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Home Ownership and Home Equity Promote Entrepreneurial Activity

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Abstract

This article studies the effects of private real estate collateral on entrepreneurial lending and entrepreneurial activity in the Netherlands. The residential collateral channel is especially relevant for sole- proprietors who own a business with unlimited liability. We used administrative data on outstanding bank credit based on all Dutch sole-proprietorships in the $2007 - 2013$ period. Our results indicate that, during a severe economic crisis, home-owning entrepreneurs are affected less severely than renting entrepreneurs. Home ownership improved access to credit at the extensive and intensive margin, and it reduced the probability of exit. Positive home equity is the driving force behind this effect, as entrepreneurs with negative home equity are not treated significantly differently from renters.

JEL Classification: G23, L26, R2, R31
Keywords: collateral lending channel, house price shocks, negative home equity, entrepreneurial lending.

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1 Introduction

What are the crucial elements that determine whether small business owners are able to obtain funding? This is a key question raised by economists, policy makers and entrepreneurs themselves. A large body of literature has demonstrated that small businesses owners depend strongly on financial institutions to obtain the capital they require for their business activities. A key factor seems to be borrower's collateral (Avery, Bostic & Samolyk, 1998; Tirole, 2010; Berger, Frame & Ioannidou, 2016). It serves as commitment device for the entrepreneur to overcome potential problems, such as adverse selection and ex-post moral hazard, arising from asymmetric information between the lender and borrower. Furthermore, collateral reduces the loss for the lender in case of unexpected default of the borrower.

For small businesses, collateral may consist of specific personal assets, such as the amount of equity in an entrepreneur's house.[1] Banks explicitly mention the role of private real estate when they provide loans to small businesses. Most banks in the Netherlands include a stipulation in their credit agreements that private real estate collateral put up by the borrower can be pledged if they default on their loan. For instance, '*If you are a sole-proprietor [...] you are personally liable for the credit [...]. This means that the bank can claim your private wealth [...] and as a consequence you have to sell your private house.*' [2] This makes homeowners personally liable for business debts.

The collateral channel can have large and real economic implications as declining values of residential collateral due to a negative economic shock will further exacerbate an economic downturn. In such cases, the value of residential collateral decreases, which

[1] A related literature considers the relationship between housing and economic outcomes. For instance, Mian, Rao & Sufi (2013) and Mian & Sufi (2014) find evidence for a link between household balance sheets and their consumption and employment. They document an increasing marginal propensity to consume out of net housing wealth for more leveraged households. Moreover, they document that regions with stronger declines in housing net worth encounter a higher growth in unemployment.

[2] See for instance the credit conditions of ABN-AMRO or Rabobank. Last access 10-25-2020.

means that the borrower will have less collateral to pledge to the lender, in turn leading to further credit contraction. A number of theoretical studies address potential multiplier effects of residential property markets on the economy (Bernanke & Gertler, 1989; Kiyotaki & Moore, 1997; Iacoviello, 2005). Recent empirical research shows some evidence of the importance of the housing market for business creation (Bracke, Hilber & Silva, 2018; Schmalz, Sraer & Thesmar, 2017; Adelino, Schoar & Severino, 2015; Corradin & Popov, 2015). Their estimates indicate that the probability of starting a new business is positively related to increases in collateral value. However, Kerr, Kerr & Nanda (2015) show that the magnitude of this effect is rather modest. A recent paper by Luck & Santos (2019) shows that real estate is among the most important types of collateral for small and medium-sized enterprises (SMEs) to reduce their borrowing costs.

For this study, we investigated the effect of the residential real estate collateral channel on entrepreneurial activities during the Great Recession of $2009 - 2013$ in the Netherlands. We focused on sole-proprietors who have no limited liability, meaning that they may put up their residential as collateral to obtain a business loan. We considered the impact of housing collateral on three outcomes of entrepreneurship: the incidence of bank credit, the related costs and distressed entrepreneurial exit.

