questions. First, what are the most important sources of finance to SMEs? Because Finland's financial sector has recently undergone a major restructuring in which a bank-centered financial system shifted from relationship-based debt finance towards a US type system with increasing influence of the stock market, we also compare the sources of SME finance in Finland with those in the US. Second, are the sources of finance different for innovative small businesses and/or for SMEs investing in R&D?

The conventional financial growth cycle view of SME finance suggests that the most opaque firms, such as young and small SMEs, use first insider funds, then debt, and only as a last resort outside equity. This conventional wisdom need not however apply to innovative small businesses investing in R&D. In contrast, a partially reversed pecking order may best apply to them, as outside equity rather than debt may for a number of reasons be the optimal form of finance for them.

Our analysis reveals that the capital structure of SMEs significantly varies with the size and age of firms. Consistent with conventional wisdom, we find that the three most important sources of funds are the principal owner's equity, trade credit provided by non-financial firms and debt provided by FIs. These account for about 2/3 of total equity and debt. The Finnish SMEs run a debt ratio of 54%, but the debt ratio is lower for small SMEs than for large SMEs. It also varies non-monotonically with the age of firms. Overall, these findings are in line with what BU (1998) have documented for the US. It seems that the capital structure of the Finnish SMEs does not differ fundamentally from that of the US SMEs.

We also document some interesting differences between Finland and the US. Although the Finnish SMEs start with about the same level of debt than their US counterparts,

- SMEs increase the level of indebtness more slowly in Finland than in the US; and

- the youngest SMEs rely on FI debt less in Finland than in the US.

If the differences are not entirely attributable to differences in demand, they suggest that the debt market in Finland is perhaps not as conducive for entrepreneurship and start-ups as it is in the US.

Our analysis also reveals that the financing of innovative small businesses differs in several important aspects from that of other SMEs. In particular, the evidence is consistent with the partially reversed pecking order in which equity is preferred to debt. The data speak for the partially reversed pecking order in the following dimensions:

- Innovative firms, firms with R&D-activities and firms that own patents and/or intangible assets run a lower debt ratio than their counterparts. The difference is most notable for the most R&D-intensive SMEs.

- Unlike for their (non-innovative) counterparts, the most important source of funds for innovative firms, firms with R&D-activities, and firms that own patents and/or intangible assets is equity attributable to the principal owner.

- Despite the low leverage, innovative firms, firms with R&D-activities and firms that own patents and/or intangible assets resort quite a lot to capital loans.

- The most R&D-intensive firms are less leveraged than firms that can already demonstrate a degree of innovativeness.

- The most R&D-intensive firms are less dependent on the debt supplied by FIs than other firms are.

This evidence is consistent with the US cross-sectional evidence showing that R&D-intensity and leverage are negatively correlated across firms (Smith and Watts 1992, Bhagat and Welch 1995 and Hall 2002). It is also consistent with the view that an important determinant of SMEs' investments in innovativeness is the availability of internal finance (quite like in the US, see Himmelberg and Petersen 1994) and equity.

We also document some interesting, new patterns in the financing of innovative small businesses. First, the most R&D-intensive SMEs have a variety of main lenders when compared to their less R&D-intensive counterparts. Second, a small subset of SMEs exhausts most of the debt provided by banks and FIs as well as most of the outside equity. In fact, most of the SMEs have no outside equity at all. Third, different sources of funding are more often substitutes or complements for SMEs with R&D-activities than for SMEs with no R&D-activity. This suggests interconnectedness may be a characteristics feature of innovation finance.

Taken together, the findings of this paper indicate several fruitful directions for further analysis, both for researchers and policy makers. We subjectively em

phasize two of them: On the one hand, it seems that the Finnish FIs provide debt finance to SMEs selectively, leaving in particular the financing of the youngest and most R&D-intensive SMEs to other investors. Whether this is a signal of a credit market imperfection, specialization within the private market for debt and equity or something else, is an open but important question, especially because government agencies (particularly Finnvera) seem to be strongly present in the market that provides debt to these firms.

