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Male vs. female business owners: Are there differences in investment behavior?

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Male vs. female business owners: Are there differences in investment behavior?

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Abstract

This paper analyzes gender differences in the investment activity of German small and medium sized enterprises (SMEs). The empirical analysis is carried out on a sample of firms drawn from the KfW Mittelstandspanel, a representative survey of German SMEs for the period from 2003 to 2009. We find evidence that female-owned firms are less likely to invest and if they invest, then their average investment rate is lower. These differences cannot entirely be explained by firm or owner characteristics. Furthermore, women's investment is less sensitive to cash flow, which indicates that it is unlikely that their lower investment is driven by difficulties in acquiring external finance. An analysis of stated investment goals reveals that women have different preferences and attitudes towards investment. They indicate to a lesser extent aspiring and growth-orientated investment goals like sales increase, innovation/R&D or implementation of new products.

Keywords: Gender Economics, Female Entrepreneurship, Investment

JEL classification: G 11, J 16, L 26

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1 Introduction

Female participation in business and entrepreneurship has increased considerably in the last decades. Nonetheless, the gender gap between the entrepreneurial activity of men and women is substantial, particularly in industrialized countries (Allen et al. 2007). Furthermore, firms that are owned by women differ significantly from male-owned firms. Female entrepreneurs have smaller firms, they start with less capital and are more likely to be found in the service sector. Moreover, female-owned firms seem to underperform male-owned firms in profitability, innovativeness and firm growth (Fairlie and Robb 2009, Gottschalk and Niefert 2011, Tonoyan and Strohmeyer 2005).

Most studies find that this gender gap in firm performance - or at least a large part of it - is attributable to differences in industry, human capital of the firm owner, professional experience or access to finance and networks (Robb and Watson 2010, Du Rietz and Henrekson 2000). Yet, particularly for the performance indicators of sales growth and firm size, there still remains a gender gap that cannot be explained with the usually observed firm- and owner-specific characteristics. The standard explanations for this phenomenon can be subsumed to two concepts: differences in growth and size between female- and male-owned firms are caused either by discrimination or by preferences. Indeed, there is evidence that women prefer to keep their businesses smaller and more manageable and that they are less likely to have growth on their entrepreneurial agenda (Cliff 1998). Regarding discrimination in the form of financial constraints, the proposition that women have more difficult access to external finance cannot be validated for industrialized countries (Cole and Mehran 2009).

So far there is little knowledge about the underlying entrepreneurial decisions that reflect those gender differences in preferences and also determine the differences in firm size. We do not know much about how men and women act as firm owners and managers and how successful they are. Particularly, gender differences in investment behavior are not well explored yet. This question is highly relevant though, as firm investment is an important driver of firm growth.

The aim of this paper is to gain new insights into gender differences in investment activity in order to contribute to a better understanding of observed lower growth rates and smaller firm sizes of female-owned firms. For this purpose, we attempt to disentangle the impact of gender on investment activity that remains after controlling for firm- and owner-specific characteristics, such as industry, firm age, firm size, management team size, expectations, innovation activity, cash flow as well as age and education of the firm owner. Using the KfW Mittelstandspanel, a data set consisting of roughly 35,000 German SMEs that were observed from 2003 to 2009, we focus on the extensive and intensive margin of investment as well as on stated investment goals. Our analysis is threefold: first, we estimate a linear probability model (LPM) with the binary investment decision as the dependent variable to examine the extensive margin of

investment. Second, we analyze the investment rate, i.e. the intensive margin of investment, by using a simple reduced form investment model with time-averaged data. Third, we examine the investment goals of investing firms. We consider both standard explanations for women's lower firm sizes: discrimination in the form of financial constraints and preferences. The inclusion of cash flow into the analysis of the extensive and intensive margin of investment serves as a control for financial constraints. The analysis of investment goals sheds light on gender differences in preferences.

Our results reveal that female firm owners are less inclined to invest, both at the extensive and intensive margin. The probability that they make an investment is lower and if they invest, the relative amount of their investment is lower on average, too. Moreover, we find that the availability of internal funds in the form of cash flow does not have the same impact on male and female firm owners' investment behavior. The investment rate in female-owned firms reacts less to a marginal increase in the availability of cash flow. This means that under the presence of the same financial endowment women are more reluctant to invest. The explanation for this behavior cannot directly be assessed within the estimation framework, but a further analysis of the firms' investment goals suggests that women are indeed less growth-oriented as they are less likely to name sales increases, innovation/R&D and implementation of new products as their investment goals.

We conclude that women's lower propensity to invest and consequently also their lower firm sizes are a consequence of preferences rather than financial constraints. We are not able to draw any conclusion on the underlying causes for these gender differences in investment goals. We have no information on personal conditions and resources of the firm owners that may affect investment behavior and growth aspirations, such as attitudes towards risk taking, family status and non-entrepreneurial responsibilities. However, previous research on gender differences confirms that women are on average more risk and competition averse, less overconfident, less ambitious and less work-centered. These findings may not only hold for the average women but also to some extent for female entrepreneurs, particularly for owners of small, non-growing firms.

2 Literature review on gender differences

Two strands of the economic literature are related to this paper: that on firm investment and that on gender economics. Investment theory provides the background for the estimation of the reduced form investment model and will briefly be discussed in Section 4.1. In the following, we review the literature on gender differences in risk aversion, overconfidence, competition and personal preferences. We discuss the impact of these findings on investment behavior of firm owners.

Research on gender differences in investment behavior has concentrated on private investment; there exists no evidence for firm investment. For private investors, Sunden and Surette (1998) find that women choose retirement plan assets that are less risky than the average man's choice.

Gender differences in risk attitudes have been explored in field and laboratory experiments. Most studies, in different environments and across a range of tasks, find that women have on average a lower risk propensity than men (Dohmen and Falk 2011). Croson and Gneezy (2009) outline three possible reasons for gender differences in risk taking: different evaluations of risk, differences in the perceptibility of emotions and male overconfidence. On average, men regard risk as challenge while women perceive it as threat. Moreover, women report more intense nervousness and fear than men in anticipation of negative outcomes, they are therefore more reluctant when it comes to a risky decision. These two explanations refer to different assessments of identical situations. Overconfidence in contrast refers to differences in the self-evaluation of one's own abilities, knowledge and possibilities. Overconfident people underestimate risk because they believe they are more capable than they actually are. Risk-aversion should not be confounded with overconfidence (or even overoptimism), although the two concepts are closely related. Rational non-overconfident people may differ in their true risk preferences, while overconfident people underestimate risk because they are too confident about their ability. Overoptimistic people, in contrast, have unrealistic and overly positive expectations about the future. The literature indeed finds that men are more overconfident than women, and particularly so in male-dominated areas such as finance (Odean and Barber 2001).

Schubert et al. (1999) argue that observed gender differences in risk attitudes in the average population are possibly confounded with financial literacy and wealth effects due to gender-specific income differences outside the laboratory. They claim that the experimental results may not reflect true male and female attitudes towards financial risks, but may stand for differences in individual opportunity sets. Under controlled economic conditions they find that the comparative risk propensity in financial choices strongly depends on the decision frame and that women do not generally make less risky financial choices than men.

Furthermore, while laboratory experiments may provide strong control of the economic environment surrounding risky decisions they may not be adequate for drawing conclusions on gender-specific risk attitudes of investors and managers. Indeed, most of these studies were carried out with a subsample of the general population or with university students. Croson and Gneezy (2009) point out that with a subsample consisting exclusively of business owners and managers, gender differences in financial risk preferences may be smaller or not observable. Entrepreneurs are a special subsample of the population with higher risk preferences than the average. The fact that very few women decide to become business owners could therefore be

partly the result of self-selection due to individual attitudes in risk aversion. Even though the attitude towards risk is not the central determinant of becoming an entrepreneur, people that choose entrepreneurial positions are on average more risk-taking (Blanchflower and Oswald 1998, Caliendo et al. 2009). Women who opt for entrepreneurial positions therefore might have risk preferences similar to men. Yet, it also seems plausible that even within the group of entrepreneurs there are gender differences in risk attitudes and behavior, particularly within owners of small firms. Indeed, there is evidence that female entrepreneurs are less risk-taking compared to their male counterparts (Sexton and Bowman-Upton 1990, Orobia et al. 2011). Yet, there is also evidence on the opposite: Johnson and Powell (1994) investigate decision-making characteristics of men and women in a 'non-managerial' population with those of a 'managerial' population. Males and females in the managerial population exhibit similar risk propensity and make decisions of equal quality, while in the non-managerial population women are more risk averse than men. Dwyer et al. (2002) come to a similar finding in a different setting. They analyze whether the gender of an investor is related to risk taking in mutual fund investment decisions. In line with the experimental literature they find that women are less risk taking than men, but the impact of gender falls significantly when they control for knowledge of financial markets.

Gender differences in attitudes toward competitive environments have been investigated in a number of laboratory experiments, too. Gneezy et al. (2003) run an experiment where they test for gender differences in performance generated by different incentive schemes. They observe that with increasing competitiveness of the environment, the performance of men increases but not that of women. However, in non-competitive environments there is no gender difference in performance. Then again, when women compete in a purely female environment their performance increases. It seems that women like to compete with other women but not against men. As possible reasons the authors name women's lower feelings of confidence and competence and differences in the way how men and women compete against each other. Niederle and Vesterlund (2007) have found that in choosing incentive schemes in an experimental setting men select twice as often the competitive environment of a tournament, although ex-post there are no gender differences in performance. This tournament-entry gap is driven by gender differences in preferences for competitive environments and by male overconfidence. They conclude that 'women shy away from competition and men embrace it' (Niederle and Vesterlund 2007, p. 1067).

Regarding differences in preferences, there is evidence that women on average do not measure success by the traditional 'male' indicators of growth and profitability and have different motivations for opening their own businesses. Likewise, women view the value of work differently than men. Hakim (2002) distinguishes three different lifestyles that are attributed to social preferences: home-centered, work-centered and adaptive. She finds that a majority of

men but only very few women are 'work-centered', meaning that work dominates their lives, even though women have similar educational attainments and despite increasing female work participation over the past three decades. Most women are 'adaptive', they prefer to combine employment and family work in a balanced manner. Fairlie and Robb (2009) find that female business owners may have different objectives for their businesses and that they work fewer hours. One major difference between men and women is that women are more likely to report that they own a business in order to be able to meet family responsibilities. These stated preferences are presumably a result of social norms. Women traditionally take more responsibility for family and child care. They need to balance work and family on average more than work-centered men do. This of course may have implications for the outcomes of female-owned businesses and may induce women to keep their firms smaller and more manageable.

The objective of this paper is to find out whether and how male and female business owners differ in their investment decisions. We summarize the discussed findings as follows: in economic experiments and laboratory settings, women are on average more risk-averse, less overconfident and less eager to participate in competitive environments. Moreover, women have different preferences and entrepreneurial objectives, they are less growth-oriented and have lower goals concerning their desired firm size. There are good reasons to believe that the described personal attributes have an impact on investment behavior. Lower growth aspirations may result in lower investment rates. Moreover, firm investment involves risk-taking and requires certain confidence in the assessment of the ex-ante unknown profitability of the investment. Based on these considerations we expect - if the discussed findings hold for female business owners, too - the following two results: first, women are less likely to invest, and second, if they invest, they invest lower amounts.

