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Working Paper

How Does Owners' Exposure to Idiosyncratic Risk Influence the Capital Structure of Private Companies?

ZEW Discussion Papers, No. 05-14 [rev.]

Provided in cooperation with:

Zentrum für Europäische Wirtschaftsforschung (ZEW)

Suggested citation: Müller, Elisabeth (2006) : How Does Owners' Exposure to Idiosyncratic Risk Influence the Capital Structure of Private Companies?, ZEW Discussion Papers, No. 05-14 [rev.], <http://hdl.handle.net/10419/24698>

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Structure of Private Companies?**

Elisabeth Müller

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Zentrum für Europäische
Wirtschaftsforschung GmbH

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Non-technical Summary

Private companies typically have only a limited number of owners, each with a large ownership share. This concentrated ownership helps to overcome control problems caused by the opaqueness of business operations. However, it also exposes owners to idiosyncratic risk, since they often invest a high share of their personal net worth in a single company. Their personal portfolios are therefore not well diversified. If owners require a compensation for their risk exposure, they have to demand higher returns on their equity investment, which is equivalent to higher costs of equity capital.

We test two hypotheses about the consequences of owners' lack of diversification. First, since poor diversification increases the cost of equity capital, we expect a higher demand for bank financing from owners who have invested a higher share of their personal wealth in the company. This would be the consequence if owners tried to equalize the marginal cost of equity and debt capital. Second, we hypothesize that a higher exposure to idiosyncratic risk leads to higher leverage. This is the central point of interest of this paper: a higher cost of equity capital for less diversified owners should lead to a more extensive use of bank financing.

These hypotheses are tested with data from a survey of private companies from the US. As hypothesized, we find that less diversified owners confronted with higher costs of equity capital evince a higher demand for bank loans. The probability that a company made an application for a new loan in the three years preceding the survey increases with lack of diversification. Furthermore, being less diversified has a positive and large effect on leverage. Owners' exposure to idiosyncratic risk is therefore an important determinant of the capital structure of private companies.

How Does Owners' Exposure to Idiosyncratic Risk Influence the Capital Structure of Private Companies?

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First version: February 2005

This version: August 2006

Abstract

This paper identifies the entrepreneur's exposure to idiosyncratic risk as an important determinant of the demand for loans and the capital structure. The analysis is based on a sample of small and medium-sized private companies from the United States. The exposure to idiosyncratic risk is approximated by the share of personal net worth invested in one company (SNWI). Exposure to idiosyncratic risk increases the cost of equity capital, since higher equity returns are required as compensation. This therefore makes bank financing more attractive. We find that SNWI increases both the demand for new bank loans and leverage substantially.

JEL classification: G32, G30

Keywords: capital structure, exposure to idiosyncratic risk, private companies

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Acknowledgements: I would like to thank Ron Anderson, Georg Licht, Steve Nickell and Tereza Tykvova for helpful discussions. Comments from the participants of the EARIE Meeting 2005 in Porto, Portugal and the German Finance Association Meeting 2005 in Augsburg, Germany are acknowledged. This paper received the Young Economist Award at the EARIE Meeting 2005.

1 Introduction

Private companies typically have only a limited number of owners, each with a large ownership share. This concentrated ownership helps to overcome control problems caused by the opaqueness of business operations. However, it also exposes owners to idiosyncratic risk, since they often invest a high share of their personal net worth in a single company (Moskowitz and Vissing-Jørgensen (2002)). Their personal portfolios are therefore not well diversified. If owners require a compensation for their risk exposure, they have to demand higher returns on their equity investment, which is equivalent to higher costs of equity capital. External finance from banks is therefore more attractive for owners with a concentrated investment.

The main point of this paper is to investigate how owners' exposure to idiosyncratic risk influences demand for new bank loans and capital structure. Tests concerning capital structure have so far neglected influences that stem from the specific ownership structure of private companies. We test two hypotheses about the consequences of owners' lack of diversification. First, since poor diversification increases the cost of equity capital, we expect a higher demand for bank financing from owners who have invested a higher share of their personal wealth in the company. This would be the consequence if owners tried to equalize the marginal cost of equity and debt capital. Second, we hypothesize that a higher exposure to idiosyncratic risk leads to higher leverage. This is the central point of interest of this paper: a higher cost of equity capital for less diversified owners should lead to a more extensive use of bank financing.

The empirical analysis is based on the Survey of Small Business Finances (SSBF) from the year 1998. The survey is well suited for our analysis since it provides information on

the financial structure of private companies and the personal wealth of their owners. The survey includes companies with up to 500 employees, i.e. companies for which concentrated ownership is typical. The exposure to idiosyncratic risk can be empirically approximated by the share of the owners' net worth which is invested in one company. Since we are confronted with reverse causality, we use an instrumental variables approach with age of the owner and sex of the owner as instruments for the share of net worth invested.