On the other hand, the financing of the most R&D-intensive SMEs is surprisingly dependent on equity, especially inside equity. The mere finding supports the view that it may be efficient to finance R&D investments with equity. Whether the prevalent reliance by the most R&D-intensive SMEs on inside equity is a signal of an equity market imperfection, or something else, is another open but important question, especially because SMEs' possibilities to tap the market for outside equity are closely linked to macroeconomic conditions. Because the Finnish venture capital industry may lack a degree or two of maturity (Hyytinen and Pajarinen 2001) and because the Finnish stock market (and the economy) seems to be rather volatile (Ali-Yrkkö, Hyytinen and Liukkonen 2001), special attention should perhaps be paid to the availability of equity financing in different market conditions. Temporary hiring and firing of research personnel and other adjustments to SME's R&D projects due to disruptions in the availability of equity finance would be, if anything, inefficient. They would result in losses of firm-specific knowledge, in information leaks to competitors and in other adjustment costs that characterize involuntary scaling of R&D projects.

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Appendix 1.   Data and Survey Design

The data are drawn from a primary survey administrated by the Research Institute of the Finnish Economy (ETLA) and Etlatieto Ltd. The main objective of the survey was to obtain quantitative information on the funding sources, including equity, and financial structure of Finnish firms, particularly those of technology-based SMEs. The survey was conducted between December 2001 and January 2002.

Sample design and interviews
The survey respondents were drawn from a population of active, for-profit, non-financial and non-farm corporations registered in Finland. Proprietorships, partnerships as well as subsidiaries were excluded from the sample. The subsidiaries were excluded, because the internal capital markets of firms may fundamentally differ from the markets for external capital (Stein 2001) and because the characteristics of a subsidiary firm may carry no information about its creditworthiness or ultimate sources of (external) finance (Harhoff and Körting 1998). Proprietorships and partnerships were excluded from the sample because of the financial and other intertwining of owners and their businesses (see Ang 1992) in such firms.

Because of our special interest in the technology-based SMEs, we over-sampled firms in the high-technology (NACE Rev.1 244, 30, 321, 322, 353), medium high-technology (NACE Rev.1 24 excluding 244, 29, 31, 323, 33, 34, 352) and information-intensive service (NACE Rev.1 642, 721, 722, 73, 743) sectors. Many earlier studies consider these sectors innovative and R&D-intensive (see, for example OECD 1996, 1999), though we acknowledge that the classification is not complete. The over-sampled sectors account for 60% of the sample. The remaining sample consists of firms in basic manufacturing, services and trade.

The survey was conducted as computer-assisted telephone interviews and the interviews were carried out by Tietoykkönen Ltd (for more information, see www.tieto1.fi). Trained interviewers, mostly university students in statistics and business administration, suggested a contacted firm to choose a respondent, a single informant, who is strongly involved in the firm's decision-making. All the questions in the survey asked the respondent to provide the interviewer with either quantitative data or a "Yes/No"-answer. The questions requiring the provision of

quantitative data were asked in three stages. First, the respondent was expected to provide the quantitative data at the level of accuracy the accounting books or other written sources of the firm allowed her to respond. If no accurate number was available, or the respondent was not reluctant to provide it, she was asked to provide a rough estimate of the data item in question. Finally, if no rough estimate was available either, the respondent was asked to indicate to which pre-specified category her firm belongs. The pre-specified categories were given by the interviewer. This strategy of letting the respondents to self-select at which level they are willing to provide information turned out to be important in questions addressing firms' R&D-intensity, for example.

The initial objective of ours was that around 1000 firms would participate in the survey. To this end, around 2600 firms were initially contacted. Though some of the contacted firms were subsidiaries, proprietorships or partnerships and therefore excluded, over 1100 firms declined to participate in the survey. The most frequently presented reason for not participating was that the respondent was too busy to participate (63% of the non-respondents). Some of the respondents said, however, that they are not willing to disclose the information we were interested in. Such *explicit* declines due to data confidentiality were quite rare (5%), as the interviewers constantly stressed that full anonymity and confidentiality would be guaranteed. Of the initial sample of 1000 firms, 936 responses were after certain logical tests and other data checks eventually accepted. These firms constitute our original sample, yielding a response rate of 36 percent. For this paper, the data quality in the original sample was further analyzed and answers cross-checked. The further checks decrease the sample to 754.