We examined the prevalence of two housing collateral mechanisms - driven by the entrepreneur's position on the housing market - that may have delayed the development of entrepreneurial activities. The first mechanism concerns the fact that entrepreneurs may face difficulties in using the collateral channel to obtain bank credit if nominal prices start to decrease during a crisis. Declining housing value leads to a decrease of the housing collateral, for borrowers to pledge to lenders, in turn leading to further credit contraction. This mechanism applies to entrepreneurial homeowners whose home equity was decreasing during the Great Recession.

The second housing collateral mechanism is based on the notion that, during a recession, banks are confronted with an expansion of their balance sheet with non-performing

loans and an increase in expected losses on those loans due to lower collateral values. These effects will be reflected in higher impairment and higher capital reserves. As a consequences, banks could apply stricter credit terms and conditions to high-risk borrowers who are unable to provide residential collateral for a loan. This mechanism may apply to entrepreneurs who occupy a rental residence, as well as to those who are 'under water' (i.e. have negative home equity), which means that their mortgage loan is larger than the value of the related property. However, also for entrepreneurs able to post residential property as collateral, banks may reduce the availability of credit if the market value of their collateral is depreciating.

We conducted an empirical analysis using administrative data from Statistics Netherlands for the 2007-2013 period. Based on the universe of Dutch sole-proprietors, we used annual panel data on their firm and household balance sheets. The firm balance sheet data contain information on the size and price of the outstanding bank credit, which is derived from the firms' tax statements. We merged these data with information from the household balance sheet of each entrepreneur. This includes their homeownership status, size of outstanding mortgage loans, house value, and all other household assets and liabilities. Residential collateral, measured as the loan-to-value ratio (LTV-ratio), is time varying, in particular due to the house value developments during the Great Recession.

We estimated three reduced-form equations and applied two identification strategies. The dependent variables are incidence of bank credit, the costs of bank credit and the exit of the sole-proprietor. The first strategy uses house price variation on the local labour-market-level in a specific year and variation only on the level of the individual entrepreneur to identify a relationship between home-equity and entrepreneurial outcomes.

In a second set of estimations, we applied a difference-in-difference estimator with the above-mentioned fixed effects, in which we compare renting entrepreneurs to homeowning entrepreneurs with differing levels of home equity. The treatment starts from the time of decline in the Dutch housing market in, 2008. The underlying assumption being

that home-owning entrepreneurs and renting entrepreneurs were affected by the same demand shock on the product side. However, homeowners with positive home equity would have been able to absorb some or all of this shock and should therefore have enjoyed more favourable lending conditions and a lower incidence of exit, during this crisis.

Our study resulted in three major empirical findings. First, compared to the renters, the negative effect of a higher LTV- ratio on the probability of bank credit becomes more pronounced during the crisis. Homeowners with positive home equity were found to be up to 4 percentage points more likely to have bank credit during the housing crises. In addition, the positive impact of the LTV- ratio on the costs of a loan also becomes stronger during the crisis. Positive home equity during the housing crisis led to 20% lower credit costs. This indicates that loan conditions for entrepreneurs through the housing collateral deteriorated during the Great Recession. Second, for both dependent variables (the probability of receiving a loan as well as the costs of a loan) we do not observe a significant difference between the group of renters and the homeowners with negative home equity during the crisis. Entrepreneurs in both these groups were unable to provide residential housing collateral. The estimates suggest that banks consider both groups as equally risky. Third, during the crisis, entrepreneurial exit was significantly lower for homeowners with higher levels of home equity.

This paper provides three new contributions to the empirical literature of the housing collateral channel. In the first place, to the best of our knowledge, this is the first analysis that directly and explicitly explores the link between the entrepreneurs' residential collateral and bank credit of sole-proprietors. The focus on sole-proprietors allowed us a cleaner identification, since the entrepreneur is fully liable with his personal assets, unlike in the case of many other corporate forms. Most recent papers consider various groups of entrepreneurs and do not directly observe the actual value of home equity at the entrepreneurial level (Bahaj, Foulis & Pinter, 2020; Schmalz et al., 2017; Adelino et al., 2015). Imputing household variables using regional information can lead to attenuation bias of the estimated regression parameters. Moreover, we obtained data on outstanding

bank credit and total related costs. Other studies use more indirect measures, such as regional business creation or employment, whereas, to test the collateral channel (Adelino et al., 2015) or survey data (Corradin & Popov, 2015) we are able to identify the effect of residential collateral on bank credit at the level of individual borrowers. The paper which comes closest to ours is a recent study by Bahaj et al. (2020). In a very careful analysis, it explores the relationship between residential real estate and financing for limited liability businesses in the United Kingdom, using imputed price variations of the personal real estate of the general managers. The authors find a significant and positive effect of house price growth on company investments.