3 Data and descriptives

3.1 Data source

The analysis is based on the KfW Mittelstandspanel, an annual firm survey which has been conducted since 2003 by the KfW Bankengruppe, a German public bank in the ownership of the Federal Republic of Germany and the Federal States. Among other business activities, the KfW offers financial support to small and medium-sized enterprises (SMEs). The collection of the data was initialized by the KfW Research Division in order to learn more about SMEs as their main clients - their financing needs, innovative behavior, activities abroad, economic situation, earnings situation, equity resources, expectations, access to investment and venture capital, in short: everything that is relevant to SMEs and SME policy. The data set is available to external researchers only upon request and only for research on predetermined topics. The

KfW-Mittelstandspanel is the only panel data set which is representative of all German SMEs. It includes firms with maximum annual sales of 500 million Euro without having restrictions on the number of employees. The inclusion of very small firms is important for our analysis, as female-owned firms are typically very small. Furthermore, the survey provides information on characteristics of the firm owner such as gender, age and education - a feature that is not available in most public data sets. The owner characteristics are available only for one firm owner or associate even if the firm has more than one owner, so we assume that the information holds for the most influential owner. Additionally, we have information on the size of the management team, consisting of active and responsible executive directors, owners and associates of the firm. The sample of the survey was selected using stratified random sampling. The stratification was done according to six size groups (less than 5 employees, 5-9, 10-19, 20-49, 50-99 and 100 or more employees), five industries (manufacturing, construction, retail, wholesale and services), region (West and East Germany), and participation in a KfW support program for SMEs. Firms that are located in East Germany are oversampled. Small and service firms are underrepresented compared to the population, therefore the share of large and industry firms is higher in the sample than in the population. As a result, the share of female-owned firms is underrepresented as these are prevalently small and belong to the service sector. Yet, in the regressions we control for all stratification variables. The survey, which is six pages long, was sent by mail to the firms for the first time in 2003 and has been repeated in every following year. Participation in the survey is voluntary, some firms dropped out, others did not respond in every single year. New firms were included in 2005, 2007 and 2009 in order to keep the sample size constant. The survey achieved response rates between 18.2% and 23.4%, which is in the typical range for medium-length mail surveys without incentive to participate for SMEs.[1] This corresponds to 9,000 to 15,000 observations for each year. The panel is unbalanced, therefore the time dimension of the data is limited. 58% of the firms are observed only once, 6,800 firms have participated at least three times and more than 1,000 SMEs have participated in all years.[2]

3.2 Regression sampling and descriptives

The analysis is based on three sub-samples. For the first regression in Section 4.4 we use the largest sub-sample, which is based on 34,234 firms with a total of 80,543 observations over time. We exclude observations with extreme values. These are those below the 0.5th and above the 99.5th percentiles-bound for the variables sales, sales growth, employment growth and return on sales. The use of lagged values requires at least two subsequent observations for each firm

[1] Mail survey response rates for SMEs are lower than for large firms. Bartholomev and Smith (2006) have reviewed mail surveys published in 'Entrepreneurship Theory and Practice' and 'Journal of Small Business Management' over the period 1998-2004 and have found an average response rate of 27%.

[2] A detailed description of the data set in German language can be found in Reize (2010).

and with the further restriction of non-missing entries in the regression variables the number of observations reduces to 20,254 in the first regression. The second regression in Section 4.5 restricts the data set to firms that are observed in every single year between 2006 to 2009, therefore the sample shrinks to 1,389 observations. For the third regression, which is discussed in Section 4.6, we consider only those firms that have invested and have stated their investment goals, reducing the sample size therefore to 7,194 observations.

Table 1 provides the variable descriptions and Table 2 descriptive statistics disaggregated by gender for the first and largest regression sample. There are statistically significant gender differences in several dimensions. Female entrepreneurs are on average three years younger and their firms are younger, too. As expected, female-owned firms are smaller in terms of sales and employees and they are more likely to be organized as sole proprietorships and less likely as a corporation. Consequently a larger share of male-owned firms have more than three owners and/or managers. Female-owned firms are rarely active in the manufacturing and construction industries and more often active in services, particularly retail and hotel and restaurant industries.[3] Female-owned firms' propensity to invest and to innovate is lower and they are less likely to have positive sales expectations.

In Figure 1 we present results from kernel density estimates of the distributions of the logs of number of employees and sales for female- and male-owned firms. The dashed line represents male-owned firms while the solid line depicts female-owned firms. The Kolmogorov-Smirnov test rejects the null hypothesis that the male and female distributions are equally distributed with a p-value of 0.000 for both variables.

Since the interpretation of simple means of performance measures may be misleading, we run a simple random effects GLS regression of firm performance in terms of sales growth (Table 3). We control for education, age of the firm and the owner, firm size, management team size and industry. We find that female owners have significantly lower growth rates, which is in line with previous findings on gender and firm growth. We are aware that this regression is just a very basic attempt to separate the impact of female ownership from other underlying variables that might have an influence on growth and may be correlated with female ownership. However, the aim of this simple regression is to confirm the finding that female-owned firms have lower growth rates with our data. Our main question of interest is investment behavior. As investment is an important determinant of firm growth and size, our analysis contributes to a better understanding of existing differences in firm size and growth.

[3]The data set contains firms from 55 industries according to the NACE industry classification. In order to create industry dummy variables that comprise a reasonable number of female-owned firms, we merge these 55 industries into eight categories.

Table 1: Variable descriptions

Owner characteristics	
Female owner (d)	1 if the principal firm owner/manager is female, 0 else
Graduate (d)	1 if the firm owner has graduated from an institution of higher education, 0 else
Age firm owner (c)	Age of the firm owner
Firm characteristics	
FTE (c)	Number of full time employees (FTEs) including the firm owner
Sales (c)	Amount of sales in Euro
FTE (log) (c)	Logarithm of the number of full time employees (FTEs) incl. firm owner
Sales (log) (c)	Logarithm of the amount of sales
Sales growth (c)	Growth rate of sales
Cash flow (c)	Earnings before taxes+depreciation
Cash flow/sales (c)	Cashlow divided by total lagged sales
Demeaned cashflow (c)	Deviation of cashflow from the sample mean
Firm age <5 years (d)	1 if the firm is less than 5 years old, 0 else (reference category)
Firm age 5-10 years (d)	1 if the firm is between 5 and 10 years old, 0 else
Firm age 11-20 years (d)	1 if the firm is between 11 and 20 years old, 0 else
Firm age >20 years (d)	1 if the firm is more than 20 years old, 0 else
1 owner-manager (d)	1 if the firm has 1 active owner-manager, 0 else (reference category)
2 owners/managers (d)	1 if the firm has 2 active owners/managers, 0 else
3 or more owners/managers (d)	1 if the firm has 3 or more active owners/managers, 0 else
Investment (d)	1 if the firm has invested, 0 else
Innovation (d)	1 if the firm has innovation activities, 0 else
Sales expectations positive (d)	1 if the expectation for next year's sales is positive, 0 else
Stratification variables and industry dummies	
KfW support (d)	1 if the firm has received a KfW promotional loan, 0 else
Region (d)	1 if the firm is located in East Germany, 0 if the firm is located in West Germany
Manufacturing (d)	1 if the firm is in manufacturing industry, 0 else (reference category)
Construction (d)	1 if the firm is in construction industry, 0 else
Retail and wholesale (d)	1 if the firm is in retail and wholesale industry, 0 else
Hotel and restaurants (d)	1 if the firm is in hotel and restaurant industry, 0 else
Transport, finance, data processing (d)	1 if the firm is in transport, finance or data processing industry, 0 else
Commercial services (d)	1 if the firm is in commercial services, 0 else
Other business-related services (d)	1 if the firm is in other business-related services, 0 else
Other industry (d)	1 if the firm is in another industry, 0 else
Legal form dummies	
Sole proprietorship (d)	1 if the firm is in sole proprietorship, 0 else (reference category)
Private limited company (d)	1 if the firm is a private limited company, 0 else
Limited liability company (d)	1 if the firm is a limited liability company, 0 else
Corporation (d)	1 if the firm is a corporation, 0 else
Other legal form (d)	1 if the firm has another legal form, 0 else

Notes: d = dummy variable, c = continuous variable

Table 2: Summary statistics regression sample

Gender variable	Mean	St.dev.	Min.	Max.
Female owner (d)	0.116	0.321	0	1

	Male owner				Female owner				t-test
	Mean	St.dev.	Min.	Max.	Mean	St.dev.	Min.	Max.	p-value
Owner characteristics									
Graduate (d)	0.540	0.498	0	1	0.524	0.499	0	1	0.140
Age firm owner	48.432	9.944	20	80	44.909	9.025	23	78	0.000***
Firm characteristics									
FTE	33.3	54.2	0.5	1253	20.2	36.0	0.5	462	0.000***
Sales (in million Euro)	5.349	10.030	10	104	2.620	6.894	10	102	0.000***
Sales growth	0.041	0.298	-1.542	2.037	0.038	0.276	-1.538	2.004	0.745
Cash flow (in thousand Euro)	327	669	-320	8,150	189	510	-307	6,800	0.000***
Firm age	31.280	36.29	1	384	27.022	34.579	1	312	0.000***
Firm age <5 years (d)	0.151	0.358	0	1	0.242	0.428	0	1	0.000***
Firm age 5-10 years (d)	0.160	0.366	0	1	0.187	0.390	0	1	0.001***
Firm age 11-20 years (d)	0.285	0.452	0	1	0.239	0.427	0	1	0.000***
Firm age >20 years (d)	0.404	0.491	0	1	0.332	0.471	0	1	0.000***
1 owner-manager (d)	0.586	0.492	0	1	0.604	0.489	0	1	0.093
2 owners/managers (d)	0.274	0.446	0	1	0.272	0.445	0	1	0.848
3 or more owners/managers (d)	0.107	0.310	0	1	0.079	0.269	0	1	0.000***
Investment (d)	0.650	0.477	0	1	0.537	0.499	0	1	0.000***
Innovation (d)	0.505	0.500	0	1	0.399	0.490	0	1	0.000***
Sales expectations positive (d)	0.309	0.462	0	1	0.272	0.445	0	1	0.000***
Stratification variables									
KfW support (d)	0.682	0.466	0	1	0.687	0.009	0	1	0.602
Region (d)	0.404	0.491	0	1	0.432	0.010	0	1	0.007***
Industry dummies									
Manufacturing (d)	0.298	0.457	0	1	0.185	0.389	0	1	0.000***
Construction (d)	0.187	0.390	0	1	0.082	0.274	0	1	0.000***
Retail and wholesale (d)	0.263	0.440	0	1	0.313	0.464	0	1	0.000***
Hotel and restaurants (d)	0.032	0.175	0	1	0.080	0.272	0	1	0.000***
Transport, finance, data processing (d)	0.040	0.196	0	1	0.035	0.183	0	1	0.206
Commercial services (d)	0.094	0.291	0	1	0.102	0.302	0	1	0.219
Other business-related services (d)	0.070	0.256	0	1	0.195	0.396	0	1	0.000***
Other (d)	0.016	0.124	0	1	0.007	0.002	0	1	0.002***
Legal form dummies									
Sole proprietorship (d)	0.306	0.461	0	1	0.488	0.500	0	1	0.000***
Private limited (d)	0.074	0.262	0	1	0.078	0.269	0	1	0.503
Limited partnership (d)	0.110	0.313	0	1	0.070	0.255	0	1	0.000***
Limited liability corporation (d)	0.502	0.500	0	1	0.354	0.010	0	1	0.000***
Other legal form (d)	0.007	0.083	0	1	0.010	0.098	0	1	0.139