Questionnaire design

The structure of the survey reflected our special interest in the funding sources and financial structure of Finnish SMEs. Besides some ordinary income and balance sheet items, the survey questions were about firms' basic characteristics (such as age), product market environment, ownership structure, creditors, innovation activity, support from governmental bodies, and systems of corporate governance, totaling to nearly 70 questions. To cover this broad set of questions, the survey was divided into six main parts. In the first part, the respondent, who typically was either the CEO or CFO of the firm, was asked to provide us with background information on the firm. In the second, third and fourth parts of the survey,

detailed information about the sources of debt, capital loans and equity were asked. Capital loans were given a special treatment, because the Finnish Companies Act allows firms to include them to the share capital even though their economic nature resembles more that of debt. In particular, capital loans are special in that if they conform the restrictions of the Companies Act, they contribute to shareholder's equity even though the holders of a capital loan do not have voting or other ownership rights. In part five, the respondent provided us with information on her firm's previous and current use of public support. Finally, part six consisted of a series of questions addressing the firm's innovativeness, such as its R&D intensity.

In the initial sample, the average duration of interviews was 23 minutes, ranging from 10 to 65 minutes. Given that the length of the survey in terms of the total number of questions, the average duration may seem low. However, it is important to note that not all firms were required to answer to all questions. For example, a firm with no R&D, no capital loans, and no use of public support was expected to answer fewer than 30 questions, most of which were "Yes/No"-type of questions.

Appendix 2. Distributions of Equity and Debt by Growth-Orientation and Market Characteristics

Whereas (young) age and (small) size are often considered potential sources of financial constraints to SMEs, other as evident sources are ignored. The objective of a small business to grow rapidly is a prime example of such often-neglected sources of financial constrains. The same applies to the characteristics of small businesses' product market. For example, SMEs that are highly dependent on either a single customer or single product may find it difficult to obtain external finance. In this appendix, we briefly consider these alternative sources of financial constraints.

Overview

Table 4.1 displays the estimated distribution of the sources of funds by SMEs' growth targets and by selected indicators of the (product) market structure that they face.[27] Panel B breaks SMEs down into "High growth" and "Low growth" groups. A firm is a high growth firm if its own estimate for the average annual sales growth rate for the next three years exceeds the average nominal GDP growth rate in Finland during the last decade (4%) by a factor of 2.5. The proportion of such firms in the data set is 21%, while the median growth estimate falls in category 2-5%. Panels C and D depict the sources of funds by the product market structure of SMEs. In Panel C we have included a firm in the "Concentrated customer base" category if one of its customers accounts for more than 1/3 of the firm's sales and in the "Diversified customer base" category otherwise. The "Single-product firm" category in Panel D in turn includes SMEs that have a single product which accounts for more than 90% of sales. The remaining firms are classified as "Multi-product firms".

Panel B illustrates that if capital loans are not included in the shareholders' equity, high growth SMEs with their debt ratio of 56% are somewhat more levered than low growth SMEs. Panel B also shows that capital loans as well as loans

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[27] The data in this section include only firms that responded to the survey questions regarding the growth and market structure. Comparing Panel A in Table 4.1 to that in Table 3.2 shows that the sample is not different from the sample on which we relied in the previous section. For example, it suggests a debt ratio of 54% that is almost identical to that reported in the previous section.

from FIs are a more important source of funds for high growth SMEs than for low growth SMEs. Panels C and D show that like high growth SMEs, SMEs with a concentrated customer base and with single product are more dependent on debt than their counterparts. However, unlike high growth SMEs, these firms use less FI debt than their counterparts. Finally, Panels B, C and D show that principal owner's share of total debt and equity is slightly higher among high growth SMEs than among low growth SMEs (30% vs. 28%) and that the opposite holds for SMEs with a concentrated customer base and single product.

Sources of equity

Table 4.2 – Table 4.4 shed light on the uses and sources of inside and outside equity. The following findings are worth pointing out:

- High-growth SMEs depend clearly more on (broad and narrow) inside equity than low growth SMEs (94% vs. 86% and 90% vs. 81%), while the opposite holds for SMEs with a concentrated customer base and single product;

- The most important source of outside equity for high-growth SMEs is other non-financial firms ("Other firms"; see Table 4.2), which also holds for SMEs with a concentrated customer base and single product.

