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Short-term borrowing for long-term projects: Are family businesses more susceptible to 'irrational' financing choices?

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Non-technical summary

Based on a dataset with 1,417 family and 1,195 non-family businesses in Germany, we find that family businesses rely more heavily than other enterprises on *short term* credit in order to finance *long term* investment and innovation projects. We investigate the reasons underlying these differences in the financing behaviour of family businesses and other businesses. Do family businesses tend to use shorter-term - on average more expensive - sources of financing because they face more financial restrictions than comparable non-family enterprises? Or do they have other motives for their ostensibly irrational financing choices, such as a strong desire to remain independent? We approach answering this research question by simultaneously estimating the determinants of financing behaviour and creditworthiness. For both of these facets, we compare family businesses with non-family businesses that have otherwise the same characteristics. Our econometric results show that creditworthiness for family-driven companies tends to be higher than for non-family driven companies. In particular, large family businesses exhibit a higher creditworthiness and use short-term credit more frequently. This goes against the notion that greater use of short-term sources of credit by family enterprises is an indicator for financing restrictions.

As a result, we discuss two possible explanations for our observation that family enterprises make greater use of overdrafts and revolving credit: One reason might be that family businesses are offered lines of credit at advantageous rates. These forms of credit therefore do not represent as much of a cost disadvantage as they would for other, less creditworthy businesses. While it is not possible to verify this explanation due to a lack of enterprise-specific data on the cost of the credit lines granted, it seems unlikely that the observed differences in financing behaviour can be explained purely on the basis of interest rate effects. In particular, higher creditworthiness would lower interest rates for all maturities and not necessarily lead to a reduction in the relative costs of short term credit.

Another reason might be that family businesses are particularly concerned about staying independent from external capital providers. For this reason, they prefer the less complicated option of an overdraft or revolving credit to a loan dedicated to a specific investment. There is some additional evidence in the Mannheim Innovation Panel to suggest that this might be the relevant explanation in this case. In particular, large family businesses stated that a high level of dependence from a lender would be a reason to decide against borrowing.

Overall, our results seem to confirm the frequently stated assumption that independence from external capital providers is of central importance for family businesses. Based on the frequency of use of various sources of finance, our data provide clear evidence that family businesses are prepared to accept higher financing costs in order to preserve their financial independence and flexibility. Surprisingly, this particularly applies to family businesses that are larger and generally more creditworthy.

Nicht-technische Zusammenfassung

Ein Vergleich von 1.417 Familienunternehmen mit 1.195 Nicht-Familienunternehmen zeigt, dass Familienunternehmen in höherem Maße als andere Unternehmen *kurzfristige* Kredite zur Finanzierung von *langfristigen* Investitionen und Innovationen einsetzen. Wir untersuchen die Gründe dafür, dass die Familienunternehmen diese im Durchschnitt teureren Mittel nutzen und fragen, ob sich darin Finanzierungsrestriktionen äußern oder ob dieses Verhalten möglicherweise auf einen besonders starken Wunsch nach Unabhängigkeit von Kreditgebern zurückzuführen ist.

Wir beantworten diese Frage mithilfe simultaner Schätzungen der Finanzierungsformwahl und der Kreditwürdigkeit. Für beide Aspekte vergleichen wir Familienunternehmen mit weitgehend ähnlichen Nicht-Familienunternehmen. Unsere ökonometrischen Ergebnisse zeigen, dass Familienunternehmen im Durchschnitt kreditwürdiger als Nicht-Familienunternehmen sind. Dies gilt insbesondere für große Familienunternehmen, die am häufigsten auf kurzfristige Kredite zurückgreifen. Dies spricht dagegen, die höhere Präferenz der Familienunternehmen für kurzfristige Finanzierungen mit Kreditrestriktionen zu begründen.

Wir diskutieren zwei mögliche andere Gründe für das beobachtbare Finanzierungsverhalten. Ein möglicher Grund könnte darin bestehen, dass Familienunternehmen wegen ihrer höheren Kreditwürdigkeit bessere Kreditkonditionen erhalten als Nicht-Familienunternehmen. Wir können dies wegen fehlender Daten zu den Kreditkonditionen nicht direkt untersuchen, halten es aber für unwahrscheinlich, dass die beobachtbaren Effekte ausschließlich mit Zinsunterschieden erklärt werden können. Insbesondere führt die höhere Kreditwürdigkeit zu Zinsvorteilen bei allen Laufzeiten und reduziert nicht notwendigerweise die relativen Kosten kurzfristiger Kredite.

Ein anderer Grund für die Präferenz kurzfristiger, flexibel einsetzbarer Kredite könnte der Wunsch nach größerer Unabhängigkeit von externen Kapitalgebern sein. Für dieses Argument findet sich zusätzliche Evidenz im Datensatz, da insbesondere die größeren Familienunternehmen angeben, sich bei größerer Abhängigkeit von einem Kreditgeber gegen weitere Kreditaufnahme zu entscheiden. Insgesamt bestätigen unsere Ergebnisse damit die in der Literatur häufig geäußerte Vermutung, dass Flexibilität und Unabhängigkeit von externen Kapitalgebern für Familienunternehmen große Bedeutung hat und die Unternehmen dafür auch höhere Kreditkosten in Kauf nehmen. Interessanterweise trifft dies vor allem auf größere und tendenziell kreditwürdigere Familienunternehmen zu.

Short-term borrowing for long-term projects: Are family businesses more susceptible to "irrational" financing choices?

Bettina Peters* and Peter Westerheide**

January 30th, 2011

Abstract:

There are noticeable differences between the roles that various forms of credit financing play in family businesses and in other businesses. Family businesses take out more often bank loans specifically to finance investments and innovations, and they particularly often resort to the short-term and relatively expensive option of an overdraft. How can we explain these differences in financing choices? Do family businesses tend to use shorter-term, more expensive sources of financing because they face more restrictions than other or are there other motives such as financial independence at play? Our econometric approach to these issues is to study the financing behaviour and creditworthiness. For both of these aspects, we compare family businesses with non-family-run businesses that otherwise have the same characteristics. Our results do not confirm that family businesses are faced by stronger financial constraints but they indicate that family firms are prepared to accept higher financing costs in order to preserve their financial independence.

Keywords: corporate financing, innovation, family businesses, financing restrictions

JEL classification: G32 G31 M14

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1 Introduction

Family businesses constitute a major share of all companies in many industrialized countries. In most western European countries between 70% and more than 90 % of all companies are family controlled.[1] Even if there is no generally accepted definition of the family firm in economics, a majority of family members among the shareholders and a dominating influence of family members in the companies' management can be seen as common characteristics of family businesses.

Many studies have already observed that family businesses are comparatively conservative in the type of financing they use. The most important sources of funds for family businesses are internal financing from cash flow, shareholders' credits and bank loans. These findings are confirmed by a new dataset on 1,417 family and 1,195 non-family businesses in Germany, drawn from the 2007 wave of the Mannheim Innovation Panel.

However, our dataset reveals another intriguing pattern. In order to finance investment and innovation projects, family businesses rely more heavily than other enterprises on overdrafts which, by their nature, are comparatively expensive and have a short-term focus. Regarding the long-term focus of investment and innovation projects this financing choice seems to be irrational at first glance. This stylised fact leads us to ask for the reasons underlying the differences in the financing behaviour of family businesses and other businesses. Do family businesses tend to use shorter-term, more expensive sources of financing because they face more financial restrictions than comparable non-family enterprises? Or do they have other motives for their ostensibly irrational financing choices, such as a strong desire to remain independent? We answer this research question by simultaneously examining the determinants of financing behaviour and creditworthiness. For both of these facets, we compare family businesses with non-family-run businesses that have otherwise the same characteristics. Our paper therefore adds to the existing literature by exploiting a new dataset to explain differences on the debt maturity structure of family businesses to other companies, systematically controlling for differences in creditworthiness and other relevant company characteristics.

In the following Section 2, we begin by offering an overview of the relevant literature and hypotheses related to the financing behaviour of businesses in general and of family businesses in particular. Section 3 is dedicated to the empirical analysis, starting with a description of the data set and descriptive statistics. We then go on to apply econometric methods to identify the differences in the financing strategies pursued by family and non-family businesses. Finally, we look at differences in creditworthiness between family-owned enterprises and others. Chapter 4 summarises our results.

[1] Cf. Schröder and Westerheide (2010) and the sources quoted there.

2 Literature review

2.1 Theoretical approaches to explaining family business financing

For the time being there exists no explicit theory for corporate finance of family businesses. That being said, there are a number of links between theoretical explanations of corporate financing behaviour and the characteristic features of family businesses. In particular, the theories that have been developed to explain financing problems of small and medium-sized enterprises can offer some fruitful insights into financing behaviour of family businesses, as the majority of such businesses are family-owned and managed.

The basic assumption of asymmetric information on capital markets, and their consequences for corporate finance, is a suitable starting point to explain the particular financing characteristics of family companies. As long as information is asymmetrically distributed, financing contracts cannot completely exclude opportunistic behaviour on the part of company managers. That is the basic idea behind models that postulate a hierarchy (pecking order) of different forms of financing (Myers 1984 and Myers/ Majluf 1984). Due to risk premia and monitoring costs, external financing is usually more expensive than financing from internal sources. Pecking order models rank internal financing as the most economical form, because it can be accessed without needing to overcome information asymmetries. External debt financing comes next. The most expensive form of financing is external equity, as new issues of equity capital are likely to be interpreted as a sign of overvaluation of existing shares and new shares will be undervalued on average.

Moreover, credit markets cannot simply be cleared via the price, because the risk of default rises with increasing interest rates, owing to adverse selection and moral hazard on the part of the borrowers. This implies that there is a maximum optimal rate of interest that should not be exceeded. Yet at this price, some would-be borrowers may be left unsatisfied and will be credit-rationed (Stiglitz/Weiss 1981). Collateral is one means of mitigating this rationing problem (Bester 1985); an existing long-term relationship between lenders and borrowers also helps (Petersen/Rajan 1994), for an overview on the literature see Harris/Raviv (1998) and Harhoff/Körting (1998).

These cost related arguments for a financial pecking order and credit rationing phenomena can be matched by independency considerations which are particularly important for family owned businesses. Other things being equal, managers are likely to prefer financing instruments that involve as little intrusion into their business by external capital providers as possible (see inter alia Cosh/Hughes 1994, Jordan et al. 1998, Hamilton/Fox 1998, Swinnen et al. 2005).

But not only can the choice of debt versus external equity be explained by pecking order arguments, but also the maturity structure of debt. Myers (1977) explains that shortening debt maturity could mitigate underinvestment problems due to ex ante unknown outcomes of risky

investments, although this would increase negotiation costs. A preference for expensive short term debt, particularly trade credit, can be explained also as a rationing indicator, if long term debt is not available and the company is credit rationed (Petersen/Rajan 1994).