Notes: This table provides summary statistics for the sample used in the estimation of a linear probability random effects panel GLS model of investment in Table 3.4. N = 20,254. Comparison of means with two-sample t-test of equality of means under the assumption of equal variances. *,** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Figure 1: Kernel density estimates, size in terms of sales and number of employees

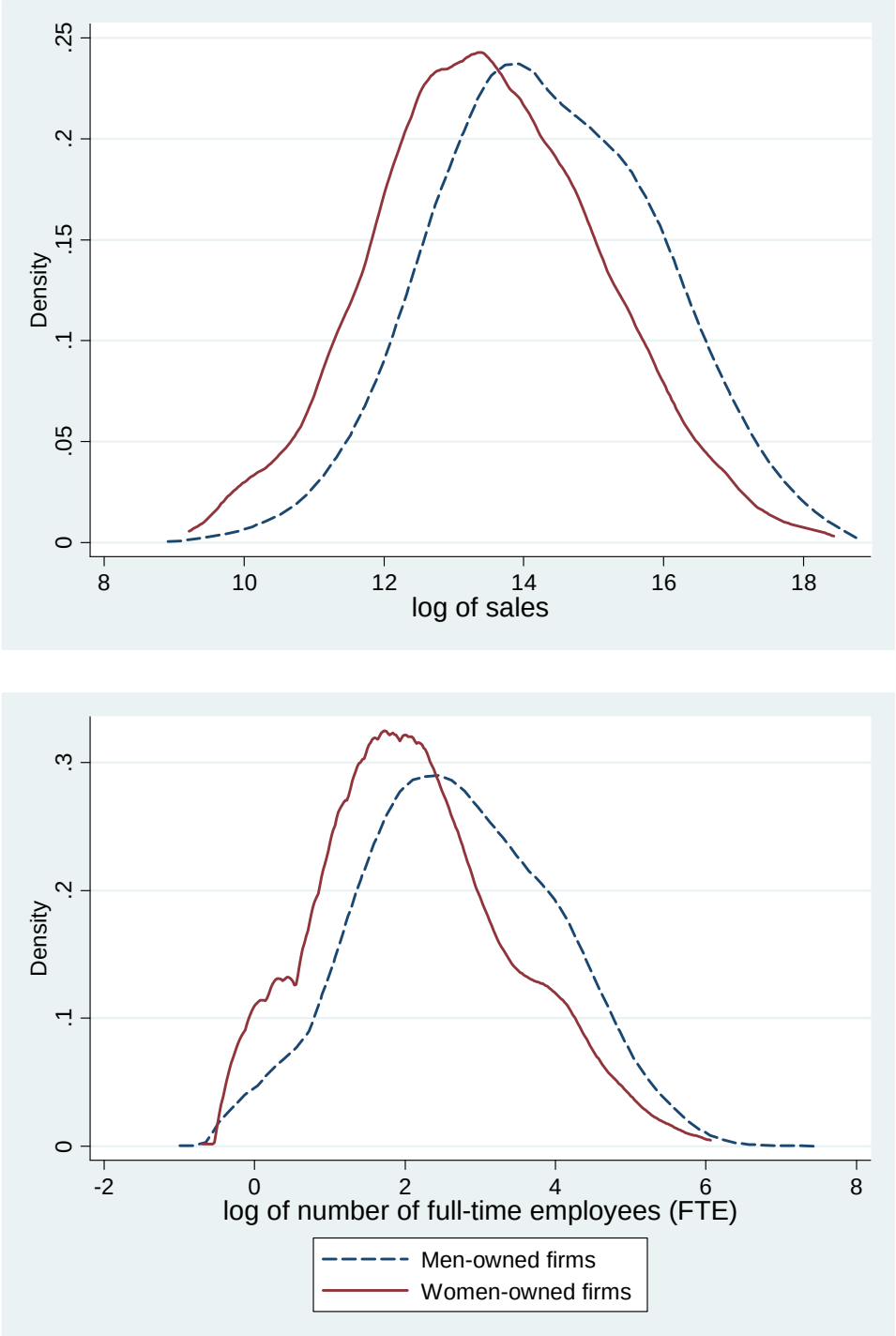


Table 3: Random effects panel GLS regression of firm growth

Dependent variable:	**Sales growth**
Female owner (d)	**-0.044*** **
	(0.007)
Graduate owner (d)	0.013**
	(0.005)
Age firm owner	-0.001**
	(0.0002)
Lagged FTE (log)	0.101***
	(0.006)
Lagged sales (log)	-0.122***
	(0.005)
Firm age 5-10 years (d)	-0.089***
	(0.009)
Firm age 11-20 years (d)	-0.109***
	(0.008)
Firm age >20 years (d)	-0.110***
	(0.008)
2 owners/managers (d)	0.024***
	(0.006)
3 or more owners/managers (d)	0.035***
	(0.008)
Constant	1.538***
	(0.064)
R-squared (overall)	0.070
Observations	20,254
Female observations	2,361
Firms	9,949
Avg. obs. per firm	2.0

Notes: This table presents the results of a random effects panel GLS regression for the years 2003-2009 with firm-level cluster-robust standard errors. The regression includes time, industry and legal form dummies as well as the stratification variables. The reference category are manufacturing firms in sole proprietorship that are younger than 5 years and have one manager. *,** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

4 Econometric analysis of gender and firm investment

4.1 Estimating investment functions

Several theoretical models attempt to describe the complex process of firm investment. Common to almost all recent models is that investment is considered as a dynamic optimization problem. Hence, a firms lives many periods and increases its optimal, long-run or equilibrium level capital stock by investing. Firms decide to invest or not given real and financial factors. Due to limited funds current and future investment are interdependent. Moreover, investment and its financing have further intertemporal effects on future profitability and future financing constraints.

When it comes to the empirical estimation of the investment process, a large part of the empirical investment literature is based on the Q investment model (Tobin and Brainard 1977) where investment opportunities are measured by the ratio of market to book value of a firm's assets. For the present analysis the Q model is not applicable as the KfW Mittelstandspanel does not provide information on stock market participation. Anyhow, as most of the firms are rather small, it can be assumed that they are not listed on the stock market. In neoclassical models investment demand is determined by measures of output and cost of capital. However, the data set does not contain information on firm-specific cost of capital. The use of an Euler equation as theoretical underpinning does not come into consideration, either, because of the strictly implied assumption of convex adjustment costs of investment. Convex adjustment costs imply that with increasing amounts of investment the adjustment costs that a firm has to bear grow over-proportionally. This results in investment smoothing: yearly firm investment is continuous over the years and there are no investment spikes over time. This assumption may hold for large firms, but what we observe in the data is that a significant fraction of firms show large variation in investment activity between years. Particularly for small firms investment is a lumpy activity, most of them do not invest in every year. Periods of larger amounts of investment are followed by periods of zero investment. The reason for this behavior is that larger investment projects (e.g. purchase of a production facility) cannot be smoothed over time and many firms cannot afford to invest every year or rather do not need or want to invest in every year.

Based on these technical limitations we start our analysis with an estimation of a linear probability random effects panel GLS model of the investment decision in order to assess gender differences in the probability of investing. To analyze the investment rate, we opt for a reduced form model of investment which is not explicitly derived from an optimal investment behavior assumption and has no specified structure of adjustment costs.[4] Furthermore we investigate

[4]Bond and Van Reenen (2007, p. 4443) point out that these type of models 'represent just an empirical approximation to some more complex underlying process that has generated the data'.

gender differences in investment goals, also with a linear probability random effects panel GLS model. Finally, we conduct several robustness checks. We re-estimate the investment decision and the investment goals with a panel probit model and the investment rate, with a panel tobit approach. Furthermore, we reduce the two samples to firms with only one owner-manager to make sure that the decision maker in the firm is indeed female. These modifications in sample size and estimation method do not alter our central findings.

4.2 Cash flow as indicator for financial constraints

Cash flow, the amount of internal funds that are available to a firm for financing investment projects and other expenses, is a measure for a firm's financial power. Financial factors such as the availability of internal funds, access to external finance as well as the quality of credit markets are important determinants of firm investment. A firm can be considered as financially unconstrained if it has no difficulties to finance the desired investment level, neither through internal nor external funds. The investment literature uses different strategies to identify and to measure financial constraints. One approach is to identify financial constraints by including a firm's cash flow into the investment equation as a measure of internal liquidity. The first study that worked with cash flow as an indicator for financial constraints was written by Fazzari et al. (1988). The resulting regression coefficient, the 'investment-cash flow sensitivity', represents the potential sensitivity of investment to fluctuations in available internal finance. A significant cash flow coefficient can be interpreted as evidence of financing constraints. The intuition behind is that if investment activity reacts strongly to a good internal financial situation (higher cash flow), then external funds must be to expensive for the firm or to difficult to acquire.

However, due to interpretation ambiguities and the absence of theoretical justifications, the use of cash flow as measure for financial constraints is highly controversial. Kaplan and Zingales (1997) argue that there is no strong theoretical reason to expect a monotonic relationship between investment-cash flow sensitivity and the degree of financial constraints. Their empirical results show that a higher investment-cash flow sensitivity cannot be interpreted as evidence that a firm is more financially constrained, therefore investment-cash flow sensitivities are questionable indicators for financing constraints. Another part of the Kaplan and Zingales critique refers to problems that arise within regressions of the Q-model, mainly caused by measurement error on the ratio of market to book value of a firm's assets. These doubts however should not cause problems in our analysis as we do not employ the Q-model. Yet another point of criticism that matters for our analysis is that the interpretation of cash flow is ambiguous because it may contain information about expected future profits. A good cash flow situation may lead to positive expectations about future profits. Without controlling for sales or profit expectations, the finding of a significant coefficient on cash flow cannot directly be interpreted as evidence of financing constraints, as the cash flow variable could pick up expectations. These

expectations on future profits again are relevant for the investment decision, too (Bond et al. 2003). Since we are able to control for expectations about future sales, this concern is probably not relevant for our analysis.