The second contribution consists of the comparison between home-owning and renting entrepreneurs. Following a strategy similar to that of (Schmalz et al., 2017), we tested the collateral channel hypothesis within the group of homeowners and by comparing the homeowners to the group of renters. In other words, we had different treatment and control groups of entrepreneurs who differ in their exposure to the house price shock, but not in their exposure to economic shocks. Within the group of homeowners, we compared entrepreneurs with differing levels of mortgage debt relative to the value of their residential property. Having a panel of individual property values linked to the balance sheets of entrepreneurs allows us to improve on the results by Schmalz et al. (2017), by being able to control for both observed and unobserved heterogeneity between homeowners and renters, and homeowners with differing levels of home equity.

Our study's third contribution is its focus on the effect of the collateral channel on existing firms during an economic downturn. So far, the literature has focused on episodes of nominal increases of house prices, in which there was no deterioration of the value of residential collateral (Adelino et al., 2015; Corradin & Popov, 2015; Schmalz et al., 2017; Bahaj et al., 2020). Our sample covers the $2007 - 2013$ period. In 2009, the Netherlands experienced a 3.9% decline in GDP which was the second strongest decline since the Second World War.[3] The value of collateral declined substantially for homeowners since

[3] http://www.cpb.nl/forecasts

the start of the crisis, whereas the amount of residential collateral did, by definition, not change for renters. However, the ability to pledge residential property as collateral for bank credit may make homeowners less risky borrowers, compared to renters in a period of credit contraction. It is not clear which effect would dominate between homeowners and renters. We do expect a negative effect on the credit conditions of homeowners for whom declining house prices pushed them into negative home equity. Furthermore, we tested whether homeownership and home equity improve the resilience of existing enterprises by testing their effect on the probability of bankruptcy.

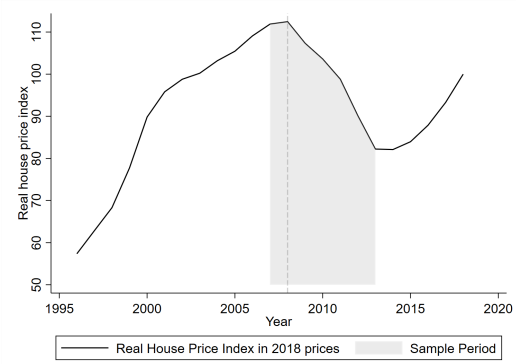
The setup of the paper is as follows: Section 2 provides an introduction to the institutional setting in the Netherlands, and the data set is described in Section 3. Section 4 presents the empirical strategy, while results are discussed in Section 5, followed by conclusions in Section 6.

2 Institutional Setting

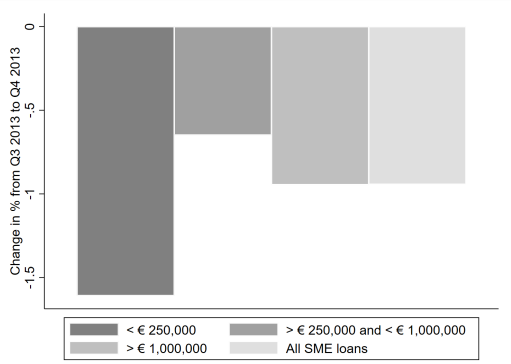
The Netherlands is a particularly interesting country to study the collateral lending effect for a number of reasons. In recent decades, the country has experienced huge fluctuations in real estate prices. As can be seen in panel (a) of Figure 1, average real house prices increased from 1995 to 2008, followed by a decrease of more than 25% up to 2013. In the subsequent period up to 2018, national house prices still did not catch up to above pre-crisis level. The share of homeowners among the Dutch population is in the medium range compared, to other European countries. About 35% of the residences are in the social housing sector; 5% percent in the commercial rental sector and 60% in the owner-occupied sector (Kattenberg & Hassink, 2017).