It might also be interpreted as a sign that borrowers are unwilling to opt for longer-term external financing, on the grounds that long term capital providers might wish to exercise a great deal of control and require a large amount of information. Short term debt "is likely to be perceived as having fewer formal restrictions associated with its use" (Jordan et al. 1998, p. 8, similarly Swinnen et al. 2005, p. 4). Cosh and Hughes (1994, p. 32f.) also emphasise that borrowers concerned mainly with independence and freedom from control will favour credit with the least formal restrictions. In particular, "[short term loans, such as overdrafts] combine flexibility with an absence of the kind of regular monitoring and repayment of interest that go with fixed term and longer loans [….] and which have led many to argue that [these] are an optimal method of solving some of the lenders agency and moral hazard problems."

These general arguments can explain particularities in the financing behaviour of family companies if these businesses typically differ from others with respect to the characteristics mentioned above. Systematic differences between family businesses and other companies might particularly exist with respect to the principal-agent conflicts between external capital providers and the management of companies in markets with asymmetric information. Going back to the seminal work on ownership and control by Fama and Jensen (1983), we find the argument that combining ownership and control is efficient in small, less complex organisations, because it minimises monitoring costs. The paper explicitly cites families as an example (p. 306): "For example, family members have many dimensions of exchange with one another over a long horizon and therefore have advantages in monitoring and disciplining related decision agents." Therefore (additional) capital provision from family members should incur comparatively low agency costs, and should be regarded as an equivalent to internal finance, even if some family members are not actively involved in the management of the company.

But agency problems could be reduced in family firms also with respect to non-family capital providers (Bopaiah 1998). Agency conflicts between managers and owners – and therefore the danger of opportunistic behaviour of non-owning managers – are less likely and agency costs therefore tend to be lower in family-owned and owner-managed companies. Furthermore, family entrepreneurs hold large ownership shares in the business on the basis of investments they have made, so their economic future is closely linked with that of their business. This reduces the risk of moral hazard at the expense of credit providers. In addition, it has also been argued that a high degree of connectedness to the regional environment leads family business to be more concerned than other enterprises about their reputation (Bopaiah 1998, p. 76).

These properties – combined with the fact that family-run enterprises have often been in existence for longer – are grounds to assume that family businesses may be better placed to access the credit market than non-family businesses of the same size, in the same industry. Problems of asymmetric information and the resultant issue of credit rationing may therefore be less pressing for family enterprises than for other businesses. The readiness of family-owners to provide collateral out of their personal wealth should mitigate credit rationing problems for family further. Finally, family owned companies should be particularly eager to preserve their independence and to minimise intrusion by external capital providers: This could explain a demand driven preference for debt financing, particularly for short term debt, of the family firm when internal sources are exhausted.

However, as Fama and Jensen (1983, p. 307) argue, restricting ownership to managers probably leads to insufficient risk diversification and high risk aversion in decision-making. This could result into a competitive disadvantage. They furthermore argue that the advantage these businesses have in terms of lower monitoring costs must be weighed up against the disadvantage of a lack of specialisation at least in larger family companies. As the knowledge needed to manage and control a business is more specific in large, complex enterprises, it generally becomes increasingly efficient, with increasing business size, to separate ownership and management, and to delegate control (Fama/Jensen 1983, p. 11). Schulze et al. (2001) provide a comprehensive discussion of agency problems in family businesses. Responding critically to the arguments in favour of lower agency costs of family businesses, they argue that in reality, family enterprises are no strangers to costly agency problems. In their view, the problem areas include a lack of control via the capital market, possibly inefficient labour markets within family firms (e.g. a lack of promotion prospects for managers who are not family members) and problems of self-discipline for managers from within the family. Bopaiah (1998, p. 76), also mentions that the possible advantage of a coherent style of leadership in a family business must be weighed up against the possible disadvantages of family disputes, arguments over succession and power struggles.

2.2 Previous empirical findings

Given the range of opposing factors involved, the question of whether family businesses have advantages over other types of enterprises when it comes to accessing external capital must ultimately be decided on an essentially empirical basis. While there are a large number of studies on the particular characteristics of the financing problems and financing behaviour of small and medium sized companies, empirical evidence on the financing characteristics of family companies, particularly in multivariate comparison to other companies with similar characteristics, is to our knowledge still limited.

One strand of empirical literature has investigated the *financing structures of family owned enterprises* in a general in a descriptive approach. Recent studies that focus on the German

and Austrian market are Leyherr (2000), Family Business Center at the University of St. Gallen/Ernst & Young (2005), Redlefsen/Eiben (2006) and CEFS (2008).

Leyherr (2000) examines the situation of family businesses in Austria and surveys 122 family businesses. He finds that many have a high equity ratio, which may seem wasteful from a financing point of view, as it reduces possible leverage effects that could increase return on equity. He also points towards a desire to preserve family influence in the business is an important goal for corporate financing. Private equity companies do not play much of a role and are generally viewed in a very negative light, particularly by enterprises that have no experience of working with them. Many family enterprises decide against going public, not only because of the cost, but also because of the influence external capital providers would gain. When it comes to external financing, bank loans are clearly of great importance. As a rule, family businesses maintain close contact with one main bank, although they also have relations with a number of other banks, usually including one local bank.

Results of a study by the Family Business Center at the University of St. Gallen/Ernst & Young (2005) show that family businesses have a lower debt to equity ratio than other businesses. According to the authors, traditional explanations (e.g. tax considerations, lack of collateral) cannot fully account for this phenomenon. They refer to the relative costs of various financing instruments (in accordance with the pecking order approach), but also to the desire to remain independent from external capital providers and the owners' lack of investment diversification. In addition, the debt to equity ratio is related to the number of family members that hold an ownership share. Accordingly, a shift towards higher indebtedness, or "risky shift", can often be observed when around 2 to 4 family members hold ownership shares. The opposite ("cautious shift") applies when a greater number of family members are involved.

Redlefsen/Eiben (2006) conduct a survey among of 297 family enterprises and come to the conclusion that almost one in ten enterprises has an equity ratio of over 70 percent and thus tends to be over-capitalised. The average equity ratio in the study is comparatively high, at 36.3%. Alongside keeping costs low, key financing goals include minimal participation rights for external capital providers, secure and long-term financing and a high level of flexibility in terms of how the funds are drawn down and used. At the same time, the amount of collateral required is an important criterion for financing. Alongside funds from within the business, the study found that bank loans and leasing are the main sources of financing used. Enterprises are aware of other instruments but tend not to use them. This questionnaire, too, found that relationships with one main bank dominate. Moreover, family businesses appear to limit the scope of their financing to an average of 3 or 4 lending banks.

A study by the Center for Entrepreneurial and Financial Studies (CEFS 2008) at the TU München has taken a sample of 237 enterprises and has investigated the aims and financing behaviour of family businesses as well as the knowledge of their employees in charge of

finance. The results have shown that family businesses concentrate on long-term goals and that independence plays an important role in financing decisions. One piece of evidence for this is family businesses' equity ratios, which are sometimes extremely high. Considerable use is made of traditional financing instruments (retained profits and bank loans), but also shareholders' credits, government-sponsored business development loans and leasing. Other forms of financing, such as factoring, silent partnerships, bonus certificates and borrowers' notes are used far less often, while private equity and publicly-quoted financing instruments are left virtually untouched.

A number of papers find strong support for the adherence of family owned companies to the *pecking order hypothesis*: López-Gracia and Sánchez-Andújar (2007) find in an econometric test of the trade-off theory – which postulates that the optimal level of debt is obtained when tax advantages and costs of financial distress are balanced – and the pecking order theory, that small Spanish family firms do in fact rely more on internal financing sources and adjust faster to their optimal debt level. Financial distress costs play no significant role for them – in contrast to non-family firms. Gallo et al. 2004 emphasize – based on an empirical comparison of 101 family owned with 204 non-family owned medium sized Spanish companies – that managers of family owned companies have "a special 'financial logic' of their own" (p. 314) by not only maximizing the market value of the companies' stock but pursuing other family related aims. Other papers supporting the hypothesis of pecking order financing by family owned companies and the dominance of financial means coming from a small group of family members are Gallo/Vilaseca (1996), McConaughy/Phillips (1999), Coleman/Carsky (1999), Poutziouris (2001), Blanco-Mazagotos et al. (2007), and Allouche et al. (2008). While many authors attribute the pecking-order financing behavior of family firms mainly to their desire for independence, Steijvers/Voordecker (2009) state in a recent paper that small family firms face higher agency costs due to problems of self control and parental altruism. Basis for their findings are simultaneous estimations of credit pricing and the demand for personal collateral for 43 lines of credit in the 1993 wave of the US National Survey of Small Business Finance.

Some more specialised papers focus on the *access of family businesses to credit markets*: Bopaiah (1998) follows a similar approach to that taken in the classic study of credit rationing by Petersen/Rajan (1994), addressing the question of whether family businesses in the USA are subjected to tighter rationing on the credit market than other forms of business. He comes to the conclusion that family enterprises can access credit markets more easily than non-family businesses. However, he finds no significant difference between owner-managed and non-owner-managed enterprises. Furthermore, although there were differences between family-run and other enterprises when it came to the availability of credit, no such differences were found in the cost of credit.

Harhoff/Körting (1998) carried out a study that also draws on the methodology of Petersen/Rajan. Their focus is on credit rationing for small and medium-sized enterprises in Germany. Their data set includes the item "family business" as a control variable, defined as a

business in which one family holds a majority stake. Their results do not provide any evidence that the characteristic "family business" influences the availability or cost of credit. The only significant influence the variable exerted was a negative effect on the amount of collateral required.

Anderson/Mansi/Reeb (2003) find that large family businesses (defined as companies of the US S&P 500 that are still – at least partially – owned by the founding family) face lower credit costs than other businesses. However, this is not true of businesses in which the position of CEO is occupied by a family member. Still, the authors do not attribute these effects to the founders, but rather to those who succeed them. They also find that the advantage in the cost of credit is particularly great when the founding family owns 12 percent of the company or less.

Particularly with respect to the *structure of debt*, Coleman/Carsky (1999) analyse the usage of different debt instruments in the 1993 wave of the US Survey of Small Business Finances. They find in a mean comparison between family-owned and non-family owned companies no significant differences in the use of different credit products with the exception of motor vehicle loans which were more frequently taken by family owned companies. A small and statistically weakly significant difference exists also in the usage of lines of credit which are – in contrast to our findings – were less frequently used by family owned companies. Coleman/Carsky also apply a multivariate logistic regression to explain the usage of different forms of credit. However, they do not control for the characteristic “family owned”, but only for the difference between sole proprietorships, partnerships and corporations. The sign of the coefficient for lines of credit for “partnerships” is negative: This matches our findings.

Poutziouris (2001) confirms in an explorative analysis of 240 small and medium sized UK companies that these companies rely heavily on internal financing sources and that “external financing […] is heavily biased toward short-term funding solutions” (p. 283). External equity, particularly venture capital, is avoided because of fears to dilute ownership and lose control. Family owners are significantly more concerned over pressures to change management by VC investors than managers of non-family owned companies.