Our hypotheses are confirmed by the data. Less diversified owners confronted with higher costs of equity capital evince a higher demand for bank loans. The probability that a company made an application for a new loan in the three years preceding the survey increases with lack of diversification. Furthermore, being less diversified has a positive and large effect on leverage. A one standard deviation increase in the share of net worth invested leads, *ceteris paribus*, to an increase in leverage of 16.2 percentage points. This is substantial, especially when considering that average leverage in the sample is 33.3%. Owners' exposure to idiosyncratic risk is therefore an important determinant of the capital structure of private companies.

The empirical results have important implications for our understanding of the financing of private companies. We find that owners who are more exposed to the idiosyncratic risk of their companies use bank financing more extensively. It allows them to reduce their own investment if they keep company size constant or, alternatively, to grow their companies without increasing their risk exposure further. Since exposure to idiosyncratic risk increases the cost of equity capital and accordingly the required returns of an investment project, the availability of bank loans enables the profitable realization of some investment projects that would not have been realized otherwise. Bank financing decreases the returns that are

required for the realization of an investment project.

The remaining part of this paper is structured as follows. Section 2 presents the theoretical background and develops the hypotheses; Section 3 discusses the related literature; Section 4 explains the data set and defines the variables; Section 5 shows the empirical results; and Section 6 concludes.

2 Theory and Hypotheses

There are some marked differences between private and public companies. Whereas public companies can have many owners, the ownership of private companies is typically concentrated among few owners with high ownership shares ¹. There are no liquid markets for the shares, because they cannot be traded on a stock exchange. This organizational form is well adapted to the opaqueness and high costs of information acquisition typical of small companies: it gives owner-managers a high incentive to exert effort and non-managing owners incentives to monitor the managers (see, for example, Jensen and Meckling (1976) and Grossman and Hart (1980)). Furthermore, with a high ownership share owners can signal the quality of the company and reduce the cost of obtaining outside equity Leland and Pyle (1977). However, this organizational form exposes the owners to the idiosyncratic risk of the company, an exposure which is quite substantial. Moskowitz and Vissing-Jørgensen (2002) document that, on average, owners of private companies have invested 41% of their net worth in private equity, of which 82% is invested in just one actively managed company.

Interestingly, consequences of exposure to idiosyncratic risk have been primarily analyzed

¹The private companies in the Survey of Small Business Finances 1998 have an average ownership share of the largest owner of 79.6% and a median value of 100%.

in the context of listed companies. Hired managers are exposed to idiosyncratic risk in order to give them incentives to exert effort. Risk-averse managers attach less value to compensation contracts based on options or restricted stock, because such contracts expose them to idiosyncratic risk (Lambert et al. (1991) and Kahl et al. (2003)). Exposure to idiosyncratic risk has also an influence on the investment decisions of managers. Parrino et al. (2005) show that despite potential wealth transfers from debtholders, managers compensated with equity prefer safe projects to risky ones. Heaney and Holmen (2002) use data on the exposure to idiosyncratic risk for Swedish shareholders of listed companies to approximate the value they attach to control.

The main motivating paper for our hypotheses is the study by Kerins et al. (2004). The authors find that exposure to idiosyncratic risk has a large influence on the cost of equity capital of private companies. The analysis is based on the capital asset pricing model and uses data on newly public companies to simulate the cost of equity capital for an entrepreneur who is able to invest in his or her own company and the stock market. The relative weights of the investment in the company and the stock market determine the total risk of the portfolio. The same total risk can be achieved by borrowing money and investing it along with one's own resources in the stock market. The expected return of this comparison portfolio is the opportunity cost of equity capital for an entrepreneur, which is calculated for different assumed levels of investment in the private company. Underlying the calculation is the presumption that rational owners will demand compensation for their exposure to idiosyncratic risk. The model predicts an increase of 9.8 percentage points in the opportunity cost of equity capital for a small company if the share of net worth invested in the company changes from 15% to 25%. This is a substantial risk premium considering that

annual returns on public equity, as calculated by Moskowitz and Vissing-Jørgensen (2002), were 11.0%, 14.6% and 24.7% for the periods 1990–92, 1993–95 and 1996–98 respectively. The returns on public equity can be used as a benchmark for the cost of equity capital if investors can diversify, since the returns do not include a compensation for exposure to idiosyncratic risk.

The considerable influence of idiosyncratic risk on the cost of equity capital should lead to large adjustments in the financing of private companies, which is the topic of this paper. A lack of diversification makes bank loans more attractive. We derive the first hypothesis accordingly:

Hypothesis 1: Owners with a higher exposure to idiosyncratic risk have a higher demand for new bank loans.

Owners who maximize company value will try to equalize the marginal cost of equity and debt capital. From the increased cost of equity capital we would expect a sizable positive effect of lack of diversification on leverage.

Hypothesis 2: Owners with a higher exposure to idiosyncratic risk choose higher leverage.

What remains to be discussed is the role of retained earnings in the financing decision of an owner of a private company. The cost of capital for retained earnings increases also in the lack of diversification, since retained earnings, as well as the original equity investment, are part of the owner's wealth that is invested in the company. Retained earnings of the past years are included in the book value of equity and therefore captured in our analysis.