Sources of debt

Table 4.5 shows the estimated distribution of debt by firms' growth targets and the product market structure. As documented in the table, high growth SMEs rely more on bank and finance firms' loans and less on trade credit than their counterparts. The opposite holds for SMEs with a concentrated customer base and single product; the ratio of trade credit to total debt is for these firms as high as 68% and 64%. Their high debt ratios thus seem to co-vary with their extensive use of trade credit. Finnvera seems to focus on high-growth firms, but overall the governmental bodies supplying SME finance do not seem to systematically supply funds based on the market structures that SMEs face.

Table 4.1   Estimated distributions of equity, capital loans and debt by market and production structure

	Sources of equity			Capital loans			Sources of debt				Total debt and equity
	Principal owner	Other equity	Total equity	Private	Public	Total cap. loans	Financial instit.	Other instit.	Other debt	Total debt	
A: All small businesses which responded to questions related to markets and growth (n = 722)											
%	28.8%	17.4%	46.2%	1.4%	0.5%	1.9%	15.8%	26.8%	9.3%	52.0%	100.0%
(amount, mill. €)											(50,094)
B: Breakout by growth prospects of small business											
"High growth firms"	30.1%	14.2%	44.3%	1.9%	1.8%	3.7%	20.4%	19.4%	12.2%	52.0%	100.0% (11,596)
"Low growth firms"	28.4%	18.3%	46.7%	1.3%	0.1%	1.3%	14.5%	29.0%	8.4%	51.9%	100.0% (38,499)
D: Breakout by customer dependency of small business											
"Concentrated customer base"	26.5%	14.6%	41.1%	1.1%	0.4%	1.5%	11.5%	41.1%	4.8%	57.4%	100.0% (20,315)
"Diversified customer base"	30.4%	19.3%	49.6%	1.6%	0.5%	2.1%	18.8%	17.0%	12.4%	48.2%	100.0% (29,779)
E: Breakout by product diversity of small business											
"Single-product firms"	22.5%	15.4%	37.9%	2.0%	0.7%	2.7%	12.4%	41.0%	6.0%	59.4%	100.0% (21,239)
"Multi-product firms"	33.4%	18.8%	52.2%	1.0%	0.3%	1.3%	18.3%	16.4%	11.8%	46.5%	100.0% (28,855)

Note: The table reports percents of total equity and debt. For more information about the data, see Table 3.1.

Table 4.2   Estimated distribution of equity by market and production structure

	Individuals			Institutions				Other Equity	Total sources of equity
	Principal owner	Managers & empl.	Other individ.	Public VC	Private VC	Financial instit.	Other firms		
A: All small businesses which responded to questions related to markets and growth									
%	62.4%	25.1%	4.9%	0.3%	0.7%	0.1%	4.1%	2.5%	100.0%
(amount, mill. €)									(23,123)
B: Breakout by growth prospects of small business									
"High growth firms"	68.0%	25.9%	0.6%	1.2%	1.3%	0.3%	2.3%	0.5%	100.0% (5,138)
"Low growth firms"	60.8%	24.9%	6.1%	0.1%	0.5%	0.0%	4.6%	3.0%	100.0% (17,985)
D: Breakout by customer dependency of small business									
"Concentrated customer base"	64.5%	20.5%	0.4%	0.6%	0.7%	0.0%	9.4%	3.9%	100.0% (8,346)
"Diversified customer base"	61.2%	27.7%	7.4%	0.1%	0.7%	0.1%	1.1%	1.6%	100.0% (14,777)
E: Breakout by product diversity of small business									
"Single-product firms"	59.5%	24.3%	4.2%	0.2%	0.3%	0.0%	10.9%	0.5%	100.0% (8,046)
"Multi-product firms"	63.9%	25.5%	5.3%	0.4%	0.9%	0.1%	0.5%	3.5%	100.0% (15,077)

Note: The table reports percents of total equity. For more information about the data, see Table 3.1.