2.3 Conclusions from previous research

In summary, there are a number of theoretical arguments (particularly drawing on the agency theory and the economics of asymmetric information to explain financing behaviour) which suggest that family businesses might have an advantage in terms of capital costs or capital availability when it comes to external financing. On the empirical level, too, some micro econometric studies have found evidence that the characteristic "family business" has a beneficial effect on the supply of credit.

Some studies have already indicated that substantial shares of family businesses have a relatively high equity ratio, which may be suboptimal according to finance theory and can be

explained mainly by a high preference of family companies for independence. This desire for independence of family businesses can also influence capital structure decisions, when it comes to choosing between short-term and long-term external financing. Empirical evidence on this topic, based on multivariate analysis of micro data, is still scarce.

3 Empirical analysis

We now move on to empirically analyse differences between the financing behaviour of family businesses and other businesses in Germany. Our main focus lies in discovering whether the observed differences in the choice of financing sources can be explained by demand-side or supply-side factors.

3.1 Dataset

Our empirical analysis, which compares the financing behaviour of family businesses with that of other enterprises, is based on data from the 2007 wave of the Mannheim Innovation Panel (MIP). The ZEW has conducted the MIP since 1993, together with infas Institute for Applied Social Sciences and the Fraunhofer Institute for Systems and Innovation Research (ISI). The survey is commissioned by Germany's Federal Ministry for Education and Research (BMBF) and provides comprehensive information on innovation-related activities in the German economy. The annual survey targets all enterprises in Germany that have at least five employees and whose main business is in manufacturing, mining, energy/water supply, knowledge-intensive services, other services or the media.[2] The sample is stratified by industry, enterprise size and region (east/west). The 2007 dataset comprises 5,221 enterprises in total.[3] However, we ignore enterprises that no longer belong to the sample population, i.e. those that have shrunk to a size of under 5 employees or do not belong to one of the industries listed in Footnote 2 (e.g. retail trade, construction, rental of property or land). Mining and the media were also excluded from this analysis. The sample also had to be adjusted to remove enterprises that had not reported whether they were family owned, which had no investments

[2] In accordance with the European industrial classification proposed by Eurostat, the relevant industries (NACE numbers) are: mining (NACE 10-14), manufacturing (NACE 15-37), energy and water supply (NACE 40-41), knowledge-intensive services (banking and insurance, data processing, telecommunications, technical services, consulting and advertising; WZ: 64.2, 65-67, 72-73, 74.1-74.4), other services (wholesale trade, transportation, postal services, cleaning, security, provision of personnel, office services, waste disposal; NACE: 51, 60-63, 64.1, 74.5-74.8, 90) and the media (NACE 92.1-92.2). An enterprise is defined as the smallest combination of legal and economically independent units producing goods or services. In the remainder of this paper the terms enterprise and firm will be used interchangeably.

[3] The gross sample consisted of 29,985 enterprises. Responses were received from 5,221 enterprises. To check for possible response bias, a non-response analysis was conducted for a further 4,656 enterprises. A probit estimation, additionally controlling for size, industry and region, confirms that there is no significant difference in the probability of innovating between response and non-response firms.

in the period or those with missing values for one of the endogenous and explanatory variables in the regression. Our empirical analysis finally draws on data about 2,612 enterprises.

Additional information relating to creditworthiness, enterprise age and legal form, provided by the credit-rating agency "Verband der Vereine Creditreform", complements the data on these enterprises.

There are two reasons why the 2007 wave of the survey is particularly appropriate for addressing our research questions. Firstly, 2007 was the first year in which businesses were asked about the involvement of a family. The relevant question categorised family businesses by their ownership structure. A family business is considered to be one in which at least 50 percent of the company is owned by members of one family. Using this characteristic as a key, we are able to evaluate the survey results for family businesses separately from other businesses and then compare the two groups. The second advantage of the 2007 MIP survey is that it had a special focus on enterprises' financing behaviour in general, but also with particular reference to financing investment and innovation projects.

Around 54 percent of the enterprises described themselves as family businesses. The sample of family businesses is structured differently in terms of size and the enterprises' main area of economic activity (cf. Table 1). In particular, a greater share of the family businesses fall into the "small" category (up to 49 employees) – more than 47 percent are classed as small, compared to 41.8 percent of non-family businesses. Conversely, 17.4 percent of non-family businesses have 500 employees or more; the figure for family businesses is just 8.5 percent. There are also clear differences in the businesses' main areas of economic activity. Around 69 percent of family businesses come from the manufacturing industry, compared to only 40 percent of other businesses. The reverse is true in the services sector, which accounts for around one third of family businesses, but one half of the non-family enterprises.

Table 1: Sample structure

	Family enterprises	**Non-family enterprises**
Number	1,417	1,195
As share of enterprises	*54.25%*	*45.75%*
By Size category (no. employees)		
5 to 49	47.14%	41.76%
50-99	16.16%	14.06%
100-499	28.16%	26.78%
500+	8.54%	17.41%
Sum	100.0%	100.0%
By Sector		
Manufacturing	68.73%	40.16%
Energy/water	0.64%	10.79%
Knowledge-intensive services	18.21%	36.74%
Other services	12.42%	12.22%
Sum	100.0%	100.0%

Source: Mannheim Innovation Panel, 2007 survey – ZEW calculations.

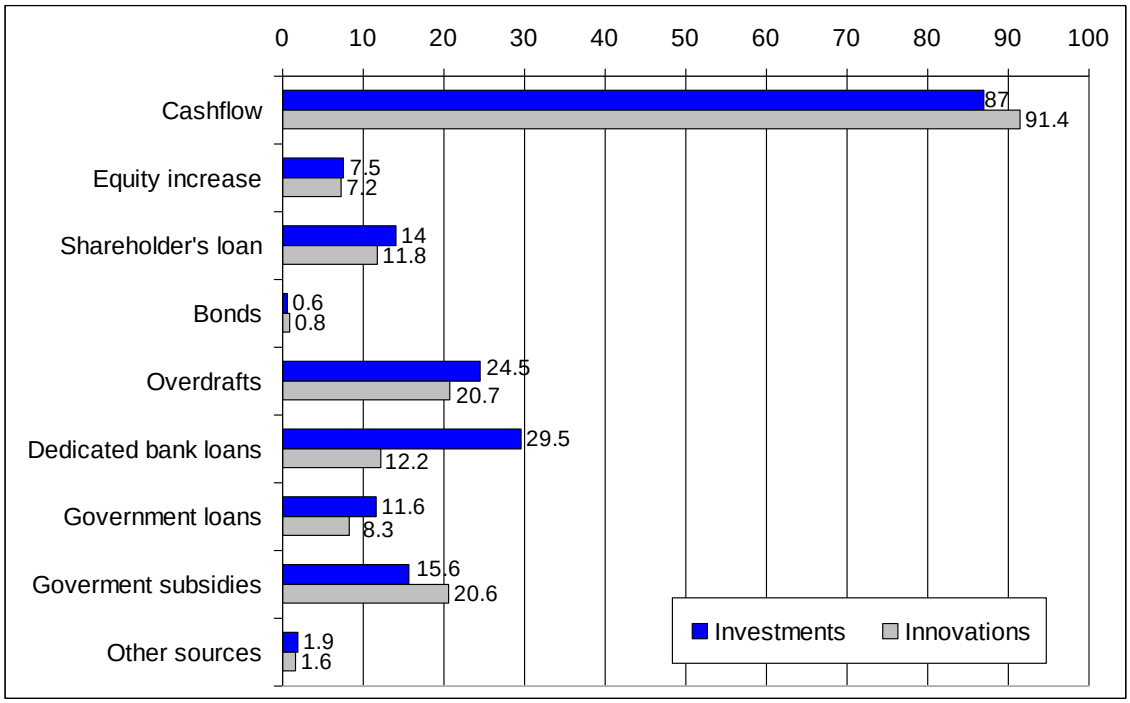
3.2 Stylised facts of financing pattern within family and non-family enterprises

This section presents some stylised facts about the large differences between financing choices in family businesses and in other businesses. All enterprises were asked which sources of financing they used between 2004 and 2006, both for investments and for innovation projects. In total, 9 different sources of finance were given in the questionnaire: (1) cash-flow, (2) equity increase including admission of a partner and new equity holding through other firms, (3) shareholder's loan including dormant equity holding and profit participating certificate, (4) issue of bonds or obligations, (5) overdrafts, (6) dedicated bank loans, (7) government loans, (8) public subsidies and (9) other sources.

First of all, Figure 1 confirms that there are marked differences in the importance between different sources of financing. Internal financing from cash flow is a particularly well-used source of funds for investments. Around 87 percent of all enterprises that made investments used this source of financing. Loans are the second most important source of funds for investments. Enterprises make considerable use of revolving credits, overdrafts as well as dedicated bank loans for this purpose. Around 29.5 percent of all enterprises use dedicated bank loans to finance investments, and almost 25 percent have even done so with overdrafts and revolving credits. Other well-used forms of financing are shareholders' credits (14%), public subsidies (just under 16%) and government-sponsored business development loans (12%). Far less use is made of the remaining sources of financing such as an increase in equity.

In our sample, 68% of all enterprises had been engaged in innovation projects during the period 2004-2006. If we rank the sources of financing for these innovation projects, a similar picture emerges as in the case of investments in general. Because innovation is associated with higher risk than other investments, we would expect internal financing and public subsidies to play a greater role here, and less use to be made of credit. This is confirmed by Figure 1. The difference is particularly evident for dedicated bank loans which are used by only 12 percent of the firms.