The pecking order theory (Myers and Majluf (1984)) is complementary to our hypotheses.

This theory predicts that companies prefer to finance with retained earnings, riskless debt and new equity in decreasing order, because the costs of asymmetric information are smallest for retained earnings and largest for new equity. Our hypotheses do not negate the role of asymmetric information. They investigate the role of an additional component of the cost of equity capital, namely the costs due to exposure to idiosyncratic risk.

3 Related Literature

The literature has come forward with several explanations for the capital structure of companies. Most prominent are the trade-off theory and the pecking order theory, which have been mainly tested for listed companies (see, for example, Titman and Wessels (1988), Rajan and Zingales (1995) and de Jong (2002)). There are also studies for private companies, but influences from their concentrated ownership structure have so far not been taken into consideration. Chittenden et al. (1996) investigate influences of company characteristics such as size, age and the ability to provide company assets as collateral. Berger and Udell (1998) study how the capital structure changes in the financial growth cycle. Giannetti (2003) focuses on differences among countries, aiming to identify the importance of legal rules and financial development.

Another strand of the literature studies aspects of owners' financial situation besides their lack of diversification. Cressy (1996) analyzes data on bank overdrafts of UK startup companies, focusing on loan conditions and company survival. He finds that banks agree to higher overdraft limits if more collateral, measured as house equity, is available. Furthermore, survival probability increases if an entrepreneur used personal funds in starting up. Cavalluzzo and Wolken (2005) test whether personal wealth affects the availability of bank loans. The

authors find that greater private wealth increases the probability of loan approval, since personal assets can be used as collateral for business loans. Avery et al. (1998) show that personal commitments are important for firms seeking certain types of loans.

4 Data

4.1 Data Source

The Survey of Small Business Finances 1998 (SSBF), which is conducted by the Board of Governors of the Federal Reserve System, Washington, DC, is used for the empirical analysis. The survey provides information on private companies with up to 500 employees from non-agricultural and non-financial sectors in the United States. The survey was conducted in 1999 and targeted business that were in operation as of December, 1998. The reference year for the information is generally year-end 1998. Companies were selected for the survey by a two-stage stratified random sample design. The survey provides information on basic firm and owner characteristics, sources of financial services, experience with the most recent loan application, information on the private wealth and credit history of the largest owner, balance sheet information as well as income and expenses information.

This survey is well suited for our study because it provides information on the financial situation of private companies *and* on the personal wealth of their owners. The investigation is restricted to the wave from 1998, since previous waves do not include information on personal wealth.²

Only companies with positive equity values are included in the analysis, because it is

²Detailed information on the 1998 SSBF survey is available in Bitler et al. (2001).

otherwise not possible to derive the share of the owners' net worth that is invested.³ In addition, companies are required to have positive assets and owners are required to have positive private wealth. 2,617 companies are eventually included in the analysis.

4.2 Variables

The main concern of this paper is the influence of poor diversification on the financial structure of private companies. We measure lack of diversification as the ratio of the largest owner's equity investment to the net worth of the largest owner, i.e., as share of net worth invested (SNWI). **Net worth** is defined as the book value of the equity investment plus the equity value of the primary residence plus the sum of all assets minus the sum of all other liabilities. 90% of the companies in the SSBF are managed by an owner and not by a hired employee. For the owner-managed companies it is likely that the largest owner takes part in the management. The level of diversification of the largest owner's investments will therefore be important for financial decisions.

Two measures of diversification are calculated. The first measure, denoted by SNWI A, considers only the value of the equity investment.

$$\text{SNWI A} = \frac{(\textit{ownership share} * \textit{book value of equity})}{\textit{net worth}}$$

The second measure, SNWI B, takes into account that the equity investment may not be the only way in which the owners' assets are tied to the company. Owners can also give

³21% of the companies have negative or zero equity values. This is a common finding for small and medium-sized enterprises. For example, KfW Research (2006) finds that almost 20% of German SMEs have negative equity values.

personal guarantees for company loans, use private assets as collateral and extend loans to the company. The survey includes information on the extent of these activities for all of the owners combined. This information is therefore multiplied by the ownership share of the largest owner to produce an approximation of that owner's personal involvement.

SNWI B =

$$\frac{\textit{ownership share} * (\textit{book value of equity} + \textit{guarantees} + \textit{collateral} + \textit{loans})}{\textit{net worth}}$$

Share of net worth invested is an approximation of the risk exposure of owners due to their equity investment in a private company. Owners are exposed to several types of risk. For example, there is a concentration of income from one source and the possibility that the value of the ownership share could fall. These risks certainly increase with SNWI. However, in order to completely describe the risk exposure of owners, it would be necessary to have information on all of the assets in the owners' portfolios and on the correlation structure of their returns. For instance, if an owner has invested in the stock market and the returns on his or her private company exhibit a negative correlation with the returns on the stock market, his or her risk exposure is lower compared to a situation in which returns are positively correlated. Since the survey has no information from which the correlation of returns could be deduced, we must rely on size of equity investment relative to net worth as a proxy for risk exposure. The credit rating is used as a control in the regressions to capture part of the overall risk level of the company. In addition, we include industry dummies to control for return characteristics of private equity that are identical within an industry.