In light of these considerations the use of cash flow is appropriate within our estimation framework. Furthermore, we are interested in gender-specific differences in the reactions to an increase in cash flow rather than in the effect and interpretation of cash flow itself. For this purpose, we create a new variable by interacting demeaned cash flow with the dummy variable for female ownership, as the magnitude of the impact of cash flow on investment may be different for female-owned firms. The interaction term approach has the main advantage that we can explicitly test differences in the investment-cash flow sensitivity of male and female firm owners.

4.3 Gender as proxy for personals traits

As we have stated before, if previous findings on gender differences in risk-aversion, overconfidence and lifestyle preferences hold to some extent for entrepreneurs, too, we expect female business owners to invest less. We have no information on risk aversion, overconfidence and preferences in our data, but we can assume that under the assumption of no gender discrimination the pure gender effect on investment is zero or at least negligible once we could control for these personal traits. However, estimating an investment model without in some way accounting for these factors would result in an omitted variable bias. The inclusion of the binary gender variable can be considered as a proxy variable to catch these features. Wooldridge (2009, p. 307) calls this the 'plug-in solution to the omitted variables problem'.

The true model to be estimated would be

$$E(I_i) = \alpha_i + \beta_1 X_i + \beta_2 D_i + \beta_3 Z_i + u_i$$

where X denotes a vector of firm-specific characteristics, D is a vector of observed owner-specific characteristics (age and education of the firm owner) and Z is a vector of unobserved personal traits that influence investment behavior positively, such as risk-propensity, over-confidence and work-centered or growth-oriented preferences. Being female is negatively correlated with risk-propensity, over-confidence and work-centered as well as growth-oriented preferences, but there are no theoretical reasons to believe that gender itself has an impact on investment behavior. We cannot observe Z, but we are interested in gender differences in investment behavior that result from gender differences in Z, therefore we estimate

$$E(I_i) = \alpha_i + \beta_1 X_i + \beta_2 D_i + \beta_3 f_i + u_i$$

where f denotes a dummy variable for female ownership.

4.4 Investment at the extensive margin: probability of investing

What is the probability that a female-owned firm invests, compared to a male-owned firm, and how does this probability change when we control for other influencing variables? In order to answer this question, we estimate a linear probability model (LPM) by virtue of its easy and straightforward interpretation. The regression coefficients should be interpreted as changes in the predicted probability of investing if the respective independent variable increases by one unit. Our estimation equation with the binary investment decision (invested=1, not invested=0) as dependent variable takes the form

$$E(I_i) = P(I_i = 1) = \alpha_i + \beta_1 X_i + \beta_2 D_i + \beta_3 f_i + u_i$$

where f denotes a dummy variable for female ownership, X is a vector of firm-specific characteristics (size in terms of sales and employees, cash flow, firm age, team size, sales expectations, innovation activity and sales growth) and D is a vector of further owner-specific characteristics (age of the firm owner and graduate status). One of the shortcomings of the LPM are heteroskedastic error terms, therefore we employ a cluster-robust form for the variance-covariance matrix of the estimator (VCE) as suggested by Cameron and Trivedi (2009) by clustering on firm-level.

Table 4 displays the results from five different regressions. In specification (1) we see that the raw probability difference between investing male and female firm owners amounts to 0.108. The probability that a female-owned firm invests is 10.8 percentage points lower than for a male-owned firm. Including industry dummies in specification (2) does not alter this difference substantially. This is in line with Fairlie and Robb (2009) who find that industry distributions are not a major explanation for gender gaps in business outcomes. In contrast, the additional inclusion of firm size in specification (3) leads to a substantial reduction of the gender difference in the probability of investing of about six percentage points to 0.049. Controlling for additional firm- and owner-specific variables does not reduce this difference considerably. Specification (5) shows that even after considering further firm- and owner-specific characteristics there still remains a significant gender difference of 3.3 percentage points in the likelihood to invest.

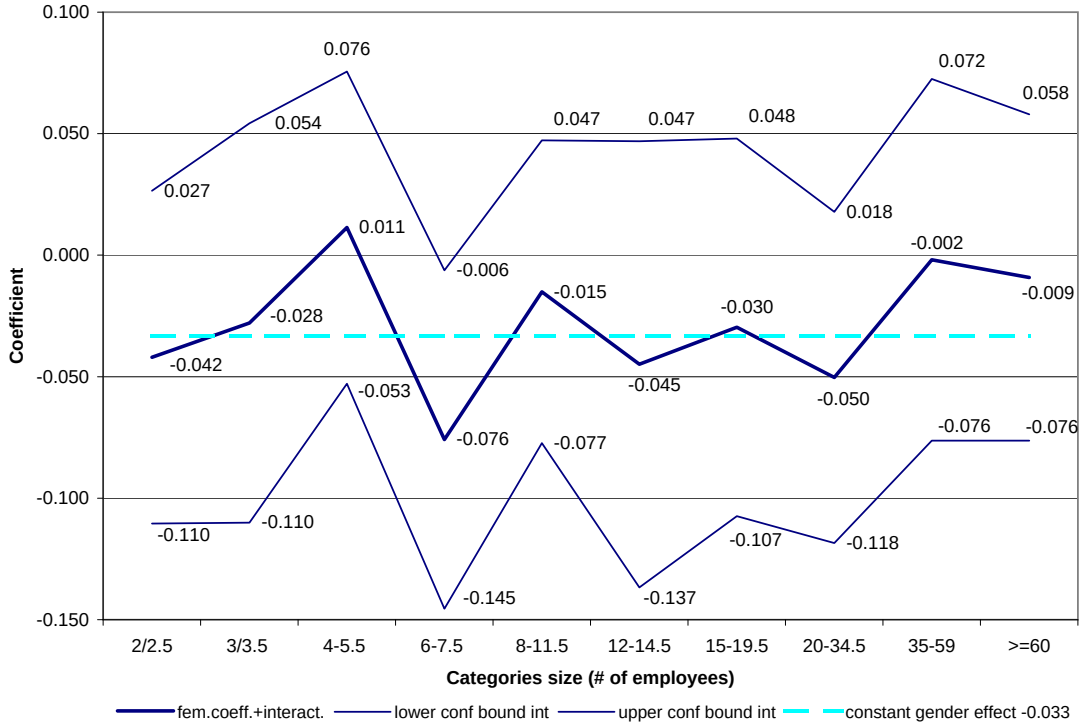
We conclude that size in terms of full time equivalent employees seems to account for the largest bulk of the gender difference in the probability to invest. Furthermore, firm size has the largest explanatory power in the model as with the inclusion of firm size the R^2 increases from 0.032 to 0.125. In order to check whether the gender effect on investment is constant over different firm size categories, we re-estimate specification (5) with interaction terms of female ownership with size categories. We repeat this procedure with firm age instead of size. We plot the interaction effects against the constant effect from a regression without

Table 4: Linear probability random effects panel GLS model of investment

Dependent variable: investment (0/1)	(1)	(2)	(3)	(4)	(5)
Female owner (d)	-0.108***	-0.097***	-0.049***	-0.048***	-0.033***
	(0.013)	(0.014)	(0.013)	(0.012)	(0.012)
Lagged FTE (log)			0.109***	0.064***	0.046***
			(0.003)	(0.006)	(0.006)
Lagged sales (log)				0.044***	0.061***
				(0.005)	(0.005)
Firm age 5-10 years (d)				-0.054***	-0.038***
				(0.012)	(0.012)
Firm age 11-20 years (d)				-0.071***	-0.049***
				(0.012)	(0.012)
Firm age >20 years (d)				-0.065***	-0.040***
				(0.012)	(0.012)
2 managers/owners (d)				0.035***	0.027***
				(0.009)	(0.009)
3 or more managers/owners (d)				0.027**	0.017
				(0.012)	(0.012)
Sales expect. positive (d)				0.051***	0.039***
				(0.007)	(0.007)
Graduate (d)				0.024***	0.012
				(0.008)	(0.008)
Age firm owner				-0.002***	-0.002***
				(0.0004)	(0.0004)
Innovation activities (d)					0.112***
					(0.007)
Sales growth					0.170***
					(0.011)
Cash flow/lagged sales					0.032***
					(0.008)
Demeaned cash flow*female					0.010
					(0.008)
Constant	0.617***	0.686***	0.348***	-0.055	-0.356***
	(0.009)	(0.011)	(0.014)	(0.062)	(0.063)
Industry dummies	no	yes	yes	yes	yes
Legal form dummies	no	no	no	yes	yes
R-squared	0.019	0.032	0.125	0.140	0.174
Observations	20,254	20,254	20,254	20,254	20,254
Female observations	2,361	2,361	2,361	2,361	2,361
Firms	9,949	9,949	9,949	9,949	9,949
Avg. obs. per firm	2.0	2.0	2.0	2.0	2.0

Notes: This table presents the results of a random effects panel GLS regression for the years 2003-2009 with firm-level cluster-robust standard errors. The regression includes time, industry and legal form dummies as well as the stratification variables. The reference category are manufacturing firms in sole proprietorship that are younger than 5 years and have one owner-manager.*,** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Figure 2: Constant effect of female ownership vs. interaction with size categories



interactions in Figures 2 and 3.[5] We find that women's lower probability of investing does not vary systematically with increasing size or firm age.

4.5 Investment at the intensive margin: investment rates

From an econometric point of view, the process of firm investment with its autoregressive distributed lags would be most appropriately estimated within the dynamic econometric framework of a system GMM estimator as proposed by Arellano and Bover (1995) and Blundell and Bond (1998). Yet, the estimation of a dynamic specification is not very promising when considering that the time dimension of our panel is very short with only seven years' data and moreover, only very few firms are present during the whole time period.