Figure 1: Real House Price Development & Credit to SMEs

(a) House price index



(b) Change in bank credit



Note. Panel (a)) shows the development of the house price index in the Netherlands in 2018 prices. Source: Statistics Netherlands. Panel (b) shows the change in outstanding bank loans for three different size categories and for all SMEs from the third to the fourth quarter of 2013. Source: DNB

The upward and downward movement in house prices strongly correlated with the expansion and contraction of bank credit to SMEs. Panel (b) of Figure 1 displays the development of outstanding bank credit, split into various size categories. The figure shows that outstanding bank credit in the category up to EUR 250.000 declined steeply after house prices started to decline. [4]

A third feature of the Dutch economy is the highly developed residential mortgage market with particularly high loan-to-value (LTV) ratios at origination. Until 2017, the largest share of residential mortgage debt was issued in the form interest-only mortgages (DNB, 2017). The Dutch housing market is known for high LTV ratios. Especially in the period under investigation LTV ratios of 110% (or more) at origination were the norm. The International Monetary Fund reported the Netherlands to be in the top group (Mrkaic, Hassine & Saksonovs, 2014). Certain policy measures have been taken, since the deep housing market crisis that lasted until 2013 (Arena, Chen, Choi, Geng, Gueye, Lybek, Papageorgiou, Zhang & others, 2020). However, major policy reforms were not

[4]For additional information, see this report: link (last accessed on 25 October 2020). Unfortunately, there are no earlier data available for the Netherlands.

introduced until in 2011 and only applied to new homeowners. These measures include the step-wise reduction in the maximum LTV ratio at origination from 110% to 106% in 2011, and the step wise reduction to 100% up to 2018. The combination of high LTV ratios at origination and no down-payment requirements resulted in negative home equity for more than a third of all homeowners in 2013.[5]

Another important feature of the Dutch housing market is that mortgages are full recourse loans, for example in contrast to many states in the United States. This makes the Dutch case very interesting to study, since strategic default on a mortgage is far less likely to play a role (Pence, 2006).

As in many other countries, in the Netherlands, the majority of small enterprises is strongly dependent on bank financing by Dutch banks. According to recent figures, 40% of all SMEs indicate bank credit to be their most important source of finance.[6] The access to alternative market-based forms of finance (e.g. issuance of equity) is limited, especially for the small enterprises which as considered in our analyses. This makes collateral even more important for obtaining bank finance.

3 Data

3.1 Population data on entrepreneurial bank credit

The empirical analyses are based on an unbalanced panel of all sole-proprietors (*'eenmanszaken'*) in the Netherlands over the 2007- 2013 period. The data contain end-of-year credit amounts and costs of credit, with $1,322,326$ million firm-year observations and $407,369$ unique entrepreneurs. The total amount of outstanding bank credit in our sam-

[5]See this news report by Statistics Netherlands: Underwater mortgages in the Netherlands, last access: September 2020.

[6]Report of the Ministry of Economic Affairs, last access: September 2020.

ple is billion EUR 3.5 (in 2013). Note that this is a quite substantial amount, since we only considered entrepreneurs who are fully liable for their business. We combined more than 10 different administrative data sets from Statistics Netherlands. The most important details on the data are highlighted in the following paragraphs. Appendix C provides more detailed information and a description of the data construction.

The amounts in outstanding credit were obtained from the tax returns of this group of entrepreneurs. The data include information at the entrepreneurial level, on the total amount in business loans at financial institutions in the Netherlands. Moreover, we also obtained information on the annual total costs paid in relation to these loans. Finally, the credit data set includes a unique entrepreneur identifier which allowed us to merge the data with other administrative data sets from Statistics Netherlands.