It can be argued that SNWI underestimates the risk exposure of the owner. The measure is based on the book value of equity, because the survey does not provide the market value.

This reduces the variation in SNWI, since underestimation is more pronounced for successful companies. However, there is still a large cross-sectional variation in SNWI. The book value is also more similar to the original investment of the owner, which may be of relevance for the owners' perception of risk.

The data set under analysis also includes companies whose owners have unlimited liability, i.e. they are liable for company obligations with all their private assets. The question arises whether our measure of lack of diversification is meaningful in this situation. The bankruptcy law in the USA stipulates that private assets below exemption limits can be kept by owners in a bankruptcy proceeding. In practise, owners often have no assets exceeding these limits and therefore only lose their equity investment in a bankruptcy (Berkowitz and White (2004, p. 71) and Fan and White (2003, p. 544)). It follows that SNWI is a valid proxy for risk exposure for owners with unlimited liability as well.⁴

As a first dependent variable we use the demand for new loans. The variable **loan application** is equal to 1 if an application for a *new* loan was filed in the three years preceding the survey and 0 otherwise. Loan *renewals* are not counted. Most companies applied for a loan at a commercial bank (71%). Finance companies were used by 11%,

⁴If a private company goes bankrupt in the USA with obligations still outstanding, an owner with unlimited liability can declare personal bankruptcy in order to dispose of the company debt. It is possible to give up all assets that are not exempt, but to keep future earnings (chapter 7) or to keep all assets and agree to a repayment plan to repay part of the debts (chapter 13). The exemption rules differ between states. The median value for home equity is USD 15,000 and the median value for other personal assets is USD 7,000 (Berkowitz and White (2004)). If owners agree to keep up payments on loans that are secured on their home or private car, they do not lose these assets. Furthermore, if the retirement savings are not excluded from the bankruptcy proceeding in the first place, they can be kept if the amount is reasonably necessary to support oneself upon retirement (Jackson (2001)).

savings banks and credit unions by 7%. 11% used other sources. **Leverage** is the second dependent variable. It is defined as the sum of a company's total liabilities divided by its total assets (sum of equity and liabilities). Total liabilities are the sum of long-term liabilities, such as loans, mortgages, notes or bonds, and short-term liabilities due within one year, such as accounts payable, accrued expenses, taxes payable, prepayments, deposits and advances from customers. Leverage includes loans that are made by owners to their companies and the outstanding amount on company credit cards. The use of personal credit cards for company expenses is not included.⁵

The regressions include controls for many company and owner characteristics. We control for **company size**, measured by number of employees, and **company age**, defined as the number of years since the company was founded or acquired. **Ownership share** is defined as the share of equity owned by the largest owner. **Dummies for legal form** differentiate between sole proprietorships, partnerships, S- and C-corporations.⁶ All regressions include **industry dummies** defined at the two-digit SIC level. **Regional dummies** differentiate between nine regions. A further dummy differentiates between **urban and rural location**.

The **education level** of the largest owner is captured by dummies for high school graduate and college/postgraduate degree, with no high school degree being the base category. The entrepreneurial work **experience** is measured as number of years owning or managing a company. Dummies for the **ethnicity** of the owner cover Hispanic, Asian and African-

⁵Average leverage increases by 2 percentage points if personal credit cards are included in the definition. We obtain identical regression results with this modification.

⁶C- and S-corporations are both characterized by limited liability. C-corporations have to pay corporation tax on profits that are paid out to shareholders, whereas the profits of S-corporations are only charged with the personal income tax rate of their owners.

American ownership with White as base category.

We also include control variables to capture the financial standing of the company. First, the **credit rating** by Dun and Bradstreet classifies companies in five categories. The rating reflects the likelihood of payment delinquency during the next 12 months. Second, we use dummies for the **credit history of the company and the owner**. They cover whether the firm or its principal owner declared bankruptcy within the past seven years, whether the owner has been delinquent on personal obligations for 60 or more days within the past three years, whether the firm has been delinquent on business obligations for 60 or more days within the past three years, and whether any judgements have been rendered against the principal owner within the past three years. The variable **length** gives the length of the relationship with the company's main financial institution in months.⁷

4.3 Summary Statistics

Descriptive statistics for all of the variables can be found in Table 1. The measures SNWI A and SNWI B document a considerable lack of diversification. SNWI A has an average of 25.3%. By additionally considering guarantees, collateral and loans, the average value of SNWI B increases by six percentage points.

The SSBF data cover small to medium-sized companies. The average number of employees is 28.3 with a substantially lower median value of 5. 26% of the companies applied for a loan in the three years preceding the survey. The average level of leverage stands at 33%. As is typical for private companies, the ownership structure is concentrated with an average

⁷1% of the highest values are replaced with the value of the 99th percentile (480 months) in order to reduce the influence of extreme values.