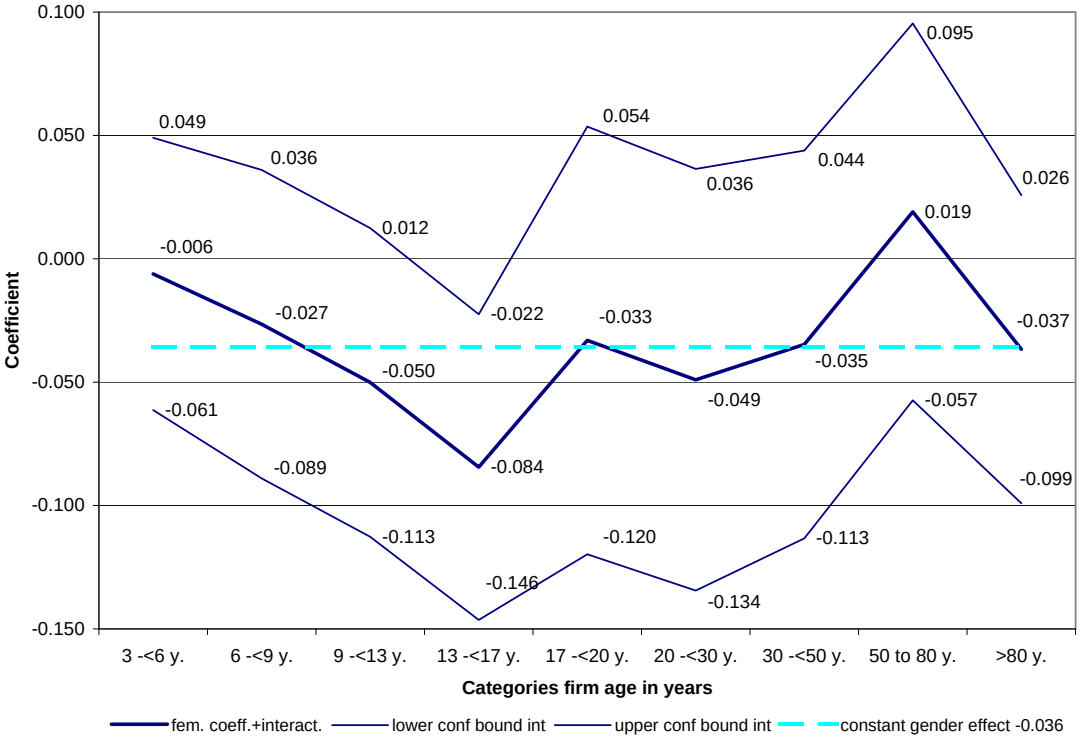
Due to these data limitations we are confined to estimate a simple OLS regression of a reduced form model with time-averaged data. In doing so, we follow Addison et al. (2007) who analyze the impact of works councils on investment. We adopt their approach to examine gender differences in investment. The basic estimation equation can be written as:

$$\frac{I_{i,2008}+I_{i,2009}}{2} = \alpha + \beta_1 f_i + \beta_2 \frac{CF_{i,2008}+CF_{i,2009}}{2} + \beta_3 DemCF_i * f_i + \gamma X_i + u$$

where I in the dependent variable denotes the investment rate, the amount invested divided by

[5] see Appendix Tables 10 and 11 for the regression results.

Figure 3: Constant effect of female ownership vs. interaction with age categories



lagged sales. We average the investment rate over two years in order to ensure that there are no investment spikes in the data and that investment is smoothed over the years. f is a dummy variable for female ownership. We average cash flow (CF) over the years 2008 and 2009, too. $DemCF * f$ stands for demeaned cash flow interacted with the dummy variable for female ownership. X represents a vector of the standard control variables in investment functions and includes also the lagged investment rate that serves as a rough depiction of the dynamic adjustment process of investment. Furthermore, we include sales growth as an explanatory variable, since fluctuations in sales or output motivate changes in investment spending. Sales or output growth has a positive impact on firm investment and vice versa. Increasing sales imply that a firm expects rising profits and cash flow as well as a higher degree of existing capacity utilization. This usually implies that profit expectations rise and this again encourages firms to invest more e.g. in buildings or machinery (accelerator effect). According to investment theory firms take into account expectations of the future when they decide about their investment strategy. Firms invest when the expected return on investment (ROI) exceeds their costs of investing. Positive expectations of future sales boosts investment whereas negative expectations may constrain investment. To incorporate the role of expectations aside from the growth rate of sales we include two dummy variables for positive expectations for the years 2009 and 2010. The firms were asked whether they expect their sales situation to improve, to deteriorate or to stay unchanged next year. Aspiring investment intentions may not necessarily be reflected in current growth rate or in sales expectations. Therefore we also include a dummy variable

for ambitious investment goals that takes the value 1 if the firm has stated implementation of new products, innovation/R&D or sales increases as an objective for its investment (see Section 4.6 for more details). We control for firm size and industry. There should exist a positive relationship between a firm's size and its investment as larger firms have easier access to finance and more ability to bear higher risks (Fazzari et al. 1988). Investment patterns also vary between different industries. Usually manufacturing firms are more capital intensive than services and some industries may experience sector-specific business cycles.

Table 5: OLS regression of the average investment rate in 2008/2009

Dependent var: Investment rate (Investment/lagged sales, averaged over 2008/2009)	(1)	(1A)	(2)	(2A)	(3)	(3A)	(4)	(5)
Female owner (d)	**-0.013****	**-0.014*****	**-0.012****	**-0.014*****	**-0.009***	**-0.011****	**-0.010***	**-0.010***
	(0.006)	**(0.005)**	**(0.006)**	**(0.005)**	**(0.005)**	**(0.005)**	**(0.005)**	**(0.005)**
Investment/sales 2006/2007	0.232***	0.219***	0.200***	0.188***	0.193***	0.181***	0.190***	0.175***
	(0.049)	(0.043)	(0.048)	(0.042)	(0.048)	(0.042)	(0.047)	(0.044)
Growth rate sales 2008/2009	0.079***	0.074***	0.054***	0.049***	0.054***	0.049***	0.056***	0.045**
	(0.020)	(0.018)	(0.019)	(0.017)	(0.019)	(0.017)	(0.021)	(0.020)
FTE (log) 2007	-0.003	-0.003	0.002	0.003	0.002	0.003*	0.002	-0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Cash flow/lagged sales 2008/2009			0.167***	0.163***	0.198***	0.197***	0.194***	0.171***
			(0.036)	(0.032)	(0.042)	(0.038)	(0.042)	(0.039)
Cash flow*female					-0.148***	-0.157***	-0.149***	-0.138***
					(0.050)	(0.045)	(0.049)	(0.045)
Sales expectation for 2010 pos. (d)							0.017***	0.013**
							(0.006)	(0.006)
Sales expectation for 2009 pos. (d)							0.005	0.004
							(0.008)	(0.007)
Ambitious investment goals (d)								0.044***
								(0.005)
Constant	0.052***	0.051***	0.015	0.014	0.010	0.009	0.006	0.001
	(0.013)	(0.011)	(0.011)	(0.010)	(0.012)	(0.011)	(0.012)	(0.011)
Observations	1,389	1,598	1,389	1,598	1,389	1,598	1,389	1,389
Female observations	155	183	155	183	155	183	155	155
R-squared	0.146	0.144	0.184	0.182	0.191	0.191	0.199	0.248

Notes: This table presents the results of an OLS regression with robust standard errors and time-averaged data for the years 2006-2009. Each regression includes industry and legal form dummies as well as the stratification variables. Regressions (1A)-(1C) are repetitions of regressions (1)-(3) with a larger sample that due to missing entries in expectations and investment goals could not be used for (4) and (5). The reference category are manufacturing firms in sole proprietorship. Robust standard errors in parentheses. *,** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Table 5 reports the results from five OLS regressions of the reduced form investment equation. We use a sub-sample of firms that are observed in each single year from 2006-2009. We include only firms that have invested at least once in those years. Table 9 in the Appendix contains the summary statistics for this reduced sample. Investing firms are larger and are more likely to be organized as a corporation than non-investing firms. Moreover, the share of firm owners that hold a graduate degree is higher.

Again, we start with a basic specification in (1) that does not include cash flow, the interaction term and the dummy variables for positive expectations and ambitious investment goals.

We gradually include these variables in specifications (2)-(5). As the number of observations is quite small, we re-estimate the smaller specifications (1)-(3) with all available observations (1A)-(3A). All control variables enter the regressions with the expected signs. Lagged investment and sales growth are positively correlated with investment and so are expectations and ambitious goals. The coefficient for cash flow is significant and shows the expected sign, firms with higher internal funds are more inclined to invest higher amounts. Interestingly, the negative coefficient of the interaction term suggests that cash flow has a greater impact on the investment rate of male-owned firms than of female-owned firms.

The dummy variable for female ownership has a negative sign and is significant in all specifications, suggesting a higher degree of investment reluctance for women. The significance decreases from the 1% level in (1) and (2) to merely 10% in (4) and (5) and the size of the coefficient reduces from 0.014 to 0.010 as we include more explanatory variables. However, the gender difference is economically not trivial. Using the coefficients from specification (5), we calculate an exemplary investment rate of 0.081 for a male-owned firm and 0.07 for a female-owned firm with the same characteristics.[6] With 1 mio. Euro annual sales, a male-owned firm would invest 81,000 Euro and a female-owned firm only 70,000 Euro which makes a non-trivial difference of about 15%.

This result is open to multiple interpretations and cannot completely be explained within the regression framework. We might reason that female-owned firms are apparently less financially constrained because they react less to an increase in cash flow. However, the results confirm our expectation that gender differences in risk-aversion, over-confidence and attitudes towards entrepreneurship may result in lower investment activity. Yet, all these assertions are pure speculation as they cannot be tested directly within the investment function. A further analysis of the investment goals in the next section reveals that there are gender differences in the stated reasons for investing. These differences may also serve as a valid explanation for women's lower investment activity.

4.6 Investment goals

Investing firms stated their motivations for the previous year's investment by choosing between eight pre-formulated non mutually exclusive investment goals: environment protection, rationalization (cost cutting), implementation of new products, technical replacements, innovation/R&D, governmental requirements, sales increases and other goals. We identify three goals as growth-oriented and/or risky investment goals: implementation of new products, innovation/R&D and sales increases. The other reasons (environment protection, cost cutting,

[6]We use the following values for this calculation: investment rate in 2006/2007: 0.05, growth rate sales 2008/2009; 0.01, 18.5 FTEs, cash flow/sales: 0.11, positive expectations for 2009 and 2010 and ambitious investment goals.

technical replacements and governmental requirements) can be viewed as entrepreneurial necessities which can take place without the intention for growing or expanding.

Table 6: Summary statistics investment goals

	Male owner		Female owner		t-test
Investment goals	Mean	St.dev.	Mean	St.dev.	p-value
Environment protection	0.105	0.306	0.076	0.265	0.015**
Rationalization	0.527	0.5	0.471	0.5	0.004***
Implementation new products	0.309	0.462	0.252	0.434	0.001***
Technical replacements	0.599	0.49	0.613	0.487	0.475
Innovation / R&D	0.116	0.32	0.052	0.223	0.000***
Governmental requirements	0.061	0.239	0.089	0.286	0.003***
Sales increase	0.492	0.5	0.424	0.494	0.001***
Other goals	0.073	0.26	0.105	0.306	0.002***
Average number of stated goals	2.282	1.109	2.083	1.045	0.000***

Notes: the variables take the value 1 if the firm has indicated the respective goal, 0 else. Comparison of means with two-sample t-test of equality of means unser the assumption of equal variances. *,** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Table 7: Correlation table investment goals

	Environm. protection	Rational-ization	Implement. new prod.	Technical replacem.	Innovation/ R&D	Governm. requirem.	Sales increase
Environment protection	1						
Rationalization	0.102*	1					
Implementation new products	-0.011	-0.061*	1				
Technical replacements	0.075*	0.038*	-0.119*	1			
Innovation / R&D	0.065*	0.011	0.176*	-0.006	1		
Governmental requirements	0.123*	0.008	-0.024	0.038*	-0.008	1	
Sales increase	-0.003	0.029	0.184*	-0.171*	0.142*	-0.014	1
Other goals	-0.055*	-0.180*	-0.121*	-0.183*	-0.069*	-0.026	-0.119*

Notes: *,** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Table 6 and 7 show summary statistics and a correlation table of investment goals. The growth oriented goals are significantly correlated to each other and are more often stated by male firm owners than by female owners. We estimate a linear probability random effects GLS model for each investment goal separately (Table 8).