We merged the information on the firms with data on all self-employed individuals, including information on profits, the business size (in terms of employees), and the main industry per firm. The data set also includes a person identifier, which we used to merge annual household balance sheet data on outstanding mortgage debt, the value of the residential property, wealth and income. Finally, we added demographic information on age, marital status and household composition.

For our sample, we made a number of important selections.[7] These selections were made to provide a cleaner identification of the residential collateral channel. Therefore, aimed to exclude possible confounding factors that would influence the collateral. First, we focused on households whose main source of income consisted of business profits. By doing so, we excluded entrepreneurial households that would earn a substantial share of their income from sources other than their own business. Second, we only considered households who did not move house during the period of our investigation, as such moves often also involve changes in the LTV ratio that could influence the creditwor-

[7] We ran all regressions including the excluded observations and this did not change our estimates in any significant way. The results are available upon request.

thiness of these enterprises for other reasons than price changes on the housing market. Furthermore, we wanted to avoid that households would switch from being renters to becoming homeowners, or vice versa, during the sample period. Third, we excluded all business credits which are greater than EUR $1,000,000$. Fourth, we excluded all homeowners with residential properties worth under EUR $100,000$ (in 2007).

3.2 Construction of the main variables

Dependent variables. Our first dependent variable is the incidence of bank credit; here the value '1' was assigned to any bank credit with a maturity of more than one year. Our second dependent variable is the relative costs of bank credit; it consists of the total costs of long-term debt, weighted by the share of bank credit divided by the total amount of outstanding bank credit.[8] Our third dependent variable is that of entrepreneurial distressed exits; here the value '1' was assigned to any entrepreneurial exits in a given year if the exit was preceded by 2 years of negative profits.

Home ownership status, house prices and mortgage debt. Household balance sheet data were obtained from the Dutch Tax and Customs Administration. These data allowed us to determine whether entrepreneurs owned or rented their place of residence. Moreover, we constructed annual LTV ratios by dividing the total amount of outstanding mortgage debt, as reported in the tax returns by the property value of the address in which the household is registered.

We looked at the annual property value of each address. This so-called WOZ-value (valuation of real estate as determined by municipalities, for taxation purposes, under the Dutch Valuation of Immovable Property Act) is determined on an annual basis for every

[8]Since our data stem from annual administrative tax records we could not derive the interest rate of a specific loan. We did observe the *total cost of credit* (TC) paid for all long-term, short-term bank credit. In addition, we also observe the total amounts outstanding for Total Debt (D), Bank Credit (B). We then calculated the relative costs of bank credit as the weighted share of all costs of credit: Relative costs of bank credit $= \frac{\left(\frac{B}{D} * TC\right)}{B}$.

address in the Netherlands. The WOZ-value of every building is based on a combination of recent local transaction prices and house characteristics, and is used for property tax purposes. Because the Netherlands taxes housing wealth, every household receives an official document, at the beginning of each calendar year, which states the value of their property as it was on 1 January of the previous year. Based on that value, the actual amount in property tax payable is calculated.[9] Moreover, banks also have access to this information and use this valuation to estimate the value of the underlying collateral for a mortgage loan.[10]

Based on the information on the outstanding mortgage debt of the first residence and the annual valuation of the house, we constructed the LTV ratio of owner-occupier households. We divide households into 1 group of renters and 13 groups of homeowners according to their LTV ratios in 10%-clusters (i.e. $0\% - 10\%$, $10\% - 20\%$, ..., $120\% - 130\%$). Three important remarks have to be made with regard to this variable. First, because we matched individuals with their addresses, we only considered the value of the private residences in our LTV definition and exclude all sorts of corporate specific assets. Second, we excluded mortgage debts that had increased from one year to another. This ensured that the increases in LTV ratios were only due to variations in house prices and excluded the possibility that an increased amount in private mortgage had been applied to finance business investments. Third, households with LTV ratios of more than 130% were excluded from our analysis, mainly because such extraordinarily high LTV ratios stem from measurement errors in the data that occur when households move residence. [11]

[9] The information for every address is also publicly available and can be accessed at: https://www.wozwaardeloket.nl. More information on the method (in Dutch) is available at https://www.waarderingskamer.nl/klopt-mijn-woz-waarde/totstandkoming-woz-waarde/

[10] See for instance this website: https://www.abnamro.nl/nl/prive/hypotheken/huis-kopen/woz-waarde.html, accessed in September 2020.