Table 1: Descriptive Statistics

Variable	Mean	Median	Stdev.	Min	Max
<i>Company characteristics</i>					
Number of employees	28.3	5	58.1	1	482
Company age (in years)	15.3	12	12.4	1	104
Dummy loan application	0.263	0	0.440	0	1
Leverage (in %)	33.3	27.3	31.0	0	99.8
Length banking relationship (in months)	99.8	60	97.4	1	480
<i>Owner characteristics</i>					
Net worth (in million US-\$)	1.538	0.448	4.412	0.001	116
SNWI A (in %)	25.3	17.9	24.1	0.004	98.9
SNWI B (in %)	31.3	22.3	29.0	0.014	100
Ownership share largest owner (in %)	79.6	100	27.8	1	100
Owner age (in years)	51.2	51	11.3	21	95
Dummy female owner	0.206	0	0.404	0	1

Note: Descriptive statistics refer to the sample information without weighting. The displayed statistics reflect the variation in the sample, but are not representative of the US economy.

ownership share of the largest owner of 79.6%. Even the median company has only one owner. As Table 2 shows, the industry spectrum of the survey covers almost the whole US economy.

The SSBF data has a complex sample design. The sample is stratified according to size, region and urban versus rural area. In addition, companies with Hispanic, Asian and African-American majority ownership and large companies are oversampled. We use unweighted regressions with controls for the variables used for stratification and oversampling. This approach was also chosen by Bitler et al. (2005).

Table 2: Industry Distribution

Industry	No. of companies	% of companies
SIC 1 – Mining, construction	262	10.0
SIC 2 – Manufacturing	125	4.8
SIC 3 – Manufacturing	177	6.8
SIC 4 – Transp., communication, utilities	97	3.7
SIC 5 – Retail trade	731	27.9
SIC 6 – Real estate	152	5.8
SIC 7 – Services	592	22.6
SIC 8 – Services	481	18.4
Total	2617	100

Note: Descriptive statistics refer to the sample information without weighting. The displayed statistics reflect the variation in the sample, but are not representative of the US economy. Industry dummies at the 2-digit level are included in the regression analysis.

5 Empirical Results

5.1 Endogeneity of Regressors

In the empirical analysis we need to be concerned with potential endogeneity of our main variable of interest, share of net worth invested (SNWI). First of all, there is the problem of reverse causality. If owners demand loans (and get the application granted), they have access to financial resources that allow them to limit their equity investment. Hence, demand for loans may have a negative influence on SNWI. There is also a reverse causality problem with respect to leverage. Reverse causality introduces a negative relationship between leverage and SNWI, since the accumulated use of bank loans again allows a reduction in equity finance. The negative influence of the reverse causality effect on SNWI makes it more difficult to

find evidence in favour of our hypotheses. The ownership share of a firm's largest owner can also be influenced by the demand for bank loans and by leverage. If bank financing is not available and a firm's original owner has too few resources to meet the total investment required, it may be necessary to take on an additional owner.

Second, we need to be wary of measurement error in company and owner related variables. Most of the small companies included in the SSBF are not required by law to draw up a balance sheet. Therefore, the measurement of the assets and liabilities of these companies may be imprecise; there may be some error in the measurement of leverage. Information on the net worth of the principal owner is provided in three categories: the value of the equity investment, the value of home equity and the value of other nonfirm assets. There could also be measurement error in the wealth information.⁸

Third, omitted variables may bias the coefficient of SNWI. Controls for company risk are important, since risk can influence both the owner's invested share of personal wealth and leverage. Bitler et al. (2005) find a negative correlation between firm risk and ownership share.⁹ Owners are only willing to take on a high ownership share if they consider the risk to be manageable. In an extreme case, this could result in a negative correlation between SNWI and exposure to risk. Risk is also an important factor for the bank's decision whether

⁸Browning et al. (2003) consider problems that may arise when questions about aggregate values are asked in surveys. They discuss the usefulness of total expenditure questions as opposed to asking for expenditure in different categories. First, rounding can happen, i.e. values may be noisy. However, even with rounding, the total expenditure questions still contain valuable information. Second, it is possible that total expenditure is underestimated, if only one question about the total is asked.

⁹Bitler et al. (2005) measure firm risk as the absolute value of the residual of a regression of the profit-to-equity ratio on firm characteristics.

to extend a loan. Companies with higher risk will find it more difficult to obtain loans, i.e. they will have lower leverage. The influence of risk could then lead to a spurious positive correlation between leverage and SNWI. We control for risk with the credit rating of the company and with the credit history of both company and owner. Other company characteristics included, such as size, age and industry, also help to control for risk. Nevertheless, the controls may not capture company risk perfectly.