The explanatory variables are the same as in the estimation of the binary investment decision. The only regressions where the dummy variable for female ownership is significant with a negative sign are those for the growth-oriented and risky investment goals. Hence, the probability that a female business owner indicates that she strives for these investment goals is significantly

Table 8: Linear probability model of investment goals

Dependent variable: Investment goal (0/1)	Environm. protection	Rational- ization	Implement. new prod.	Technical replacem.	Innovation/ R&D	Governm. requirem.	Sales increase	Other goals
Female owner (d)	**-0.018**	**-0.009**	**-0.049****	**0.015**	**-0.040*****	**0.018**	**-0.054****	**0.019**
	(0.012)	**(0.022)**	**(0.020)**	**(0.021)**	**(0.012)**	**(0.012)**	**(0.023)**	**(0.013)**
Lagged FTE (log)	0.002	0.070***	-0.005	-0.001	0.004	-0.001	0.039***	-0.009
	(0.008)	(0.012)	(0.010)	(0.012)	(0.007)	(0.007)	(0.012)	(0.006)
Lagged sales (log)	0.012*	-0.009	0.004	0.014	0.008	0.005	0.001	-0.002
	(0.007)	(0.010)	(0.009)	(0.010)	(0.006)	(0.006)	(0.010)	(0.005)
Firm age 5-10 years (d)	0.002	0.045*	-0.008	0.004	-0.001	0.013	-0.027	-0.007
	(0.013)	(0.024)	(0.024)	(0.025)	(0.015)	(0.014)	(0.024)	(0.014)
Firm age 11-20 years (d)	0.004	0.010	-0.030	0.062***	-0.027*	-0.002	-0.058**	-0.014
	(0.013)	(0.023)	(0.023)	(0.024)	(0.015)	(0.012)	(0.024)	(0.013)
Firm age >20 years (d)	0.020	0.033	-0.054**	0.077***	-0.055***	0.013	-0.106***	-0.016
	(0.014)	(0.024)	(0.023)	(0.024)	(0.015)	(0.013)	(0.024)	(0.014)
Sales expect. positive (d)	-0.016**	-0.002	0.047***	-0.046***	0.031***	-0.001	0.150***	-0.002
	(0.008)	(0.013)	(0.012)	(0.013)	(0.008)	(0.007)	(0.013)	(0.007)
Graduate owner (d)	-0.032***	0.004	-0.031**	5.45e-06	0.029***	-0.012*	-0.052***	0.008
	(0.009)	(0.015)	(0.014)	(0.015)	(0.009)	(0.007)	(0.015)	(0.008)
Age firm owner	-0.0004	-0.0005	0.0001	-0.002***	0.001**	-0.0007*	-0.001	0.0001
	(0.0004)	(0.001)	(0.001)	(0.001)	(0.001)	(0.0004)	(0.001)	(0.0004)
2 owners/managers (d)	0.005	-0.008	0.002	0.003	0.006	0.0002	0.016	-0.003
	(0.009)	(0.015)	(0.014)	(0.015)	(0.010)	(0.008)	(0.015)	(0.008)
3 or more owners/managers (d)	-0.012	0.017	-0.031	5.37e-05	0.003	-0.009	0.002	0.017
	(0.013)	(0.021)	(0.019)	(0.021)	(0.014)	(0.010)	(0.021)	(0.011)
Sales growth	0.023*	0.033	-0.022	-0.014	0.007	-0.003	0.165***	-0.035***
	(0.014)	(0.025)	(0.023)	(0.024)	(0.015)	(0.012)	(0.023)	(0.013)
Cash flow in t/sales t-1	-0.0001	0.001***	0.0001	-0.002***	-0.0003	0.0003	0.0002	-0.0004*
	(0.0002)	(0.0004)	(0.001)	(0.001)	(0.0002)	(0.001)	(0.001)	(0.0002)
Constant	-0.002	0.525***	0.331***	0.468***	-0.021	0.065	0.403***	0.120*
	(0.085)	(0.127)	(0.111)	(0.126)	(0.079)	(0.071)	(0.124)	(0.064)
R-squared overall	0.030	0.060	0.038	0.027	0.075	0.016	0.028	0.097
Observations	7,194	7,194	7,194	7,194	7,194	7,194	7,194	7,194
Female observations	726	726	726	726	726	726	726	726
Firms	3,999	3,999	3,999	3,999	3,999	3,999	3,999	3,999
Avg. obs. per firm	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8

Notes: This table presents the results of a linear probability random effects panel regression with robust standard errors for the years 2005-2009. Only investing firms considered. The definitions and constructions of the variables can be found in Table 1. Each regression includes industry dummies as well as a dummy for region and participation in a promotional loan program. Robust standard errors in parentheses. *,** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

lower. For women the probability of pursuing these investment goals is about 0.05 lower for sales increases and implementation of new products and 0.04 lower for innovation/R&D. For the other investment goals there is no statistically significant gender difference. This result contributes to a better understanding of the puzzling outcome that women react less to an increase in cash flow. We can infer that female-owned firms are on average less eager to expand and to invest in more risky business areas. This may also be an explanation for the fact that - even with higher cash flow - female firm owners invest less and are less inclined to increase their investments. One caveat of the regression may be the relatively low explanatory power of the estimated model with an R^2 between 0.027 and 0.097.

4.7 Robustness checks

In order to validate our findings we employ several robustness checks for each regression. These robustness checks essentially confirm our findings from the main regressions, as the signs and

the significances do not differ substantially.

1. Check: other model specification, panel probit instead of LPM.
Typically, binary dependent variables are estimated with non-linear regression models. We therefore re-run the regressions of the binary investment decision (Section 4.4) and the investment goals (Section 4.6) with a panel probit model (Appendix Tables 12 and 13).

2. Check: other model specification, tobit instead of OLS.
The investment rate in our data is a censored variable. We have a significant proportion of zero outcomes for investment and we do not know which part of these zeros are latent non-zero observations. In other words, we do not know if the zero observations for investment are 'true' zeros because the firm owner did not want to invest or if the zeros are in fact negative observations, firms that could not invest. We have tried to overcome this problem by time-averaging the data in the estimation of an investment function in Section 4.5. However, the standard approach for this type of analysis is the use of censored regression models. In using a censored regression model it would be appropriate to estimate a two part (or Heckman) model to overcome the strong assumption of one part models that the same probability mechanism generates both the zeros and the positives values. These models, however, need at least one exclusion variable that has a substantial impact on the probability of selection but not on the positive outcome variable for robust identification. Unfortunately we are not able to justify any of the available variables as exogenous for the investment rate but substantial for the selection into investing. We therefore re-run the OLS regression of the investment rate with a tobit maximum likelihood estimator (MLE). However, the tobit approach is based on strong assumptions about the conditional data distribution and functional form. These strong assumptions are likely to be violated and this makes the tobit MLE a non-robust estimator (Cameron and Trivedi 2009). Using the tobit model we are able to estimate the regressions with a larger sample compared to the small sample size of the OLS regression, as we do not need to time-average the data (Appendix Table 14).

3. Check: considering only firms with one owner.
We only have information about the gender of the primary firm owner and not about all members of the management team. In order to make sure that the decision maker in the firm is indeed female, we repeat all regressions considering only firms with one owner-manager (Appendix Tables 15, 16, 17).

5 Conclusion

This paper addresses the question of whether female-owned firms differ in their investment activity from male-owned firms. Our results offer valuable insights to gender differences in investment behavior and enhance the understanding of the causes of smaller firm size for firms owned by women. Even after controlling for other owner and firm characteristics we find that women invest significantly less than men, at the extensive as well as at the intensive margin. Furthermore, women react less to a marginal increase in cash flow, suggesting that even in the presence of the same internal funds women invest less. This difference in the impact of cash flow on investment rate is probably the most astonishing result in the paper. Of course we cannot infer any statements about causality, the observed differences are mere correlations. However, previous findings suggest that women are more risk and competition averse, less over-confident and have different preferences in life. These personal traits are correlated with gender and are likely to have a negative influence on investment behavior. Our estimation results confirm our hypothesis that women invest less if these findings do not only hold for the average women but for female entrepreneurs, too. Therefore, the significant gender effect from the regressions on the extensive and intensive margin of investment possibly contains these unobserved features that are best able to explain the differences in investment. An additional regression on investment goals reveals that women are less likely to invest for reasons that indicate an ambition to expand their businesses. This result points to the fact that women's lower investment is attributable rather to differences in preferences than to discrimination. However, size and growth are not the only criteria for business success, pursuing lower-pace growth may also be beneficial for a firm. Further research is needed in order to shed light on gender differences in business outcomes after investment.

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Appendix

Table 9: Summary statistics regression sample intensive margin

Gender variable	Mean	St.dev.							
Female owner (d)	0.115	0.318							
	Male owner				Female owner				t-test
	Mean	St.dev.	Min.	Max.	Mean	St.dev.	Min.	Max.	p-value
Dependent variable									
Inv./lagged sales, 2008/2009	0.049	0.094	0	1.063	0.035	0.060	0	0.413	0.079*
Independent variables									
Inv./lagged sales, 2006/2007	0.065	0.116	0	1.232	0.056	0.111	0	1.028	0.371
Av. growth rate sales 2008/2009	0.001	0.149	-0.605	0.974	-0.008	0.126	-0.412	0.366	0.461
FTE (log)	37.4	54.5	0.5	822	23.2	30.5	1	162	0.001***
Cash flow/lagged sales 2008/2009	0.114	0.129	-0.198	1.184	0.142	0.177	-0.110	0.823	0.015**
Interaction cash flow*female					0.026	0.014	-0.226	0.707	
Sales expectation for 2010 pos. (d)	0.322	0.467	0	1	0.316	0.466	0	1	0.872
Sales expectation for 2009 pos. (d)	0.144	0.351	0	1	0.142	0.350	0	1	0.938
Ambitious investment goals (d)	0.567	0.496	0	1	0.484	0.501	0	1	0.049**
Stratification variables and industry dummies									
KfW support (d)	0.784	0.412	0	1	0.761	0.428	0	1	0.526
Region (d)	0.414	0.493	0	1	0.419	0.495	0	1	0.900
Manufacturing+other (d)	0.341	0.474	0	1	0.206	0.406	0	1	0.001***
Construction (d)	0.185	0.388	0	1	0.090	0.287	0	1	0.003***
Retail and wholesale (d)	0.260	0.439	0	1	0.303	0.461	0	1	0.252
Services (d)	0.214	0.410	0	1	0.400	0.491	0	1	0.000***
Legal form dummies									
Sole proprietorship (d)	0.271	0.444	0	1	0.393	0.490	0	1	0.001***
Private limited (d)	0.070	0.256	0	1	0.103	0.305	0	1	0.143
Limited liability (d)	0.118	0.323	0	1	0.071	0.258	0	1	0.079*
Corporation (d)	0.532	0.499	0	1	0.419	0.495	0	1	0.008***
Other legal form (d)	0.008	0.090	0	1	0.013	0.113	0	1	0.543