[11] We run the analyses also without the selection and the estimates did no change in any meaningful way. Our main results all held. The results are available upon request.

3.3 Descriptive Statistics

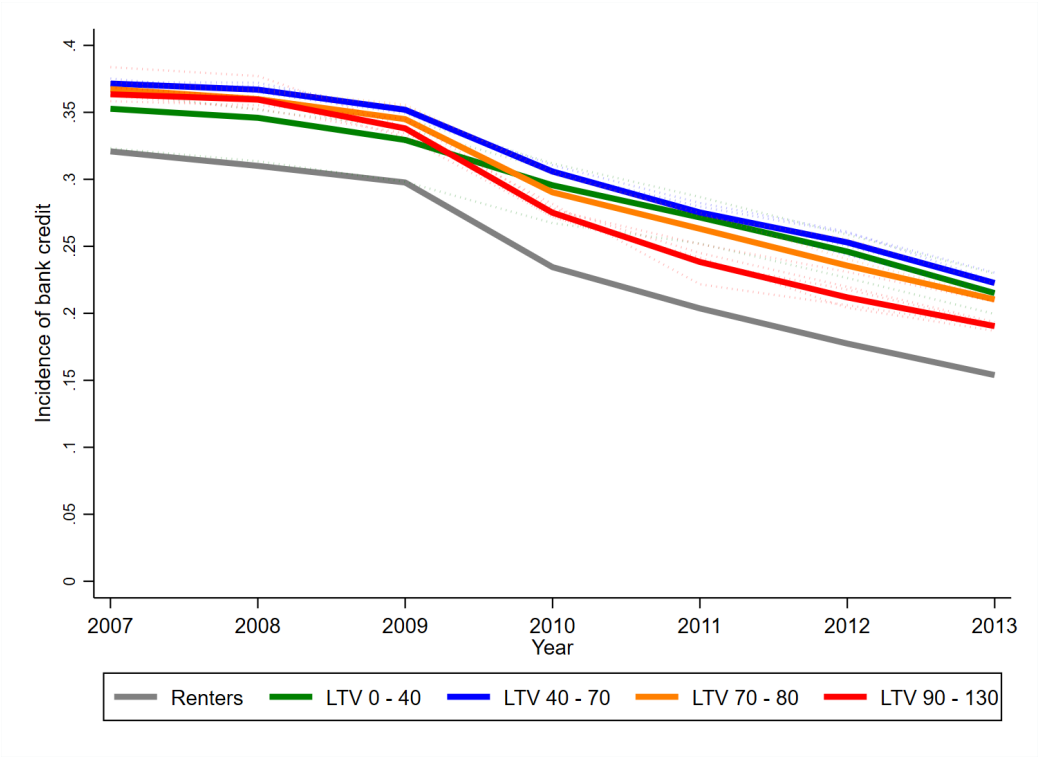
3.3.1 Bank credit probability and homeowner status

Figure 2 presents the development of our first dependent variable, business loan incidence (Inc), for the 14 groups of entrepreneurs. This variable was assigned the value of '1' if entrepreneurs had reported long-term bank credit on their tax return.[12] Green lines indicate the four groups of LTV ratios from 0% to 40%, blue lines represent three groups of LTV ratios from 40% to 70%. Two orange groups range from 70% to 90% and LTVs ratios from 100% to 130% are marked in red. Renters are shown in grey. For the sake of discernibility, the average of the groups is presented by a solid line, while the subgroups are shown in dotted lines of the same colour.