To deal with the above-mentioned problems of endogeneity we use specific owner characteristics as instruments of SNWI. The first instrument is age of the largest owner measured in years. Heaton and Lucas (2000) show that investment in private equity changes with age; this instrument should thus be related to SNWI. For age to be a valid instrument, it is important that we control for other variables in the second stage regression. First, we control for the education level and the experience of the owner, since they are related to age and it is to be expected that better educated and more experienced owners will find it easier to obtain bank loans. By using education and experience as explicit controls, we use only the part of SNWI that can be explained by age, net of experience and education. Second, we control for company age. Within 10 years, 80% of companies exit the market (Dunn et al. (1988)). It is therefore likely that older owners run more successful companies. Owners of successful companies may have more outside wealth and therefore lower SNWI. Also, according to the pecking order theory, it can be expected that successful companies finance more with retained earnings. Survivorship bias may therefore lead to a positive spurious relationship between SNWI and demand for bank financing through the instrument owner age, if we do not control for the age of the company.

A further instrument is the sex of the owner. The dummy ‘female owner’ takes the value 1

for female owners and the value 0 for male owners. It has to be acknowledged that there may be differences in demand for bank loans or capital structure in a univariate analysis of male and female owned companies resulting from company characteristics that differ between male and female owners. For example, the SSBF data show that the companies of male owners are on average larger than the companies of female owners. However, there is no reason to expect that male and female owners differ in their financing strategies after detailed company and owner characteristics are controlled for. In the second stage regression we therefore control for, among other things, company size and industry as well as education, experience and credit history of the owner.

Table 3 shows the first-stage regression results. From columns (1) and (2) it can be seen

Table 3: First-Stage Regression Results

Dep. variable:	SNWI A	SNWI B
	(1)	(2)
Owner age	-0.341*** (0.055)	-0.406*** (0.064)
Dummy female owner	-3.679*** (1.174)	-4.238*** (1.352)
Number of observations	2617	2617
Joint significance of excluded instruments, $F(2, 2545)$	24.40***	25.18***
Shea's partial R squared	0.019	0.020
R squared	0.179	0.228

Note: *, **, *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively. Robust standard errors are in parentheses. The regressions also include controls for company size and age, dummies for industry at the 2-digit level, dummies for legal form, region, urban/rural area and credit history. Controls for the credit rating of the company, experience, education and ethnicity of the owner are also included.

that owner age has a significant negative influence on SNWI. Older owners have had more time to build up wealth outside the company by saving their income. This income can be either from owning a company or wage income from employment. The dummy for female owners shows that women invest a smaller share of their personal wealth in one company. A possible explanation for the higher investment shares among men would be if owning or managing a company has a higher importance for them, for example, if they are under more pressure to earn a living.¹⁰

5.2 Demand for Bank Loans

Lack of diversification sharply increases the cost of equity capital because it exposes owners to idiosyncratic risk for which they may require compensation. Less diversified owners can therefore be expected to express a higher demand for bank loans as an alternative source of financing. This is the content of Hypothesis 1, which we test in this subsection. Bank loans allow owners to reduce their financial exposure to the company or to grow the company without increasing their exposure.

The information for our dependent variable, the incidence of loan applications, spans the time period of the three years preceding the survey, i.e. of 1996–1998, whereas lack of diversification and the other regressors are measured at the end of fiscal year 1998. There is a potential endogeneity problem in that the left hand side variable is measured before the right hand side variables.¹¹ However, there is not much time-variation but a lot of cross-sectional

¹⁰Bitler et al. (2005) use similar instruments for ownership for data from the Survey of Consumer Finances, namely age, age squared and dummies for type of company acquisition.

¹¹Cavalluzzo and Wolken (2005) face the same situation in their analysis of loan turndowns and discrimination also conducted with the SSBF data.

variation in the right hand side variables. Our key variable SNWI covers investment in the company in relation to the overall wealth, which is likely to be quite time-invariant, since overall wealth does not fluctuate much from one year to the next. Furthermore, ownership shares typically change little over time. To deal with this endogeneity problem, we use the time-invariant instruments sex of the owner and type of company acquisition. Owner age is measured at the time of the survey, but here the variation due to the timing of the loan application is negligible compared to the overall variance of this variable.

Table 4 presents probit regressions on demand for bank loans. The OLS specification in column (1) shows a higher demand for bank loans for owners with higher values of SNWI, but the result is affected by reverse causality. If owners decide, for whatever reason, not to use bank loans as a means of financing their company, they must rely more heavily on their own resources; this increases SNWI. The results also show that larger and younger companies exhibit a higher demand for new loans.