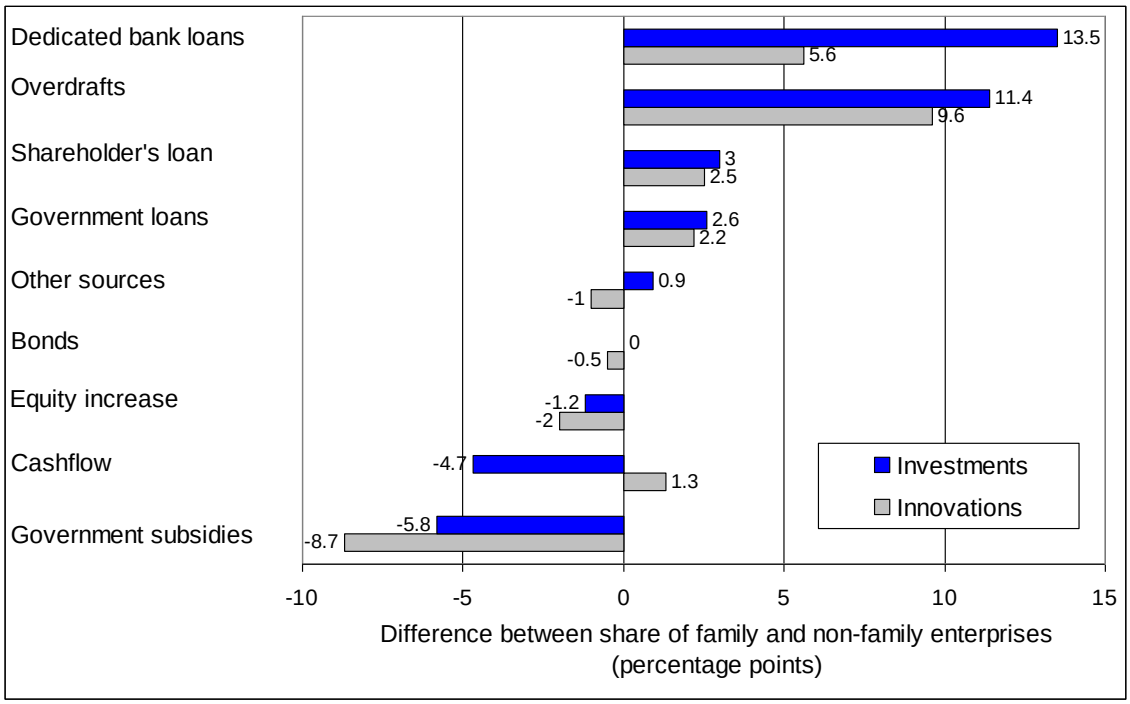
Figure 1: Sources of financing used for investments and innovation, 2004-2006



Note: The share of firms with a particular source of investment and innovation financing is based on total the number of firms with investment activities (2,612) and innovation activities (1,766), respectively.
Source: Mannheim Innovation Panel, 2007 survey, own calculations.

Table 2 and Figure 2 present similarities and differences between family and non-family businesses, in terms of the types of financing used for investment and innovation. As well as differing in terms of the importance they attach to government subsidies and shareholders' loans, the two groups of enterprises display intriguing differences when it comes to credit financing. A statistically significantly larger share of family companies chose loans to finance investments and innovations than non-family businesses did. Around 36 percent of family businesses used dedicated bank loans to finance investments compared to less than a quarter of non-family owned companies (22%). Table 2 confirms that this deviation is statistically significant at the 1 percent level. Likewise worthy of note is the significant difference in the use of short-term overdrafts and revolving credits. Around 30 percent of family businesses used one of these forms of financing for investments while less than a fifth of non-family enterprises (18.3%) relied on overdrafts and revolving credits for investment projects. A similar gap can even be detected for more risky innovation projects (24% compared to 14%). As for bank loans, this gap is statistically significant at the 1 percent level. On the other hand family businesses use cash flow and government subsidies less often to finance investment projects.

Figure 2: Forms of financing used by family businesses and other enterprises, 2004 - 2006



Source: Mannheim Innovation Panel, 2007 survey, own calculations.

Table 2: Financing decisions for investment and innovation – family businesses and other enterprises

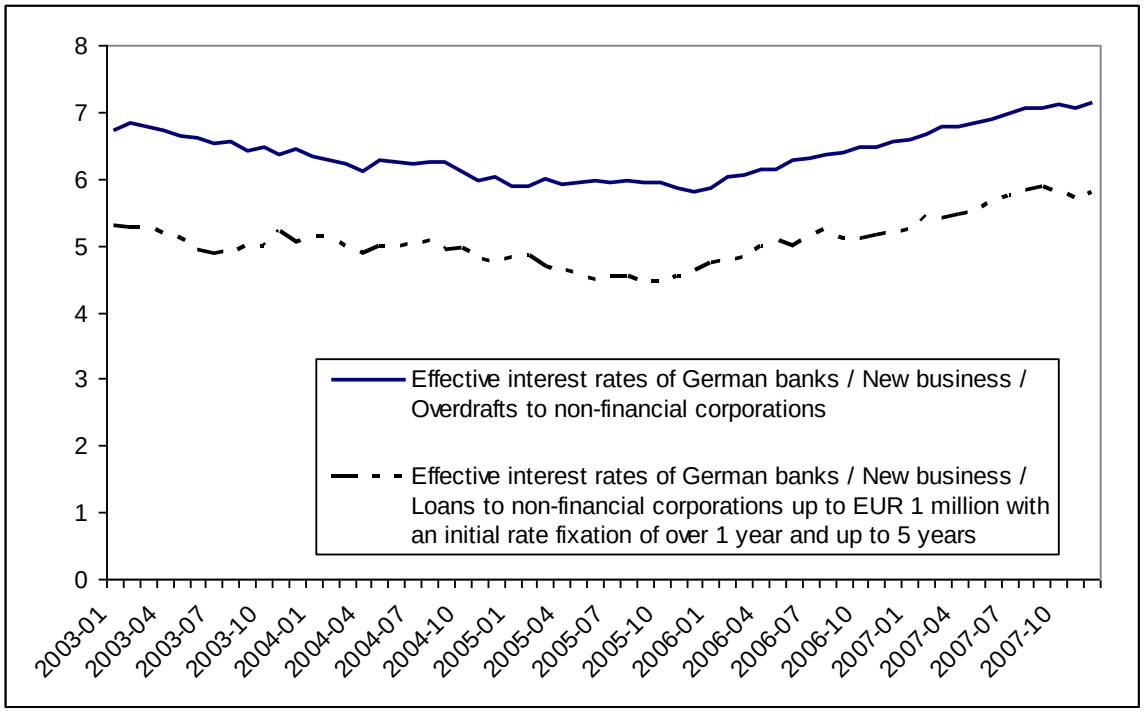
	Investments			Innovations		
	Other enter-prises	**Family busi-nesses**	**t-test**	**Other enter-prises**	**Family busi-nesses**	**t-test**
Cash flow	0.895	0.848	**0.000**	0.913	0.926	0.344
Equity increase	0.081	0.069	0.247	0.080	0.060	**0.090**
Shareholder's loans	0.123	0.153	**0.026**	0.098	0.123	**0.085**
Bonds and debentures	0.006	0.006	0.943	0.010	0.005	0.266
Overdrafts	0.183	0.297	**0.000**	0.143	0.239	**0.000**
Dedicated bank loans	0.222	0.357	**0.000**	0.087	0.143	**0.000**
Government-sponsored loans	0.102	0.128	**0.034**	0.068	0.090	**0.088**
Government subsidies	0.187	0.129	**0.000**	0.240	0.153	**0.000**
Other sources	0.014	0.023	**0.086**	0.020	0.010	0.114
Number of observations	1192	1414		809	957	

Notes: t-test reports the p-value of a two-tailed t-test on equal means in both groups (the variances are allowed to be unequal between both groups). The share of firms with a particular source of investment and innovation financing is based on total number of firms with investment and innovation activities within family and non-family enterprises, respectively.

These stylised facts which corroborate previous empirical evidence lead us to the question of how to explain these differences in financing behaviour. Demand-side arguments based on the pecking-order theory offer a plausible explanation for the greater use of long-term credit instead of external equity if internal sources are exhausted. The theory suggests that owner-managed enterprises are more averse than others to accepting the loss of control associated with external equity, which involves the capital providers being given a voice in business decisions.

Nevertheless, there are a range of possible causes and motives underlying the more frequent use of revolving credits and overdraft facilities for long-term investments and innovations, although these are essentially short-term instruments. The considerable flexibility of revolving credits and overdrafts is one plausible reason why they are used – at least to some extent – to finance investments and innovation. For example, short-term forms of credit may serve as a bridging loan while waiting for a longer-term financing option, with a better-suited payment schedule, to become available. However, the use of short-term lines of credit for long-term investments and innovation activities can also be interpreted as an indicator for financing problems. It can be argued that enterprises only choose these comparatively expensive sources of financing because more affordable options are simply not available. Figure 3 shows the difference between the effective rates of interest for a typical overdraft and a fixed interest loan over 1 to 5 years. The borrower in each case is assumed to be a non-financial corporation. In the period between 2004 and 2006, overdrafts were an average of 1.25 percentage points more expensive than dedicated fixed-interest loans with this period to maturity. In this context, the more frequent use of longer-term dedicated bank loans could be interpreted as an indicator that financing restrictions are more of a problem for family businesses. Since family businesses use dedicated bank loans more than non-family businesses for financing purposes, it is possible that family businesses have already used up more of their available borrowing capacity.

Figure 3: Comparison of debit interest rates



Source: Deutsche Bundesbank, ECB

3.3 Econometric analysis of financing choices

3.3.1 One-stage model

Econometric model and implementation

Notwithstanding, it is important not to read too much into the differences we see on a descriptive and aggregated level. As we noted in Section 3.1, the frequency of various industries within the sample is quite different in the two groups (family businesses and other businesses). It is necessary to ascertain whether the differences in the financing choices still remain when we take these structural differences and other enterprise characteristics into account. An appropriate way to achieve this aim is to use an econometric framework and to estimate probit models which identify the determinants of the use of each financial source. In the following econometric analysis we disregard bonds/debentures and other sources as they had an inferior standing in financing choices and turned out to be rare events in our sample.

The data set does not contain information about the amount of financing by sources (y_{hi}^{*}) but only whether the firm has used a specific source for financing innovation and investments or not. We thus assume the following econometric model:

$$y_{hi} = \begin{cases} 1 & \text{if} \quad y_{hi}^{*} = X_{hi}\beta_h + \varepsilon_{hi} > 0 \\ 0 & \text{if} \quad y_{hi}^{*} = X_{hi}\beta_h + \varepsilon_{hi} \le 0 \end{cases} \qquad \forall h = 1,\ldots 7; i = 1,\ldots N$$

y_{hi} indicates whether the enterprise *i* has decided to use instrument *h* for financing investments or innovations in the period 2004-2006, respectively. y_{hi} takes value one if y_{hi}^{*} is larger than zero.

The decision to use a specific financial source is explained by a set of explanatory variables summarised in the vector X. Table 10 in the Appendix provides more detailed definitions of all these explanatory variables and Table 11 depicts corresponding descriptive statistics. In addition to a dummy variable indicating whether the firm is family-owned (*family business*), we include an index measuring the firm's *creditworthiness* at the beginning of the observed period, i.e. in 2004. The indicator we shall use for this is the creditworthiness index provided by the business information service "Verband der Vereine Creditreform". The Creditreform creditworthiness index is a standardised score that can be used to judge the expected liquidity of an enterprise in the future. It combines the various data that Creditreform collects about each enterprise into a single three-digit value (between 100 and 600), which represents the estimated credit risk. The creditworthiness index is originally measured on a scale ranging from 100 (most creditworthy) to 600 (least creditworthy). The value reflects an enterprise's probability of default within a period of 12 to 24 months. The creditworthiness index incorporates data on the enterprise's development in the past, current orders, certain negative

signals (payment delays or defaults), total demand for credit etc. The index has been divided by -100 for our analysis, so that it ranges between 1 and 6 with 6 representing the highest creditworthiness. A positive coefficient therefore implies a positive effect of creditworthiness on the respective form of finance. In addition to family business status and creditworthiness, we account for various other factors that might influence firms' financing decisions. More specifically, we control for firm's profitability at the beginning of the observed period, measured by the *profit margin* in 2004. We further include *firm size* (number of employees in 2004), *firm age* (3 dummy variables whether the enterprise was less than 3, 4 to 8 or more than 8 years old in 2004), *legal form* of the enterprise (private company, public limited company or limited company) and an indicator variable whether the firm belongs to an enterprise *group*. All equations additionally contain dummy variables for the *industry* and *region* (*Eastern/Western Germany*) the enterprise belongs to.