Notes: this table provides summary statistics for the reduced sample used in the estimation of a OLS model of investment in Table 3.5. N=1,389. Only firms that are observable from 2006-2009 and firms that have invested at least once in those years are included. Comparison of means with two-sample t-test of equality of means under the assumption of equal variances. *,** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Table 10: Linear probability RE panel GLS model with interactions (size)

	(1)	(2)
Dependent variable:		with size cat
investment (0/1)	with size cat	& size interact
Female owner (d)	-0.033***	-0.120***
	(0.012)	(0.039)
2/2.5 empl	0.041*	0.025
	(0.022)	(0.025)
3/3.5 empl	0.047**	0.028
	(0.024)	(0.026)
4-5.5 empl	0.099***	0.075***
	(0.023)	(0.025)
6-7.5 empl	0.106***	0.095***
	(0.024)	(0.026)
8-11.5 empl	0.167***	0.147***
	(0.024)	(0.026)
12-14.5 empl	0.183***	0.167***
	(0.027)	(0.029)
15-19.5 empl	0.247***	0.229***
	(0.027)	(0.028)
20-34.5 empl	0.248***	0.232***
	(0.028)	(0.029)
35-59 empl	0.262***	0.243***
	(0.030)	(0.031)
>60 empl	0.297***	0.278***
	(0.032)	(0.033)
fem*2/2.5 empl		0.078
		(0.051)
fem*3/3.5 empl		0.092
		(0.058)
fem*4-5.5 empl		0.131***
		(0.051)
fem*6-7.5 empl		0.044
		(0.053)
fem*8-11.5 empl		0.105**
		(0.050)
fem*12-14.5 empl		0.075
		(0.061)
fem*15-19.5 empl		0.090
		(0.056)
fem*20-34.5 empl		0.070
		(0.052)
fem*35-59 empl		0.118**
		(0.054)
fem*>60 empl		0.111**
		(0.052)
Firm age	-0.0002	-0.0002
	(0.0001)	(0.0001)
Lagged sales (log)	0.036***	0.035***
	(0.005)	(0.005)
2 managers/owners (d)	0.024***	0.024***
	(0.008)	(0.008)
3 or more managers	0.018	0.018
/owners (d)	(0.012)	(0.012)
Graduate (d)	0.017**	0.017**
	(0.008)	(0.008)
Age firm owner	-0.002***	-0.002***
	(0.0004)	(0.0004)
Sales expect. positive (d)	0.037***	0.036***
	(0.007)	(0.007)
Innovation activities (d)	0.108***	0.108***
	(0.007)	(0.007)
Sales growth	0.160***	0.160***
	(0.011)	(0.011)
Cash flow	2.82e-08***	2.83e-08***
	(4.85e-09)	(4.86e-09)
Constant	-0.070	-0.050
	(0.066)	(0.067)
R-squared	0.169	0.176
Observations	20,254	20,254
Female observations	2,361	2,361
Firms	9,949	9,949
Avg. obs. per firm	2.0	2.0

Notes: This table presents the results of a random effects panel GLS regression for the years 2003-2009 with firm-level cluster-robust standard errors. The regression includes time dummies and the stratification variables. The reference category are manufacturing firms in sole proprietorship that are younger than 5 years and have one owner-manager. *,** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Table 11: Linear probability RE panel GLS model with interactions (age)

	(1)	(2)
Dependent variable: investment (0/1)	with age cat	with age cat & age interact
Female owner (d)	-0.036***	-0.055
	-0.012	(0.038)
3 -<6 y.	-0.042**	-0.051**
	(0.018)	(0.020)
6 -<9 y.	-0.070***	-0.075***
	(0.019)	(0.020)
9 -<13 y.	-0.055***	-0.056***
	(0.018)	(0.020)
13 -<17 y.	-0.084***	-0.082***
	(0.018)	(0.020)
17 -<20 y.	-0.081***	-0.085***
	(0.020)	(0.021)
20 -<30 y.	-0.067***	-0.069***
	(0.020)	(0.022)
30 -<50 y.	-0.057***	-0.060***
	(0.019)	(0.021)
50 to 80 y.	-0.071***	-0.079***
	(0.020)	(0.021)
>80 y.	-0.077***	-0.080***
	(0.020)	(0.021)
fem*3 -<6 y.		0.048
		(0.046)
fem*6 -<9 y.		0.028
		(0.050)
fem*9 -<13 y.		0.004
		(0.049)
fem*13 -<17 y.		-0.030
		(0.049)
fem*17 -<20 y.		0.021
		(0.058)
fem*20 -<30 y.		0.005
		(0.057)
fem*30 -<50 y.		0.020
		(0.055)
fem*50-80 y.		0.074
		(0.054)
fem*>80 y.		0.018
		(0.049)
Firm size	0.069***	0.069***
(number of FTE)	(0.006)	(0.006)
Lagged sales (log)	0.039***	0.039***
	(0.005)	(0.005)
2 managers/owners (d)	0.025***	0.025***
	(0.008)	(0.008)
3 or more managers	0.015	0.015
/owners (d)	(0.012)	(0.012)
Graduate (d)	0.016*	0.016**
	(0.008)	(0.008)
Age firm owner	-0.002***	-0.002***
	(0.0004)	(0.0004)
Sales expect. positive (d)	0.034***	0.034***
	(0.007)	(0.007)
Innovation activities (d)	0.109***	0.109***
	(0.007)	(0.007)
Sales growth	0.156***	0.155***
	(0.011)	(0.011)
Cash flow	1.42e-08***	1.43e-08***
	(4.85e-09)	(4.86e-09)
Constant	-0.079	-0.077
	(0.066)	(0.066)
R-squared	0.170	0.175
Observations	20,254	20,254
Female observations	2,361	2,361
Firms	9,949	9,949
Avg. obs. per firm	2.0	2.0

Notes: This table presents the results of a random effects panel GLS regression for the years 2003-2009 with firm-level cluster-robust standard errors. The regression includes time dummies and the stratification variables. The reference category are manufacturing firms in sole proprietorship that are younger than 5 years and have one owner-manager. *,** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Table 12: Panel random effects probit model of investment

Dependent variable: investment (0/1)	(1)	(2)	(3)	(4)	(5)
Female owner (d)	-0.446***	-0.398***	-0.188***	-0.181***	-0.123**
	(0.054)	(0.055)	(0.049)	(0.049)	(0.049)
Lagged FTE (log)			0.450***	0.268***	0.198***
			(0.014)	(0.025)	(0.025)
Lagged sales (log)				0.179***	0.252***
				(0.021)	(0.022)
Firm age 5-10 years (d)				-0.222***	-0.156***
				(0.046)	(0.046)
Firm age 11-20 years (d)				-0.295***	-0.208***
				(0.048)	(0.048)
Firm age >20 years (d)				-0.268***	-0.168***
				(0.048)	(0.048)
2 owners/managers (d)				0.141***	0.110***
				(0.037)	(0.037)
3 or more managers/owners (d)				0.135**	0.090*
				(0.054)	(0.053)
Sales expect. positive (d)				0.225***	0.172***
				(0.030)	(0.030)
Graduate (d)				0.103***	0.051
				(0.034)	(0.033)
Age firm owner				-0.007***	-0.006***
				(0.002)	(0.002)
Innovation activities (d)					0.465***
					(0.028)
Sales growth					0.690***
					(0.046)
Cash flow/lagged sales					0.342***
					(0.065)
Demeaned cash flow*female					0.285
					(0.183)
Constant	0.463***	0.755***	-0.658***	-2.345***	-3.583***
	(0.0390)	(0.0496)	(0.0580)	(0.252)	(0.262)
Industry dummies	no	yes	yes	yes	yes
Legal form dummies	no	no	no	yes	yes
Prob > chi2	0,000	0,000	0,000	0,000	0,000
Observations	20,254	20,254	20,254	20,254	20,254
Female Observations	2,361	2,361	2,361	2,361	2,361
Firms	9,949	9,949	9,949	9,949	9,949
Avg. obs. per firm	2.0	2.0	2.0	2.0	2.0

Notes: This table presents the results of a random effects panel probit regression for the years 2003-2009 with firm-level cluster-robust standard errors. All regressions include time and legal form dummies as well as the stratification variables. The reference category are manufacturing firms in sole proprietorship that are younger than 5 years and have one owner-manager. *,** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Table 13: Panel probit regression of investment goals

Dependent variable: Investment goal (0/1)	Environm. protection	Rational-ization	Implement. new prod.	Technical replacem.	Innovation/ R&D	Governm. requirem.	Sales increase	Other goals
Female owner (d)	**-0.153**	**-0.036**	**-0.193****	**0.049**	**-0.535*****	**0.151**	**-0.205****	**0.158**
	(0.129)	**(0.082)**	**(0.079)**	**(0.072)**	**(0.178)**	**(0.122)**	**(0.084)**	**(0.099)**
Lagged FTE (log)	0.026	0.255***	-0.016	-0.008	0.032	-0.0148	0.146***	-0.096*
	(0.063)	(0.043)	(0.041)	(0.038)	(0.080)	(0.067)	(0.044)	(0.057)
Lagged sales (log)	0.104*	-0.035	0.012	0.047	0.087	0.059	0.004	-0.011
	(0.055)	(0.037)	(0.036)	(0.033)	(0.070)	(0.058)	(0.0380)	(0.049)
Firm age 5-10 years (d)	-0.015	0.162*	-0.029	0.014	-0.002	0.158	-0.100	-0.056
	(0.143)	(0.088)	(0.084)	(0.079)	(0.157)	(0.140)	(0.090)	(0.116)
Firm age 11-20 years (d)	0.052	0.038	-0.109	0.209***	-0.240	-0.045	-0.219**	-0.096
	(0.132)	(0.085)	(0.081)	(0.076)	(0.155)	(0.139)	(0.087)	(0.112)
Firm age >20 years (d)	0.163	0.123	-0.201**	0.257***	-0.505***	0.154	-0.397***	-0.117
	(0.131)	(0.086)	(0.082)	(0.077)	(0.161)	(0.136)	(0.088)	(0.113)
Sales expect. positive (d)	-0.153**	-0.010	0.179***	-0.156***	0.302***	-0.011	0.553***	-0.016
	(0.071)	(0.047)	(0.045)	(0.043)	(0.080)	(0.077)	(0.047)	(0.065)
Graduate owner (d)	-0.309***	0.014	-0.117**	0.002	0.340***	-0.174**	-0.196***	0.059
	(0.081)	(0.054)	(0.051)	(0.048)	(0.105)	(0.086)	(0.055)	(0.070)
Age firm owner	-0.005	-0.002	0.0002	-0.007***	0.008	-0.009**	-0.003	-0.0007
	(0.004)	(0.003)	(0.003)	(0.002)	(0.005)	(0.004)	(0.003)	(0.003)
2 owners/managers (d)	0.058	-0.028	0.014	0.015	0.070	0.013	0.063	-0.041
	(0.082)	(0.056)	(0.053)	(0.050)	(0.097)	(0.089)	(0.057)	(0.077)
3 or more owners/managers (d)	-0.081	0.061	-0.123*	0.009	0.041	-0.131	-0.004	0.154
	(0.114)	(0.077)	(0.074)	(0.069)	(0.132)	(0.129)	(0.078)	(0.102)
Sales growth	0.216	0.113	-0.091	-0.046	0.094	-0.049	0.631***	-0.305**
	(0.134)	(0.086)	(0.085)	(0.080)	(0.149)	(0.146)	(0.091)	(0.123)
Cash flow in t/Sales t-1	-0.027	0.007	0.0003	-0.010	-0.004	0.004	0.002	-0.054
	(0.050)	(0.008)	(0.005)	(0.009)	(0.015)	(0.008)	(0.006)	(0.067)
Constant	-2.780***	0.092	-0.535	-0.123	-3.841***	-2.142***	-0.345	-1.530***
	(0.671)	(0.450)	(0.433)	(0.400)	(0.866)	(0.707)	(0.460)	(0.594)
Observations	7,194	7,194	7,194	7,194	7,194	7,194	7,194	7,194
Female observations	726	726	726	726	726	726	726	726
Firms	3,999	3,999	3,999	3,999	3,999	3,999	3,999	3,999
Avg. obs. per firm	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8