In the regressions in columns (2) to (6) we use instruments to control for reverse causality. The basic specification in column (2) supports Hypothesis 1; SNWI increases the probability of loan applications. Owners who are less diversified approach banks more often in order to obtain additional funds. Specifically, a one standard deviation increase in SNWI A leads, *ceteris paribus*, to an increase of 30.2 percentage points in the probability of making a loan application. The influence of poor diversification is therefore quite substantial, especially considering that the probability of applying for a new loan is only 26.3%. The IV estimate is substantially larger than the OLS estimate, although an upward bias from reverse causality is expected for OLS. We therefore conclude that the OLS estimate was affected by a bias towards zero from measurement error. The IV approach corrects for this bias, as long as the

Table 4: Demand for New Loans – Marginal Effects of Probit Estimations

Dep. variable	Loan application					
	(1)	(2)	(3)	(4)	(5)	(6)
OLS	IV	IV	IV	IV	IV	IV
	all companies	all companies	all companies	all companies	limited liability	one owner
SNWI A	0.141*** (0.037)	1.256*** (0.165)	1.113*** (0.253)	1.090*** (0.139)	1.259*** (0.276)	1.302*** (0.173)
SNWI B						
Ownership share			1.500* (0.847)			
Company size	0.001*** (0.000)	-0.001** (0.000)	0.001 (0.001)	-0.001*** (0.000)	-0.001 (0.000)	-0.001 (0.000)
Company age	-0.004*** (0.001)	-0.003*** (0.001)	-0.002 (0.001)	-0.002* (0.001)	-0.003*** (0.001)	-0.001 (0.001)
Number of observations	2617	2617	2617	2617	1406	1560
Log Pseudo Likelihood	-1385.8	-1099.5	-1375.1	-1500.4	-682.9	-509.0

Note: *, **, *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively. Robust standard errors of the marginal effects are in parentheses. The dependent variable 'loan application' equals 1 if an application for a new loan was filed in the three years preceding the survey. SNWI and ownership share are instrumented in the IV specifications. SNWI and ownership share are expressed as ratios. The regressions also include dummies for industry at the 2-digit level, dummies for legal form, region, urban/rural area and credit history. Controls for the credit rating of the company, experience, education and ethnicity of the owner are also included.

instruments are not related to the error.

The remaining specifications are intended as a robustness check. In column (3) we additionally control for the ownership share of the largest owner. The coefficient of this variable is positive at the 10% significance level. Owners who choose a high ownership share to have control over their companies may need more bank financing for their investment opportunities.¹² In column (4) we employ our second measure of diversification, SNWI B. Here the results suggest as well that lack of diversification increases demand for bank loans.

Next, we investigate whether results change, if only companies with limited liability (S- and C-corporations) are included in the regressions. As already mentioned, owners are, in practice, unlikely to lose more money than they have invested, even with unlimited liability. However, it is still of interest to report results for companies with limited liability separately, since there may be differences in the way owners perceive risk. When we restrict our analysis to companies with limited liability, we still find that lack of diversification increases loan demand.

In companies with more than one owner, the exposure to idiosyncratic risk and therefore the cost of equity to the owner can differ between owners. In order to remove the influence of other owners, we investigate our hypotheses separately for companies with just one owner. However, we think that the focus on the largest owner makes sense in most cases, since the largest owner will be less diversified than other owners, if their external wealth is the same. It is therefore likely that we captured the owner with the highest exposure to idiosyncratic

¹²For the specifications with ownership share in Table 4 and Table 5 we additionally use dummies for the type of the company acquisition - the basis category is founded with dummies for purchased and inherited respectively - as instruments, since the informational content of our two standard instruments is not sufficient here.

risk in the previous regressions. The results for companies with just one owner are shown in column (6). As before, we find a significant influence of lack of diversification on the demand for loans.

Overall, we find robust evidence for the hypothesis that a higher exposure to idiosyncratic risk leads to a higher demand for bank financing.

5.3 Influence on Leverage

Table 5 displays the effect of poor diversification on leverage. In column (1) we present the results of the OLS specification. The negative sign of SNWI is due to non-standard measurement error. Liabilities are directly or indirectly included in the dependent variable and in SNWI. Liabilities constitute the numerator of the dependent variable. SNWI has equity times ownership share in its numerator with equity calculated as the difference between total assets and liabilities. If there is measurement error in liabilities, this will introduce a negative relationship between leverage and SNWI. In order to control both for measurement error and for reverse causality, we use an instrumental variables approach in the remaining specifications.

In column (2) we find a positive and significant coefficient of SNWI. A more severe lack of diversification therefore leads to higher leverage, after controlling for endogeneity. The influence of poor diversification on the equilibrium value of leverage is quite large. A one standard deviation increase in SNWI leads, *ceteris paribus*, to an increase in leverage of 18.0 percentage points. This is indeed substantial, especially when considering that the average value of leverage in the sample is 33.3%. The empirical evidence clearly confirms Hypothesis 2: less diversified owners choose higher leverage for their companies. The additional controls