Tax considerations might also affect financing decisions. Whereas all interest payments are deductable for income tax purposes, this is generally not the case for *local business income taxes* in Germany (in German: Gewerbesteuer). Half of the interest payments related to long-term debts have to be added to the earnings before income taxes and are thus subject to local business income taxes. Interest payments related to overdrafts and revolving credits, however, can be excluded from local business income taxes under rather mild circumstances.[4] Depending on the local multiplier for the business income tax rate, firms may differ in their incentive to opt for short term external finance. Based on firm addresses, we therefore collected data on local business income tax rates levied by the corresponding municipality.

The error term ε_{hi} captures all other unobserved explanatory variables. In a first step, we assume that the error terms ε_{hi} of each financing equation $h=1,\ldots,7$ are uncorrelated, that is we estimate single probit models. However, the decision for each of the alternative financing source might be affected by common unobservable factors such as firm specific interest rates. Estimating a set of single probit equations then provides consistent estimates, but a simultaneous estimation that takes into account the full covariance structure is in general more efficient. We therefore additionally estimate a 7-equation multivariate probit model.

Results

Table 3 and Table 4 depict estimation results for investment and innovation financing using single probit models. The econometric analysis provides convincing evidence that the differences in the use of financing forms persist, even when structural differences and other firm-specific characteristics are taken into account. Compared to other businesses, family enterprises are found to be 7.5 percentage points more likely to use revolving credit for investment projects, and 9.1 percentage points more likely to use dedicated bank loans for the

[4] The current account has to feature a positive balance on eight days a year.

same purpose. This implies that roughly two thirds of the observed differences in the unconditional means between family and non-family businesses (11.4 and 13.5 percentage points, see Figure 2) can be explained by family status and one third by the other observable explanatory variables. A similar effect is found when it comes to innovation projects, with a 6.3 percentage-point greater probability of using revolving credit, although the difference with dedicated bank loans is less pronounced, at 3.2 percentage points.

Creditworthiness has no significant effect on the choice of all financing alternatives: Looking at investment financing the coefficient for the creditworthiness indicator is significantly negative only for shareholder's loans and overdrafts. It is significantly positive on the other hand for internal finance from cash flow. These signs seem plausible: Higher creditworthiness should signal higher future cash flow, while low creditworthiness might be a reason for higher demand for shareholder's loans (i.e. shortage of other forms of external finance) and revolving/overdraft credit (restricted supply of dedicated bank loans). For innovation finance the picture is less clear: here we observe a significant negative coefficient for dedicated bank loans, but only a non-significant negative coefficient for overdraft credit.

For the control variables, too, the estimation results seem plausible. As an enterprise's profit margin increases, it will tend to make greater use of internal financing. Conversely, less use overall is made of overdrafts as the profit margin increases. The profit margin is found to have no significant effect on the use of dedicated bank loans for financing investments. However, regarding more risky innovation projects, an increase in profit margins and thus in internal liquidity also raises the likelihood of getting dedicated bank loans as (additional) source of finance. The legal form has noticeable and significant effects. In particular, private companies are found to make greater use than limited companies do of dedicated bank loans and overdrafts. On the other hand, they rely on cash flow and equity increases less frequently.

Surprisingly, local business income tax rates do not matter for financing decisions; in particular, they do not affect the decision to finance with short term revolving credits. One exception is the result that firms located in municipalities where they have to render a high business income tax rate are less likely to get government sponsored loans for investments (the effect is likewise negative but not significant for innovation projects).

The regressions for revolving credit and overdrafts show a significant negative coefficient for the (log) number of employees. This suggests that the use of revolving credit and overdrafts can be used as an indicator for financial difficulties, since smaller enterprises tend to have greater financing problems than larger enterprises – as previous empirical analyses of credit rationing have usually shown. However, it is also important to bear in mind that the influence of profitability and enterprises' age differences is already taken into account in the regression. This means that these effects are not reflected in the size variable.

Table 3: How family business status affects the chosen form of investment financing

	Dependent variable: Investments were financed by…						
	Cash flow	**Equity increase**	**Shareholder's loans**	**Overdrafts**	**Dedicated bank loans**	**Government-sponsored loans**	**Government subsidies**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family business	-0.030**	0.003	0.030**	0.075***	0.091***	-0.002	-0.042***
	(0.014)	(0.010)	(0.014)	(0.019)	(0.020)	(0.014)	(0.015)
Creditworthiness	0.026**	-0.016*	-0.025**	-0.027*	0.004	0.013	-0.009
	(0.011)	(0.009)	(0.012)	(0.016)	(0.018)	(0.013)	(0.013)
Control variables							
Firm size (log.)	0.016***	-0.006*	-0.016***	-0.011*	-0.001	0.002	0.034***
	(0.005)	(0.003)	(0.005)	(0.006)	(0.007)	(0.005)	(0.005)
Eastern Germany	-0.026*	0.016	-0.001	-0.011	0.077***	0.018	0.297***
	(0.014)	(0.011)	(0.014)	(0.019)	(0.021)	(0.014)	(0.020)
Group	0.022	0.015	0.047***	-0.023	-0.073***	-0.054***	-0.073***
	(0.015)	(0.012)	(0.016)	(0.020)	(0.021)	(0.015)	(0.015)
Local business income tax	0.007	-0.009	0.002	-0.021	-0.016	-0.023*	-0.010
	(0.012)	(0.010)	(0.013)	(0.017)	(0.018)	(0.013)	(0.012)
Legal form							
Reference group: Limited company (GmbH)							
Private company	-0.043**	-0.035***	-0.094***	0.062**	0.095***	0.026	0.015
	(0.021)	(0.010)	(0.014)	(0.029)	(0.032)	(0.021)	(0.022)
PLC ("AG")	-0.062*	0.105***	-0.007	0.010	0.054	0.062*	0.074**
	(0.035)	(0.031)	(0.029)	(0.038)	(0.044)	(0.034)	(0.037)
Firm age							
Reference group: >8 years							
0-3 years	-0.014	0.059**	0.054*	-0.014	-0.004	0.049*	0.002
	(0.027)	(0.023)	(0.029)	(0.034)	(0.035)	(0.029)	(0.025)
4-8 years	0.031**	0.020	0.024	-0.031	-0.013	0.009	0.017
	(0.014)	(0.013)	(0.017)	(0.021)	(0.024)	(0.016)	(0.017)
Profit margin							
Reference group: <0%							
>0-2 %	0.050	-0.012	-0.079*	-0.034	0.071	0.075**	-0.043
	(0.039)	(0.029)	(0.041)	(0.049)	(0.050)	(0.035)	(0.039)
>2-4%	0.063	-0.023	-0.083*	0.018	0.082	0.009	-0.103***
	(0.040)	(0.029)	(0.042)	(0.053)	(0.053)	(0.032)	(0.036)
>4-7%	0.046	-0.055**	-0.125***	-0.048	0.055	0.056	-0.038
	(0.042)	(0.027)	(0.040)	(0.051)	(0.054)	(0.035)	(0.041)
>7-10%	0.075*	-0.010	-0.108**	0.014	0.076	0.024	0.006
	(0.041)	(0.033)	(0.043)	(0.056)	(0.055)	(0.035)	(0.047)
>10-15%	0.116***	-0.027	-0.088*	-0.090*	-0.071	0.040	-0.026
	(0.039)	(0.033)	(0.046)	(0.055)	(0.052)	(0.039)	(0.048)
>15	0.065	-0.056*	-0.103**	-0.057	0.001	-0.025	-0.117***
	(0.048)	(0.029)	(0.049)	(0.061)	(0.065)	(0.035)	(0.038)
Not reported	0.059*	-0.015	-0.060*	-0.041	0.032	0.031	-0.036
	(0.034)	(0.024)	(0.036)	(0.041)	(0.041)	(0.025)	(0.034)
Goodness of fit							
Pseudo R2	0.084	0.064	0.064	0.051	0.097	0.048	0.205
McKelvey Zavoina R2	0.171	0.111	0.155	0.123	0.244	0.103	0.345
Count R2	0.870	0.925	0.861	0.756	0.726	0.879	0.848

Notes: Numbers reported are the marginal effects (at sample means) from probit estimations. Standard errors in parentheses are robust to heteroskedasticity. ***, ** and * indicate significance on a 1%, 5% and 10% level, respectively. Additional control variables (not reported): Industry dummies which are jointly significant in all regressions at the 1% level except in regression (2). Number of observations is 2606 (6 observations were dropped because one industry dummy perfectly explains the outcomes of these 6 observations.).

Table 4: How family business status affects the chosen form of financing for innovation