Notes: This table presents the results of a panel probit regression with robust standard errors for the years 2005-2009. Only investing firms considered. Each regression includes industry dummies as well as a dummy for region and participation in a promotional loan program. Robust standard errors in parentheses. *,** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Table 14: Random effects panel tobit regression of investment

Dependent Variable: Investment rate (investment/sales)	(1)	(2)	(3)	(4)	(5)
Female owner (d)	-0.021***	-0.021***	-0.018***	-0.018***	-0.012***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Investment/sales t-1	0.003***	0.003***	0.003***	0.003***	0.003***
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
Sales growth	0.101***	0.085***	0.085***	0.084***	0.060***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Lagged FTE (log)	0.011***	0.015***	0.016***	0.015***	0.003**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Cash flow in t/sales t-1		0.096***	0.110***	0.111***	0.105***
		(0.007)	(0.007)	(0.007)	(0.007)
Interaction cash flow*female			-0.085***	-0.085***	-0.075***
			(0.016)	(0.016)	(0.015)
Sales expect. pos. (d)				0.031***	0.012***
				(0.002)	(0.002)
Ambitious investment goals (d)					0.145***
					(0.002)
Constant	-0.006	-0.028***	-0.031***	-0.036***	-0.070***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Observations	23,130	23,130	23,130	23,130	23,130
left-censored	8,515	8,515	8,515	8,515	8,515
uncensored	14,615	14,615	14,615	14,615	14,615
Female obs.	2673	2673	2673	2673	2673
Firms	10,966	10,966	10,966	10,966	10,966
Avg. obs. per firm	2.1	2.1	2.1	2.1	2.1

Notes: This table presents the results of a random effects panel tobit regression for the years 2003-2009. Each regression includes industry and time dummies as well as the stratification variables. The reference category are manufacturing firms that are younger than 5 years. *,** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Table 15: Linear probability random effects panel GLS model of investment (only firms with 1 owner-manager)

Dependent variable: investment (0/1)	(1)	(2)	(3)	(4)	(5)
Female owner (d)	-0.129***	-0.119***	-0.068***	-0.065***	-0.045***
	(0.017)	(0.017)	(0.016)	(0.016)	(0.016)
Lagged FTE (log)			0.107***	0.057***	0.039***
			(0.004)	(0.008)	(0.008)
Lagged sales (log)				0.051***	0.070***
				(0.007)	(0.007)
Firm age 5-10 years (d)				-0.051***	-0.035**
				(0.015)	(0.015)
Firm age 11-20 years (d)				-0.059***	-0.039***
				(0.015)	(0.015)
Firm age >20 years (d)				-0.056***	-0.031**
				(0.015)	(0.015)
Sales expect. positive (d)				0.062***	0.048***
				(0.009)	(0.009)
Graduate (d)				0.026**	0.010
				(0.011)	(0.011)
Age firm owner				-0.003***	-0.002***
				(0.0006)	(0.0006)
Innovation activities (d)					0.124***
					(0.009)
Sales growth					0.165***
					(0.015)
Cash flow/lagged sales					0.110***
					(0.030)
Demeaned cash flow*female					0.056
					(0.054)
Constant	0.575***	0.647***	0.352***	-0.0930	-0.419***
	(0.012)	(0.015)	(0.018)	(0.082)	(0.082)
Industry dummies	no	yes	yes	yes	yes
Legal form dummies	no	no	no	yes	yes
R-squared	0.023	0.035	0.116	0.133	0.17
Observations	11,918	11,918	11,918	11,918	11,918
Female observations	1,427	1,427	1,427	1,427	1,427
Firms	6,244	6,244	6,244	6,244	6,244
Avg. obs. per firm	1.9	1.9	1.9	1.9	1.9

Notes: This table presents the results of a random effects panel GLS regression for the years 2003-2009 with firm-level cluster-robust standard errors. The regression includes time dummies and the stratification variables. The reference category are manufacturing firms in sole proprietorship that are younger than 5 years.*,** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Table 16: Random effects panel tobit regression of investment (only firms with 1 owner-manager)

Dependent variable: Investment/sales	(1)	(2)	(3)	(4)	(5)
Female owner (d)	-0.029***	-0.029***	-0.027***	-0.026***	-0.020***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Investment/sales t-1	0.003***	0.003***	0.003***	0.003***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Sales growth	0.106***	0.090***	0.090***	0.089***	0.062***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)
Lagged FTE (log)	0.014***	0.019***	0.019***	0.017***	0.003**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)
Cash flow in t/sales t-1		0.090***	0.094***	0.097***	0.090***
		(0.009)	(0.009)	(0.009)	(0.009)
Interaction cash flow*female			-0.040	-0.041*	-0.034
			(0.025)	(0.025)	(0.023)
Sales expect. pos. (d)				0.036***	0.012***
				(0.004)	(0.003)
Ambitious Inv. goals (d)					0.166***
					(0.003)
Constant	-0.016*	-0.038***	-0.039***	-0.044***	-0.080***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.008)
Observations	13,551	13,551	13,551	13,551	13,551
left-censored	5,642	5,642	5,642	5,642	5,642
uncensored	7,909	7,909	7,909	7,909	7,909
Female observations	1,580	1,580	1,580	1,580	1,580
Firms	6,852	6,852	6,852	6,852	6,852
Avg. obs. per firm	2.0	2.0	2.0	2.0	2.0

Notes: This table presents the results of a random effects panel tobit regression for the years 2003-2009. Each regression includes industry and time dummies as well as the stratification variables. The reference category are manufacturing firms that are younger than 5 years. *,** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Table 17: Linear probability model of investment goals
(only firms with 1 owner-manager)

Dependent variable: Investment goal (0/1)	Environm. protection	Rational-ization	Implement. new prod.	Technical replacem.	Innovation/ R&D	Governm. requirem.	Sales increase	Other goals
Female owner (d)	**-0.036****	**-0.047**	**-0.011**	**-0.015**	**-0.050*****	**0.014**	**-0.065****	**0.004**
	(0.015)	**(0.030)**	**(0.029)**	**(0.030)**	**(0.015)**	**(0.017)**	**(0.031)**	**(0.018)**
Lagged FTE (log)	0.010	0.063***	-0.011	0.005	0.007	0.005	0.045***	-0.011
	(0.010)	(0.016)	(0.014)	(0.015)	(0.008)	(0.008)	(0.015)	(0.008)
Lagged sales (log)	0.0005	-0.009	0.011	0.006	0.004	0.003	0.002	0.002
	(0.009)	(0.014)	(0.012)	(0.014)	(0.008)	(0.007)	(0.014)	(0.007)
Firm age 5-10 years (d)	0.011	0.037	0.011	0.013	0.010	0.004	-0.035	-0.008
	(0.016)	(0.031)	(0.031)	(0.032)	(0.017)	(0.018)	(0.030)	(0.018)
Firm age 11-20 years (d)	0.022	0.022	-0.036	0.089***	-0.024	-0.005	-0.067**	-0.018
	(0.017)	(0.030)	(0.029)	(0.030)	(0.017)	(0.016)	(0.030)	(0.018)
Firm age >20 years (d)	0.046***	0.024	-0.063**	0.104***	-0.034*	0.004	-0.110***	-0.021
	(0.017)	(0.031)	(0.030)	(0.031)	(0.017)	(0.017)	(0.031)	(0.018)
Sales expect. positive (d)	-0.020*	-0.004	0.049***	-0.023	0.025**	-0.013	0.156***	0.002
	(0.011)	(0.017)	(0.017)	(0.018)	(0.011)	(0.009)	(0.018)	(0.010)
Graduate owner (d)	-0.021*	0.001	-0.030*	-0.003	0.030**	-0.020**	-0.072***	0.011
	(0.012)	(0.020)	(0.018)	(0.020)	(0.012)	(0.010)	(0.019)	(0.011)
Age firm owner	-0.001*	-0.001	-0.0004	-0.003***	0.001	-0.001**	4.56e-05	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Sales growth	0.040**	0.025	-0.003	-0.003	0.005	0.023	0.167***	-0.060***
	(0.020)	(0.032)	(0.031)	(0.033)	(0.020)	(0.017)	(0.032)	(0.018)
Cash flow in t/Sales t-1	-5.93e-05	0.001***	0.0003	-0.002***	-0.0004**	0.0003	0.0003	-0.0003**
	(0.0001)	(0.0004)	(0.001)	(0.001)	(0.0002)	(0.0005)	(0.0005)	(0.0001)
Constant	0.157	0.591***	0.261*	0.601***	0.026	0.132	0.366**	0.036
	(0.108)	(0.169)	(0.148)	(0.166)	(0.101)	(0.089)	(0.163)	(0.085)
R-squared overall	0.031	0.052	0.036	0.030	0.071	0.022	0.033	0.090
Observations	3,949	3,949	3,949	3,949	3,949	3,949	3,949	3,949
Female observations	369	369	369	369	369	369	369	369
Firms	2,336	2,336	2,336	2,336	2,336	2,336	2,336	2,336
Avg. obs. per firm	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8

Notes: This table presents the results of an random effects panel regression with robust standard errors for the years 2005-2009. Only investing firms with one owner-manager considered. The definitions and constructions of the variables can be found in Table 1. Each regression includes industry dummies as well as a dummy for region and participation in a promotional loan program. Robust standard errors in parentheses. *,** and *** indicate significance at the 10%, 5% and 1% levels, respectively.