Table 5: Influence on Leverage

Dep. variable	Leverage					
	(1)	(2)	(3)	(4)	(5)	(6)
OLS	all companies	all companies	all companies	all companies	all companies	all companies
	IV	IV	IV	IV	IV	IV
	all companies	all companies	all companies	all companies	limited liability	one owner
SNWI A	-0.196*** (0.023)	0.749*** (0.220)	0.590*** (0.217)	0.636*** (0.171)	0.744* (0.410)	0.758*** (0.228)
SNWI B						
Ownership share			0.669 (0.730)			
Company size	0.092*** (0.111)	-0.001 (0.027)	0.061 (0.072)	-0.014 (0.026)	-0.012 (0.047)	0.021 (0.044)
Company age	-0.221*** (0.059)	-0.187*** (0.072)	-0.100 (0.122)	-0.140** (0.068)	-0.156* (0.088)	-0.025 (0.122)
Length	0.015 (0.015)	0.010 (0.014)	0.019 (0.024)	0.011 (0.013)	0.020 (0.019)	0.036* (0.021)
Length squared	-0.000 (0.000)	-0.000** (0.000)	-0.000* (0.000)	-0.000** (0.000)	-0.000 (0.000)	-0.000*** (0.000)
Number of observations	2617	2617	2617	2617	1406	1560
Overidentification test, χ^2 (dof, p-value)		0.97 (1, 0.32)	1.75 (2, 0.42)	1.24 (1, 0.26)	2.00 (1, 0.16)	0.09 (1, 0.77)

Note: *, **, *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively. Robust standard errors are in parentheses. SNWI and ownership share are instrumented in the IV specifications. The regressions also include dummies for industry at the 2-digit level, dummies for legal form, region, urban/rural area and credit history. Controls for the credit rating of the company, experience, education and ethnicity of the owner are also included.

show an insignificant influence of size on leverage and a significant negative influence of age. As companies grow older they often use accumulated profits to pay down debt and to increase their equity base.

In addition to the regressors already employed in the demand equation, we control for the length of the relationship with the company's main financial institution, since it was shown that an established banking relationship can help with the quantity of available credit (see, for example, Petersen and Rajan (1994)).¹³ Without a relationship control, the instrument owner age may be directly related to leverage, since this instrument can be correlated with the length of the banking relationship. The length of the relationship with the main financial institution has a quadratic influence on leverage with a maximum at about 11 years. Since we have more instruments than endogenous variables, we can test the statistical validity of the instruments with overidentifying restrictions. As reported in the table, the instruments pass this test for all specifications.

In the next two columns we show robustness checks with all observations. In column (3) we additionally control for the ownership share of the largest owner. Ownership share has a positive but insignificant influence on leverage. The insignificance of the coefficient may be due to the relative weakness of the instruments. In column (4) we use SNWI B as an alternative measure for the level of diversification. The regressions confirm the result of our base specification.

As in the previous subsection, we also investigate the robustness of the results with subsamples of companies with limited liability and of companies with only one owner. The

¹³We do not use this regressor in the demand equation. For companies who applied for a loan we could use the length of the relationship with the institution where they applied; for companies who did not apply for a loan, however, there is no meaningful equivalent.

regressions in columns (5) and (6) show that the results remain unchanged by the restrictions on the included companies.

Strebulaev (2004) cautions that in the presence of adjustment costs, cross-sectional relationships between leverage and other variables determined by empirical analysis may differ from the relationships expected if variables are at their target level. The argument is illustrated with the help of the trade-off theory, which postulates a positive relationship between leverage and profitability since interest paid can be deducted from profits when it comes to the calculation of taxes. Even if the trade-off theory is valid, we may still observe a negative relationship between leverage and profitability if profits are used to pay down loans and leverage is adjusted infrequently. In our case, both leverage and SNWI are likely affected by adjustment costs. Higher profits will lead to lower leverage and, to a small degree, to lower values of SNWI, if profits are partially used to reduce debts and partially paid out to the owners. This could introduce a positive relationship between the variables. However, this influence of profitability is removed from our analysis through the use of instruments which are unrelated to profitability.

Overall, our empirical analysis finds that lack of diversification leads to higher leverage. The empirical results have important implications for our understanding of the capital structure of private companies. We find that entrepreneurs who are more exposed to the idiosyncratic risk of their companies use bank financing more extensively. Bank financing allows them to grow their companies without increasing their risk exposure further through additional equity investment. Alternatively, entrepreneurs can use bank financing to reduce their own investment. Since exposure to idiosyncratic risk increases the cost of equity capital and, accordingly, the required returns of an investment project, this also means that the

availability of bank loans makes the realization of some investment projects profitable that would not have been carried out if no such loans were available.

6 Conclusion

The financing of private companies relies to a large extent on the personal resources of their owners. Equity investments often amount to a substantial share of owners' total net worth, which exposes them to the idiosyncratic risk of their companies. Since this risk exposure increases the cost of equity capital substantially, it should have an important influence on the capital structure of private companies. If owners try to equalize the marginal costs of equity and debt financing, companies led by owners who have a higher share of net worth invested should have a higher demand for bank loans and should display higher values for leverage. These are the core hypotheses tested in this paper.

Using survey data of private companies in the US, we find that lack of diversification increases demand for loans, measured as the probability of making a loan application, as well as leverage. This paper identifies owners' risk exposure as a statistically and economically important influence on the capital structure of private companies.

In future research it would be of interest to test whether the effect of exposure to idiosyncratic risk on leverage found for private companies also exists for public companies. On theoretical grounds, we would also expect an effect for public companies with a concentrated ownership structure. It may be possible to use public companies in which families or founders hold high ownership shares for a corresponding test.

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