	Dependent variable: Innovations were financed by…						
	Cash flow	**Capital increase**	**Shareholder's loans**	**Overdrafts**	**Dedicated bank loan**	**Government-sponsored loans**	**Government subsidies**
	(1)	(2)	(3)	(5)	(6)	(7)	(8)
Family business	0.018	-0.002	0.035**	0.063***	0.032*	0.006	-0.099***
	(0.014)	(0.011)	(0.014)	(0.020)	(0.017)	(0.014)	(0.022)
Creditworthiness	0.016	-0.011	-0.024**	-0.017	-0.029**	0.016	-0.019
	(0.011)	(0.008)	(0.012)	(0.018)	(0.014)	(0.012)	(0.018)
Control variables							
Firm size (log.)	0.009**	-0.009***	-0.025***	-0.015**	0.003	0.004	0.019***
	(0.004)	(0.004)	(0.005)	(0.007)	(0.005)	(0.005)	(0.007)
Eastern Germany	0.002	0.017	-0.008	0.002	0.014	0.022	0.179***
	(0.014)	(0.012)	(0.015)	(0.021)	(0.018)	(0.015)	(0.024)
Group	0.037**	0.020	0.051***	0.005	-0.018	-0.025	-0.094***
	(0.015)	(0.012)	(0.016)	(0.022)	(0.018)	(0.015)	(0.022)
Local business income tax	-0.008	-0.003	0.024*	-0.024	-0.001	-0.012	0.004
	(0.012)	(0.010)	(0.013)	(0.018)	(0.016)	(0.012)	(0.019)
Legal form							
Reference group: Limited company (GmbH)							
Private company	0.001	-0.028**	-0.061***	0.085**	0.107***	0.034	0.060
	(0.022)	(0.013)	(0.017)	(0.042)	(0.040)	(0.028)	(0.043)
PLC ("AG")	-0.093**	0.112***	0.029	-0.007	0.072*	0.029	0.110**
	(0.039)	(0.033)	(0.032)	(0.037)	(0.039)	(0.029)	(0.045)
Firm age							
Reference group: >8 years							
0-3 years	0.005	0.058**	0.041	0.002	-0.013	0.004	0.011
	(0.024)	(0.025)	(0.028)	(0.036)	(0.029)	(0.024)	(0.037)
4-8 years	0.010	0.040***	0.028	-0.045**	-0.005	0.021	0.039
	(0.015)	(0.014)	(0.018)	(0.022)	(0.019)	(0.017)	(0.025)
Profit margin							
Reference group: <0%							
>0-2 %	0.020	-0.029	-0.121***	0.021	0.128***	0.031	-0.050
	(0.033)	(0.036)	(0.045)	(0.058)	(0.039)	(0.043)	(0.054)
>2-4%	-0.003	-0.032	-0.082*	-0.011	0.129***	-0.046	-0.087
	(0.037)	(0.037)	(0.049)	(0.058)	(0.041)	(0.036)	(0.054)
>4-7%	-0.035	-0.057*	-0.097**	-0.040	0.110***	0.021	-0.010
	(0.042)	(0.033)	(0.048)	(0.058)	(0.040)	(0.043)	(0.060)
>7-10%	0.030	-0.018	-0.063	0.047	0.059	-0.016	-0.059
	(0.036)	(0.039)	(0.054)	(0.066)	(0.036)	(0.040)	(0.059)
>10-15%	0.013	-0.050	-0.067	-0.076	0.073*	0.025	-0.001
	(0.041)	(0.037)	(0.054)	(0.060)	(0.042)	(0.048)	(0.067)
>15	0.004	-0.059*	-0.115**	-0.082	0.084	-0.053	-0.179***
	(0.045)	(0.034)	(0.051)	(0.064)	(0.052)	(0.041)	(0.048)
Not reported	0.008	-0.036	-0.081*	-0.049	0.064***	-0.024	-0.027
	(0.028)	(0.030)	(0.042)	(0.046)	(0.022)	(0.032)	(0.046)
Goodness of fit							
Pseudo R2	0.075	0.110	0.093	0.062	0.061	0.052	0.140
McKelvey Zavoina R2	0.126	0.187	0.210	0.167	0.120	0.097	0.262
Count R2	0.914	0.931	0.889	0.804	0.876	0.916	0.802

Note: see Table 3. Additional control variables (not reported): Industry dummies which are jointly significant at the 1% level (eqn. 4, 7), 5% level (eqn. 1, 3, 5) and 10% level (eqn. 2, 7). Number of observations: 1,766.

As already set forth, a simultaneous estimation that takes into account the interdependencies between the financing decisions by using the full covariance structure is in general more efficient. The simultaneous estimation relies on a log likelihood function that involves a 7-dimensional integral that does not have a closed form. It can be evaluated numerically through simulation techniques. We employ the Maximum Simulated Likelihood Method using the GHK simulator (Geweke 1989, Hajivassiliou and McFadden 1998, and Keane 1994; see also Train 2009) that is implemented in the user-written command cmp in Stata to estimate the multivariate probit model (see Roodman 2009).

Table 12 in the Appendix depicts the differences in marginal effects between the single probit and the 7-equation multivariate probit estimates for our two main variables of interest. As expected, we only observe slight differences in the estimated effects. The efficiency gains due to the multivariate probit estimations, however, seem to be rather small. All in all, the results are confirmed by these estimates. Table 13 additionally illustrates the estimated correlation coefficients. The table reveals significant correlations between most of the error terms. We find a significantly negative correlation between cash flow and all other sources of finance that is particularly strong for equity increase and dedicated bank loans and less so for overdrafts. On the other hand, strong correlations exist between the decision to use overdrafts and bank loans, bank and government loans as well as government subsidies and government loans. Though the significant correlations indicate that the equations should indeed be estimated simultaneously, we decided to stick to the single probit estimates since the differences in the estimated coefficients are rather small in our sample and the single probit estimates are much easier to estimate.

To investigate whether family businesses of different size (measured by the number of employees) deviate in their behaviour of using short and long term credits for financing, we carried out an additional estimation in which we allow the coefficient of family ownership to vary with firm size. More specifically, we use interaction terms between family ownership and four different size categories (5-49, 50-99, 100-499 and more than 500 employees).

Table 5 and Table 6 show that dedicated bank loans are used significantly more often by family businesses with more than 50 employees than by smaller firms with the same characteristics. Moving up the enterprise size categories, however, these differences become less pronounced and less significant.

Table 5: How family business status affects the chosen form of investment financing, by size category

	Dependent variable: Investments were financed by…						
	Cash flow	**Capital increase**	**Shareholder's credits**	**Overdrafts**	**Dedicated bank loan**	**Government-sponsored loan**	**Government subsidies**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family business with 5-49 employees	-0.034*	-0.023**	0.018	0.038	0.050*	-0.014	-0.047***
	(0.019)	(0.011)	(0.019)	(0.025)	(0.027)	(0.018)	(0.016)
Family business with 50-99 employees	-0.015	0.004	-0.002	0.110***	0.175***	0.015	-0.015
	(0.025)	(0.019)	(0.025)	(0.036)	(0.038)	(0.025)	(0.021)
Family business with 100-499 employees	-0.049**	0.039**	0.063***	0.093***	0.128***	0.009	-0.034**
	(0.025)	(0.019)	(0.024)	(0.031)	(0.033)	(0.020)	(0.017)
Family business with 500 employees or more	-0.006	0.048	0.070	0.207***	0.096*	-0.006	-0.046*
	(0.041)	(0.039)	(0.046)	(0.057)	(0.056)	(0.032)	(0.025)

Notes: Numbers reported are the marginal effects (at sample means) from probit estimations. Standard errors in parentheses are robust to heteroskedasticity. ***, ** and * indicate significance on a 1%, 5% and 10% level, respectively. Additional control variables (not reported): all control variables of Table 3.

Table 6: How family business status affects the chosen form of innovation financing, by size category

	Dependent variable: Innovations were financed by…						
	Cash flow	**Capital increase**	**Shareholder's credits**	**Overdrafts**	**Dedicated bank loan**	**Government-sponsored loan**	**Government subsidies**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family business with 5-49 employees	0.022	-0.008	0.035	0.038	0.012	-0.008	-0.093***
	(0.015)	(0.013)	(0.021)	(0.029)	(0.024)	(0.019)	(0.022)
Family business with 50-99 employees	0.017	-0.014	0.019	0.077*	0.071*	0.010	-0.067**
	(0.019)	(0.017)	(0.029)	(0.040)	(0.036)	(0.025)	(0.027)
Family business with 100-499 employees	0.001	0.003	0.060**	0.066**	0.036	0.011	-0.083***
	(0.019)	(0.016)	(0.026)	(0.032)	(0.026)	(0.019)	(0.022)
Family business with 500 employees or more	0.035	0.026	0.019	0.174***	0.052	0.034	-0.087***
	(0.023)	(0.034)	(0.042)	(0.058)	(0.044)	(0.035)	(0.032)

Notes: Numbers reported are the marginal effects (at sample means) from probit estimations. Standard errors in parentheses are robust to heteroskedasticity. ***, ** and * indicate significance on a 1%, 5% and 10% level, respectively. Additional control variables (not reported): all control variables of Table 4.

A different picture emerges for revolving credit and overdrafts. For these forms of financing, the clearest differences can be seen among larger enterprises. While no significant differences can be observed for enterprises with fewer than 50 employees, large family businesses (more than 500 employees) are more likely to use revolving credit than comparable non-family businesses. The probability that family businesses finance investments via these forms of credit is 20.7 percentage points higher than for other enterprises. For innovation financing the difference is 17.4 percentage points. These results suggest that particular restrictions faced by family businesses trying to access alternative sources of financing do not provide a plausible explanation as to why family businesses make greater use of short-term credit. There seems to be no reason why differences in the restrictions between family and non-family businesses would increase with their size.

3.3.2 Two-stage model

In the preceding sections we have treated creditworthiness as an exogenous variable. However, creditworthiness itself might be influenced by the choice of financing alternatives. Therefore, we employ an instrumental variable approach in a second step to explain creditworthiness and choice of financing alternatives simultaneously.

Creditworthiness might be explained by family status and the other control variables already applied in the preceding section. To achieve identification, we use as instruments past labour productivity, past export intensity and past capital intensity.[5] Table 7 shows the determinants of the creditworthiness index in a first stage regression. It turns out that – when all the enterprises are considered (columns 1 and 3) – family businesses emerge as *more creditworthy* than non-family businesses in almost all specifications of the model. If we differentiate between different size classes of family enterprises, however, it becomes evident that only the coefficients for the medium sized and large family driven companies (more than 100 employees) are significantly positive. That is, these family businesses are likely to get better financing conditions due a better credit rating.

With respect to the variables serving as potential identifying restrictions, we find that higher labour productivity indeed significantly improves firms' creditworthiness, while we surprisingly find no effects of capital intensity and export intensity. The other controls show that more profitable and larger firms have a better credit rating and that firms form Eastern Germany are regarded as less creditworthy. Also we can observe that firm younger than 8 years are assessed as less creditworthy.

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[5] We also experimented with past profitability (profit margin in 2003). However, profitability is characterized by high persistence and thus high correlation over time. As a consequence, it turned out that when adding the dummy variables capturing the profit margin of year 2003, they were not jointly significant. We therefore refrain from using past profitability as instrument.

In a simultaneous estimation of both the equation for the financing choice and the equation for the creditworthiness, our prior findings for the family business status are confirmed: we find nearly the same coefficients for all financing forms as in the simple model with exogenous creditworthiness. In particular, family firms tend to use short term overdraft credit with a probability that is around 8 percent higher than non family firms to finance their investment and innovation expenditures. The coefficients are highly significant for investment as well as for innovation finance.

For the other forms of finance we find – as expected – a greater role of dedicated bank loans and shareholder's loans for family driven companies. We also see in this multivariate framework that family firms tend to use government subsidies with a lower probability than others.

Wald tests on the exogeneity of creditworthiness support the IV estimation strategy since the null hypothesis of exogeneity is indeed rejected in most of the models, in particular in the cash flow and overdrafts equation.