First, the figure shows that renting entrepreneurs, on average, obtained business loans less often than home-owning entrepreneurs. Second, after 2008, the loan incidence starts to decrease and drops sharply in 2009 for all groups of entrepreneurs, and the probability of business credit continues to drop over the $2010 - 2013$ period. Third, there are small differences between the three groups of home-owning entrepreneurs, pre-crisis; however, these differences were seen to increase significantly during the crisis. It is clear from Figure 2 that home ownership with large home equity is positively associated with the likelihood to have business credit as an entrepreneur.

[12] Long-term bank credit includes all loans with a maturity longer than a year.

Figure 2: Housing market status & bank credit probability



Note. The figure shows the average annual probability of bank credit for 14 groups with respect to their housing market status. The solid lines show averages for 4 groups in the legend. The dotted lines show the averages for the 14 different groups. Green lines indicate the 5 groups with LTV ratios from 0% to 40%, blue lines 2 groups with LTV ratios from 40% to 70%. LTV ratios from 70% to 90% are shown in orange and 90% to 130% are marked in red. Renters are shown in grey.

3.3.2 Relative costs of credit and homeowner status

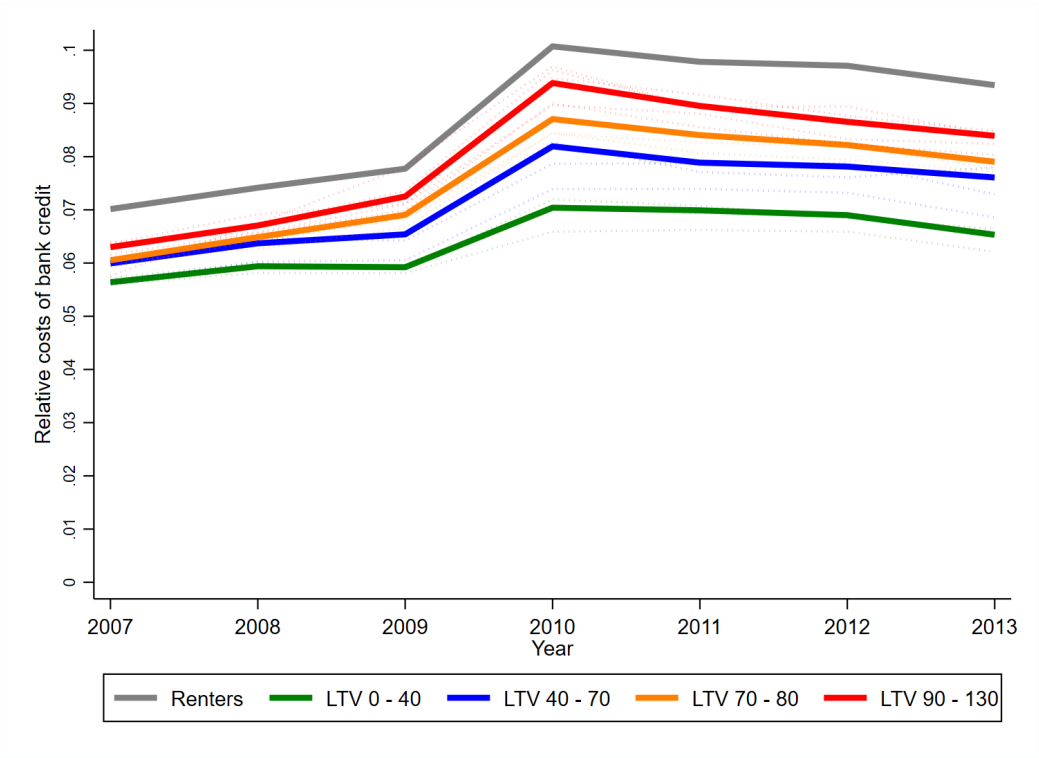
Figure 3 shows the development of the average relative costs of business credit for the 14 groups of entrepreneurs, according to their status on the housing market.[13] Relative costs of business credit are the total costs of credit reported on tax returns, weighted by the fraction of bank credit divided by the amount of outstanding bank credit for business.[14]

[13]Note that this is calculated only for entrepreneurs with bank credit.

[14]As mentioned in Section C of the appendix, our data do not distinguish between interest payments but only provide total costs of bank credit paid in a given year. This also includes, for instance, service fees.