Table 4.3   Estimated distribution of equity (principal owner disaggregated) by market and production structure

	Individuals		Institutions				Other Equity	Total sources of equity
	Active in business	Other individ.	Public VC	Private VC	Financial instit.	Other firms		
A: All small businesses which responded to questions related to markets and growth								
%	82.6%	6.8%	0.4%	1.0%	0.1%	4.9%	4.3%	100.0%
(amount, mill. €)								(23,123)
B: Breakout by growth prospects of small business								
"High growth firms"	90.1%	3.2%	1.5%	1.4%	0.3%	2.8%	0.7%	100.0% (5,138)
"Low growth firms"	80.5%	7.8%	0.1%	0.8%	0.0%	5.5%	5.3%	100.0% (17,985)
D: Breakout by customer dependency of small business								
"Concentrated customer base"	82.3%	2.2%	0.8%	0.8%	0.0%	10.0%	4.0%	100.0% (8,346)
"Diversified customer base"	82.8%	9.4%	0.2%	1.1%	0.1%	2.1%	4.4%	100.0% (14,777)
E: Breakout by product diversity of small business								
"Single-product firms"	78.2%	4.5%	0.4%	0.4%	0.0%	12.6%	3.9%	100.0% (8,046)
"Multi-product firms"	85.0%	8.0%	0.4%	1.3%	0.1%	0.9%	4.5%	100.0% (15,077)

Note: The table reports percents of total equity. For more information about the data, see Table 3.1.

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Table 4.4   Estimated distribution of principal owner's equity by market and production structure

	Individuals		Institutions			Total principal owner
	Active in business	Other individ.	Venture Capital	Other firms	Other instit.	
A: All SMEs which responded to questions related to markets and growth						
%	92.2%	3.0%	0.5%	1.3%	2.9%	100.0%
(amount, mill. €)						(14,423)
B: Breakout by growth prospects of small business						
"High growth firms"	94.4%	3.8%	0.7%	0.9%	0.3%	100.0% (3,492)
"Low growth firms"	91.5%	2.7%	0.5%	1.5%	3.8%	100.0% (10,931)
D: Breakout by customer dependency of small business						
"Concentrated customer base"	95.8%	2.7%	0.4%	0.9%	0.1%	100.0% (5,379)
"Diversified customer base"	90.1%	3.2%	0.6%	1.6%	4.6%	100.0% (9,044)
E: Breakout by product diversity of small business						
"Single-product firms"	90.5%	0.5%	0.5%	2.8%	5.7%	100.0% (4,785)
"Multi-product firms"	93.1%	4.2%	0.6%	0.6%	1.5%	100.0% (9,638)

Note: The table reports percents of total principal owner's equity. For more information about the data, see Table 3.1.

Table 4.5   Estimated distribution of debt by market and production structure

	Financial institutions				Nonfinancial business and government						Total sources of debt
	Domestic banks	Domestic finance firms	Other dom. fin. inst.	Foreign financial instit.	Trade credit	Other nonfin. business	Govt.: Finnvera	Other govt.	CPs and bonds	Other Debt	
A: All small businesses which responded to questions related to markets and growth											
%	24.7%	3.3%	2.1%	0.3%	46.1%	0.3%	4.7%	0.5%	0.0%	17.9%	100.0%
(amount, mill. €)											(26,028)
B: Breakout by growth prospects of small business											
"High growth firms"	33.1%	4.6%	1.2%	0.3%	27.5%	0.5%	8.4%	0.9%	0.0%	23.5%	100.0% (6,031)
"Low growth firms"	22.2%	2.9%	2.4%	0.4%	51.7%	0.2%	3.6%	0.3%	0.0%	16.2%	100.0% (19,997)
D: Breakout by customer dependency of small business											
"Concentrated customer base"	16.2%	2.6%	1.1%	0.0%	67.7%	0.2%	3.2%	0.5%	0.0%	8.4%	100.0% (11,664)
"Diversified customer base"	31.6%	3.8%	3.0%	0.6%	28.6%	0.4%	5.9%	0.5%	0.0%	25.6%	100.0% (14,364)
E: Breakout by product diversity of small business											
"Single-product firms"	16.5%	2.2%	1.8%	0.5%	63.6%	0.1%	4.9%	0.4%	0.0%	10.0%	100.0% (12,614)
"Multi-product firms"	32.4%	4.4%	2.5%	0.2%	29.7%	0.5%	4.6%	0.5%	0.0%	25.3%	100.0% (13,415)

Note: The table reports percents of total debt. The debt data do not include capital loans. For more information about the data, see Table 3.1.

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