Table 7: How family business status affects creditworthiness (IV 1-stage regression results)

	Dependent variable: creditworthiness of year 2004			
Financing decision	**Investment financing decision**		**Innovation financing decision**	
Specification	(1)	(2)	(3)	(4)
Family business	0.060***	-	0.087***	-
	(0.022)		(0.025)	
Family business with 5-49 employees	-	-0.013	-	0.017
		(0.028)		(0.034)
Family business with 50-99 employees	-	0.047	-	0.033
		(0.037)		(0.43)
Family business with 100-499 employees	-	0.143***	-	0.163***
		(0.031)		(0.034)
Family business with 500 employees or more	-	0.143***	-	0.156***
Family business with 5-49 employees		(0.051)		(0.054)
Control variables				
Firm size (log.)	0.091***	0.073***	0.088***	0.073***
	(0.007)	(0.008)	(0.008)	(0.009)
Eastern Germany	-0.038*	-0.036	0.007	0.010
	(0.022)	(0.022)	(0.027)	(0.027)
Group	-0.014	-0.015	-0.020	-0.023
	(0.024)	(0.024)	(0.027)	(0.027)
Local business income tax	0.027	0.030	0.027	0.001
	(0.020)	(0.020)	(0.020)	(0.023)
Legal form				
Private company	0.109***	0.118***	0.161***	0.169***
	(0.032)	(0.032)	(0.045)	(0.045)
PLC ("AG")	0.180***	0.196***	0.175***	0.188***
	(0.040)	(0.040)	(0.043)	(0.043)
Firm age				
0-3 years	-0.133***	-0.135***	-0.093**	-0.098**
	(0.039)	(0.038)	(0.044)	(0.044)
4-8 years	-0.109***	-0.111***	-0.116***	-0.119***
	(0.025)	(0.025)	(0.029)	(0.029)
Profit margin in 2004				
>0-2 %	0.119**	0.117**	0.191***	0.191***
	(0.055)	(0.055)	(0.066)	(0.066)
>2-4%	0.153***	0.145**	0.176***	0.170**
	(0.057)	(0.057)	(0.068)	(0.068)
>4-7%	0.131**	0.133**	0.229***	0.232***
	(0.058)	(0.058)	(0.067)	(0.069)
>7-10%	0.197***	0.198***	0.260***	0.263***
	(0.060)	(0.060)	(0.072)	(0.072)
>10-15%	0.170***	0.177***	0.236***	0.242***
	(0.064)	(0.064)	(0.075)	(0.075)
>15	0.127*	0.133*	0.196**	0.204**
	(0.070)	(0.070)	(0.084)	(0.084)
Not reported	0.098**	0.098**	0.174***	0.175***
	(0.045)	(0.045)	(0.054)	(0.054)
Constant	4.241***	4.305***	4.315***	4.369***
	(0.106)	(0.107)	(0.128)	(0.130)
Identifying restrictions				
Export intensity	0.047	0.029	0.063	0.048
	(0.049)	(0.049)	(0.053)	(0.053)
Labour productivity	0.102***	0.103***	0.104***	0.104***
	(0.014)	(0.014)	(0.017)	(0.017)
Capital intensity	0.024	0.024	0.040	0.042
	(0.024)	(0.024)	(0.052)	(0.052)
Goodness of fit				
R2	0.225	0.231	0.246	0.253
F-Test	19.65***	18.81***	14.85***	14.22***
N	2606	2606	1766	1766

Notes: Reported are first stage regression results of ***, ** and * indicate significance at a 1%, 5% and 10% level, respectively. Industry dummies are included in the regression (not reported).

Table 8: Impact of family business status and creditworthiness on investment financing decisions: IV results

	Dependent variable: Investments were financed by…						
	Cash flow	**Equity increase**	**Shareholder's loans**	**Overdrafts**	**Dedicated bank loans**	**Government-sponsored loans**	**Government subsidies**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family business	-0.044***	0.006	0.038**	0.085***	0.098***	0.001	-0.038**
	(0.016)	(0.012)	(0.016)	(0.019)	(0.020)	(0.015)	(0.016)
Creditworthiness	0.278**	-0.072	-0.182	-0.390***	-0.292**	-0.054	-0.097
	(0.109)	(0.085)	(0.113)	(0.091)	(0.116)	(0.089)	(0.091)
Control variables							
Enterprise size (log.)	-0.006	-0.001	-0.002	0.024**	0.027**	0.009	0.042***
	(0.011)	(0.008)	(0.011)	(0.011)	(0.012)	(0.010)	(0.010)
Eastern Germany	-0.008	0.012	-0.012	-0.037*	0.049**	0.013	0.287***
	(0.017)	(0.012)	(0.017)	(0.019)	(0.024)	(0.015)	(0.022)
Group	0.017	0.017	0.051***	-0.012	-0.061***	-0.053***	-0.072***
	(0.017)	(0.012)	(0.017)	(0.020)	(0.022)	(0.015)	(0.015)
Local business income tax	-0.000	-0.008	0.008	-0.008	-0.005	-0.022*	-0.008
	(0.014)	(0.010)	(0.014)	(0.018)	(0.018)	(0.013)	(0.013)
Legal form							
Reference group: Limited company (GmbH)							
Private company	-0.070***	-0.034***	-0.090***	0.091***	0.118***	0.033	0.025
	(0.026)	(0.011)	(0.017)	(0.030)	(0.032)	(0.023)	(0.025)
PLC ("AG")	-0.124**	0.127***	0.025	0.084*	0.112**	0.081*	0.098**
	(0.048)	(0.046)	(0.043)	(0.046)	(0.049)	(0.044)	(0.047)
Firm age							
Reference group: >8 years							
0-3 years	0.026	0.048*	0.026	-0.067**	-0.048	0.037	-0.011
	(0.030)	(0.026)	(0.032)	(0.033)	(0.038)	(0.031)	(0.028)
4-8 years	0.059***	0.013	0.007	-0.067***	-0.044*	0.002	0.007
	(0.020)	(0.015)	(0.022)	(0.022)	(0.025)	(0.018)	(0.019)
Wald test on exogeneity of creditworthiness							
(p-value)	0.008***	0.472	0.135	0.000***	0.015**	0.430	0.308
Goodness of fit							
Count R2	85.303	92.018	85.495	73.024	70.223	87.890	83.693

Note: see Table 3. Additional control variables (not reported): profit margin and industry dummies. Number of observations: 2606.

Table 9: Impact of family business status and creditworthiness on innovation financing decisions: IV results

	Dependent variable: Investments were financed by…						
	Cash flow	**Equity increase**	**Shareholder's loans**	**Overdrafts**	**Dedicated bank loans**	**Government-sponsored loans**	**Government subsidies**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Family business	-0.004	0.010	0.052**	0.081***	0.038**	0.006	-0.086***
	(0.021)	(0.018)	(0.020)	(0.022)	(0.019)	(0.016)	(0.025)
Creditworthiness	0.330**	-0.197	-0.226*	-0.306**	-0.111	0.019	-0.161
	(0.132)	(0.131)	(0.132)	(0.128)	(0.113)	(0.092)	(0.134)
Control variables							
Enterprise size (log.)	-0.018	0.005	-0.009	0.012	0.010	0.004	0.033**
	(0.012)	(0.012)	(0.012)	(0.014)	(0.012)	(0.010)	(0.014)
Eastern Germany	0.010	0.015	-0.014	-0.007	0.012	0.022	0.173***
	(0.018)	(0.015)	(0.017)	(0.022)	(0.019)	(0.015)	(0.026)
Group	0.039*	0.026	0.056***	0.006	-0.017	-0.025	-0.091***
	(0.020)	(0.017)	(0.018)	(0.022)	(0.019)	(0.015)	(0.023)
Local business income tax	-0.009	-0.003	0.027*	-0.022	-0.001	-0.012	0.004
	(0.017)	(0.013)	(0.016)	(0.019)	(0.016)	(0.012)	(0.019)
Legal form							
Reference group: Limited company (GmbH)							
Private company	-0.051	-0.023	-0.053**	0.128***	0.127***	0.034	0.087*
	(0.041)	(0.025)	(0.026)	(0.046)	(0.049)	(0.034)	(0.052)
PLC ("AG")	-0.171***	0.183***	0.078	0.050	0.095*	0.028	0.143***
	(0.057)	(0.055)	(0.049)	(0.050)	(0.053)	(0.035)	(0.055)
Firm age							
Reference group: >8 years							
0-3 years	0.042	0.041	0.015	-0.034	-0.022	0.005	-0.005
	(0.033)	(0.027)	(0.032)	(0.037)	(0.031)	(0.027)	(0.040)
4-8 years	0.048**	0.022	0.004	-0.076***	-0.015	0.021	0.021
	(0.024)	(0.019)	(0.025)	(0.026)	(0.023)	(0.021)	(0.030)
Wald test on exogeneity of creditworthiness							
(p-value)	0.002***	0.043**	0.065*	0.019**	0.446	0.972	0.272
Goodness of fit							
Count R2	88.375	91.903	87.599	78.652	87.076	91.602	79.571

Note: see Table 4. Additional control variables (not reported): profit margin and industry dummies. Number of observations: 1766.

4 Summary

Comparative analyses of the financing behaviour of family businesses and similar non-family businesses have shown that the former use dedicated bank loans, and particularly revolving credit or overdrafts, significantly more frequently than the latter. These short-term forms of credit are generally much more expensive than dedicated bank loans. Furthermore, using such instruments to finance investments and innovation goes against the principle of matching maturities of financing and the funded investments. This raises the question of why family enterprises use these means of financing more extensively.

One possible reason is that family enterprises face considerable restrictions on the credit market, forcing them to rely more on expensive sources of financing. Although the available data do not allow us to test this hypothesis directly, our empirical results indirectly lead us to believe that it is unlikely to hold. Firstly, categorising family firms by size reveals that the differences in the two groups' use of revolving credit and overdrafts are more pronounced among larger enterprises than among smaller enterprises.

Secondly, our two stage model clearly shows that creditworthiness for family driven companies tends to be higher than for non family driven companies. Furthermore, this result is mainly driven by larger family firms that exhibit better credit ratings. This goes against the notion that greater use of short-term sources of credit by family enterprises is an indicator for financing restrictions. As such, our results comply with arguments extrapolated from principal-agent theory, which suggest that family businesses may be better borrowers than non-family businesses because they have fewer control problems.

As a result, we can propose two possible explanations for our observation that family enterprises make greater use of overdrafts and revolving credit:

– *Because family businesses are more creditworthy, they are offered lines of credit at advantageous rates. These forms of credit therefore do not represent as much of a cost disadvantage as they would for other, less creditworthy businesses.* It is not possible to verify this explanation due to a lack of enterprise-specific data on the cost of the credit lines granted. However, given that there is, on average, a large difference between overdraft interest rates and interest on dedicated bank loans, and bearing in mind that it is costly for banks to provide such lines of credit, it seems unlikely that the observed differences in financing behaviour can be explained purely on the basis of interest rate effects. Moreover, higher creditworthiness of family businesses would lower interest rates for all maturities and not necessarily lead to a reduction in the relative costs of short term credit.

– *Family businesses are particularly concerned about staying independent from external capital providers. For this reason, they prefer the less complicated option of an overdraft or revolving credit to a loan dedicated to a specific investment.* There is some additional

evidence in the Mannheim Innovation Panel to suggest that this might be the relevant explanation in this case. One of the survey questions asked enterprises whether they would consider using additional external sources of funding (at a low interest rate) for investments and innovation projects. Family businesses tended to reply more positively than other comparable businesses. A subsequent question asked what would discourage enterprises from accepting this extra credit. Here, in particular large family businesses stated that a high level of dependence from a lender would be a reason to decide against borrowing.

Overall, our results seem to confirm the assumption that independence from external capital providers is of central importance for family businesses. Based on the frequency of use of various sources of finance, our data provide clear evidence that family businesses are prepared to accept higher financing costs in order to preserve their financial independence and flexibility. Surprisingly, this particularly applies to family businesses that are larger and generally more creditworthy.

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4 Appendix

Table 10: Variable definition

Variable	Definition
Dependent variables	
Sources of funding for investments	9 dummy variables taking the value 1 if the firm has used (1) cash-flow; (2) equity increase, admission of a partner, new equity holding through other firms; (3) shareholder's loan, dormant equity holding, profit participating certificate; (4) issues of bonds or obligations; (5) overdrafts; (6) dedicated bank loans; (7) government loan (in Germany e.g. issued through KfW or Landesbanken); (8) Public subsidies; (9) other sources to fund *investments* during the period 2004-2006.
Sources of funding for innovations	9 dummy variables taking the value 1 if the firm has used (1) cash-flow; (2) equity increase, admission of a partner, new equity holding through other firms; (3) shareholder's loan, dormant equity holding, profit participating certificate; (4) issues of bonds or obligations; (5) overdrafts; (6) dedicated bank loans; (7) government loan (in Germany e.g. issued through KfW or Landesbanken); (8) Public subsidies; (9) other sources to fund *innovations* during the period 2004-2006.
Explanatory variables	
Credit rating	Credit rating index in 2004, ranging between 100 (worst credit creditworthiness) and 600 (highest creditworthiness), divided by 100 to get appropriately scaled coefficients.
Family firm	Dummy variable taking the value 1 if the firm is family-owned, i.e. members of one family own at least 50 % of the company.
thereof:	
Family businesses with 5-49 employees	Dummy variable taking the value 1 if the firm is family-owned and has 5-49 employees.
Family businesses with 50-99 employees	Dummy variable taking the value 1 if the firm is family-owned and has 50-99 employees.
Family businesses with 100-499 employees	Dummy variable taking the value 1 if the firm is family-owned and has 100-499 employees.
Family businesses with 500 or more employees	Dummy variable taking the value 1 if the firm is family-owned and has 500 or more employees.
Firm size	Number of employees (head counts) in year 2004, in log.
Eastern Germany	Dummy variable taking the value 1 if the firm's headquarter is located in Eastern Germany (including Berlin).
Group	Dummy variable taking the value 1 if the firm belongs to a national or international enterprise group. A group consists of two or more legally defined enterprises under common ownership.
Local business income tax	Local multiplier for business income tax
Legal form	
Private company	Dummy variable taking the value 1 if the firm is a private partnership in 2004 (in German: Personengesellschaft, Gesellschaft bürgerlichen Rechts, offene Handelsgesellschaft (OHG) or Kommanditgesellschaft (KG)).

PLC	Dummy variable taking the value 1 if the firm is a public limited company in 2004 (in German: Aktiengesellschaft)
Limited company	Dummy variable taking the value 1 if the firm is a private limited liability company in 2004 (in German: GmbH or GmbH & Co. KG; reference group in estimation)
Firm age	
0-3 years	Dummy variable equalling 1 if the firm is less than four years old at the beginning of 2004
4-8 years	Dummy variable equalling 1 if the firm is between 4 and 8 years old at the beginning of 2004
>8 years	Dummy variable equalling 1 if the firm is older than years at the beginning of 2004 (reference group in estimation)
Profit margin	Profit margin is defined as profit-turnover ratio (before taxes) in 2004. The profit margin is originally measured as an ordinal variable. Thus, we have 8 dummy variables taking the value 1 if the profit margin is less than 0 % (reference group in estimation) / between 0 and 2 % / between 2 and 4 % / between 4 and 7 % / between 7 and 10% / between 10 and 15 % / more than 15 % / not reported.
Labour productivity	Sales per employee in 2004
Capital intensity	Stock of tangible fixed assets per employee in 2004.

Table 11: Descriptive statistics of explanatory variables

	Unit	Mean	Standard deviation	Min	Max
Creditworthiness	Index [1-6]	4.789	0.547	1	6
Family business	0/1	0.543	0.498	0	1
thereof:					
belonging to manufacturing	0/1	0.376	0.485	0	1
belonging to the service sector	0/1	0.166	0.372	0	1
with 5-49 employees	0/1	0.255	0.436	0	1
with 50-99 employees	0/1	0.088	0.283	0	1
with 100-499 employees	0/1	0.153	0.360	0	1
with 500 or more employees	0/1	0.046	0.210	0	1
Firm size[a)]	No. of empl.	710.314	9119.357	1	>60.000[b)]
Eastern Germany	0/1	0.325	0.468	0	1
Group	0/1	0.381	0.486	0	1
Local business income tax	%	3.710	0.499	2.325	4.900
Legal form					
Private company	0/1	0.113	0.316	0	1
PLC	0/1	0.073	0.259	0	1
Limited company	0/1	0.797	0.402	0	1
Firm age					
0-3 years	0/1	0.069	0.254	0	1
4-8 years	0/1	0.190	0.392	0	1
>8 years	0/1	0.733	0.443	0	1
Profit margin (2004)					
<0%	0/1	0.106	0.307	0	1
>0-2 %	0/1	0.163	0.369	0	1
>2-4%	0/1	0.163	0.369	0	1
>4-7%	0/1	0.151	0.358	0	1
>7-10%	0/1	0.114	0.317	0	1
>10-15%	0/1	0.093	0.291	0	1
>15	0/1	0.073	0.260	0	1
Not reported	0/1	0.138	0.345	0	1
Export intensity	%	0.165	0.238	0	1
Labour productivity [a)]	Mill €	0.183	0.233	0.009	1.651
Capital intensity	%	0.207	0.558	0	14.626

Notes: Number of observations: 2606. [a)] Variable values shown are not log-transformed. For estimation purposes, however, a log-transformation of these variables is used to take the skewness of the distribution into account. [b)] Not reported for confidentiality reasons.

Table 12: Efficiency gain: Single probit estimations versus multivariate probit estimations

	Dependent variable: Investments were financed by…						
	Cash flow	**Equity increase**	**Shareholder's loans**	**Overdrafts**	**Dedicated bank loans**	**Government-sponsored loans**	**Government subsidies**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				Single probit estimates			
Family business	-0.030**	0.003	0.030**	0.075***	0.091***	-0.002	-0.042***
	(0.014)	(0.010)	(0.014)	(0.019)	(0.020)	(0.014)	(0.015)
Creditworthiness	0.026**	-0.016*	-0.025**	-0.027*	0.004	0.013	-0.009
	(0.011)	(0.009)	(0.012)	(0.016)	(0.018)	(0.013)	(0.013)
				Multivariate probit estimates			
Family business	-0.032**	0.003	0.032**	0.076***	0.090***	-0.001	-0.041***
	(0.014)	(0.011)	(0.014)	(0.019)	(0.020)	(0.014)	(0.015)
Creditworthiness	0.025**	-0.015*	-0.025**	-0.027*	0.003	0.011	-0.007
	(0.011)	(0.009)	(0.012)	(0.017)	(0.018)	(0.013)	(0.013)

	Dependent variable: Innovations were financed by…						
	Cash flow	**Equity increase**	**Shareholder's loans**	**Overdrafts**	**Dedicated bank loans**	**Government-sponsored loans**	**Government subsidies**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				Single probit estimates			
Family business	0.018	-0.002	0.035**	0.063***	0.032*	0.006	-0.099***
	(0.014)	(0.011)	(0.014)	(0.020)	(0.017)	(0.014)	(0.022)
Creditworthiness	0.016	-0.011	-0.024**	-0.017	-0.029**	0.016	-0.019
	(0.011)	(0.008)	(0.012)	(0.018)	(0.014)	(0.012)	(0.018)
				Multivariate probit estimates			
Family business	0.018	-0.003	0.034**	0.063***	0.030*	0.003	-0.098***
	(0.014)	(0.011)	(0.014)	(0.020)	(0.017)	(0.014)	(0.021)
Creditworthiness	0.016	-0.012	-0.024*	-0.017	-0.030**	0.013	-0.018
	(0.011)	(0.010)	(0.013)	(0.019)	(0.015)	(0.015)	(0.019)

Notes: Numbers shown are marginal effects (at sample means) from probit estimations. Standard errors in parentheses are robust to heteroskedasticity. ***, ** and * indicate significance on a 1%, 5% and 10% level, respectively. Additional control variables as in Table 3 were included in the regression but not reported here. Multivariate probit models are estimated by using the method of maximum simulated likelihood with 2*N^0.5 draws. The regression was performed using stata command cmp (see Roodman, 2009).

Table 13: Correlation coefficients between equations in MV probit

		Dependent variable: Investments were financed by…					
		Equity increase	**Shareholder's loans**	**Overdrafts**	**Dedicated bank loans**	**Government-sponsored loans**	**Government subsidies**
		(2)	(3)	(4)	(5)	(6)	(7)
Cash flow	(1)	-0.306 (0.052)	-0.158 (0.048)	-0.124 (0.043)	-0.396 (0.037)	-0.267 (0.047)	-0.224 (0.049)
Equity increase	(2)		0.411 (0.047)	0.199 (0.049)	0.110 (0.050)	0.248 (0.056)	0.129 (0.060)
Shareholder's loans	(3)			0.296 (0.039)	0.020 (0.042)	0.023 (0.053)	0.028 (0.054)
Overdrafts	(4)				0.286 (0.034)	0.165 (0.044)	-0.006 (0.047)
Dedicated bank loans	(5)					0.415 (0.037)	0.289 (0.041)
Government-sponsored loans	(6)						0.461 (0.043)

		Dependent variable: Innovations were financed by…					
		Equity increase	**Shareholder's loans**	**Overdrafts**	**Dedicated bank loans**	**Government-sponsored loans**	**Government subsidies**
		(2)	(3)	(4)	(5)	(6)	(7)
Cash flow	(1)	-0.455 (0.064)	-0.226 (0.067)	-0.195 (0.061)	-0.446 (0.058)	-0.322 (0.068)	-0.328 (0.059)
Equity increase	(2)		0.566 (0.054)	0.281 (0.063)	0.180 (0.074)	0.323 (0.074)	0.160 (0.067)
Shareholder's loans	(3)			0.386 (0.050)	0.153 (0.064)	0.296 (0.067)	0.045 (0.064)
Overdrafts	(4)				0.379 (0.049)	0.252 (0.059)	0.003 (0.055)
Dedicated bank loans	(5)					0.475 (0.055)	0.211 (0.059)
Government-sponsored loans	(6)						0.369 (0.056)