Renting entrepreneurs (grey lines), on average, were found to pay the highest costs, followed by entrepreneurs with the highest LTV ratios. Lower debt ratios go hand in hand with lower average costs of business credit. The average costs of credit were found to increase before the crisis and then remain more or less stable. Entrepreneurs with low or negative home equity (red lines) experience the largest increase, reaching levels closer to those of renters, and significantly higher than those entrepreneurs with a high home equity (green lines).

Figure 3: Relative costs of credit & housing market status



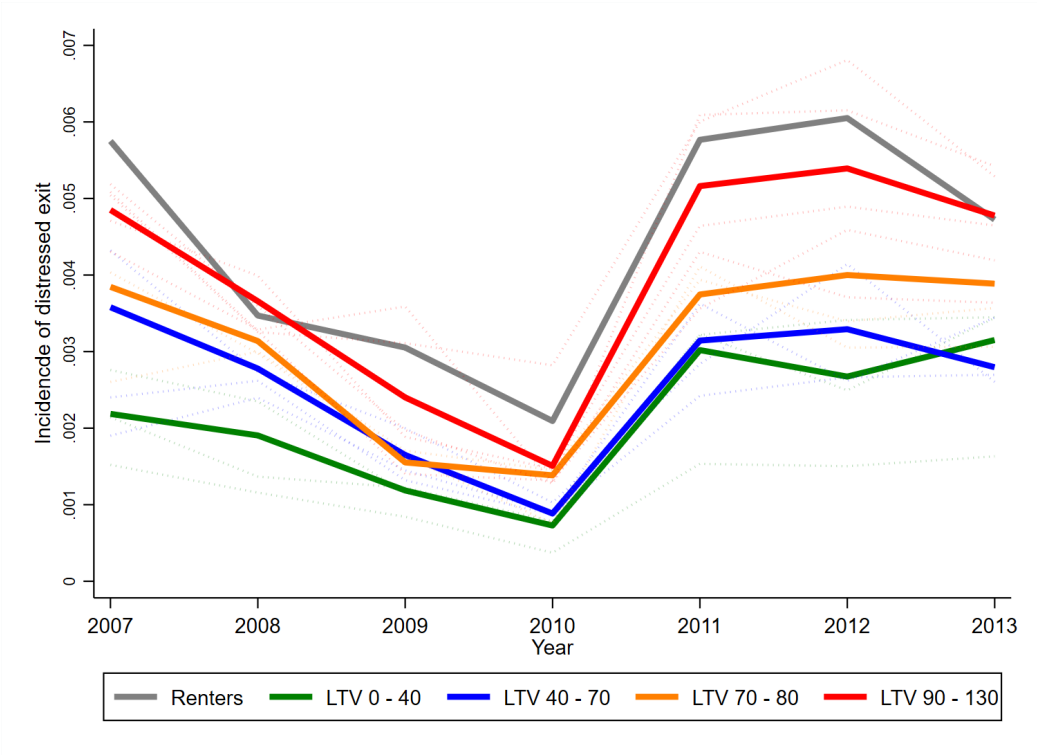
Note. The figure shows the average annual probability of bank credit for 14 groups with respect to their housing market status. The solid lines show averages for 4 groups in the legend. The dotted lines show the averages for the 14 different groups. Green lines indicate the 5 groups with LTV ratios from 0% to 40%, blue lines 2 groups with LTV ratios from 40% to 70%. LTV ratios from 70% to 90% are shown in orange and 90% to 130% are marked in red. Renters are shown in grey.

3.3.3 Probability of distressed exit and home ownership status

Figure 4 displays the probabilities of distressed exit. We used a very precise indicator of entrepreneurial exit, namely the date on which such a company had officially ceased its

operations, preceded by 2 years of negative profits. The figure presents various annual exit rates for the 14 housing status groups, showing the highest exit probability for the renting entrepreneurs (grey), followed by those with low home equity (red). The graphical analysis indicates that higher amounts of home equity help firms avoid bankruptcy.

Figure 4: Distressed firm exit & housing market status



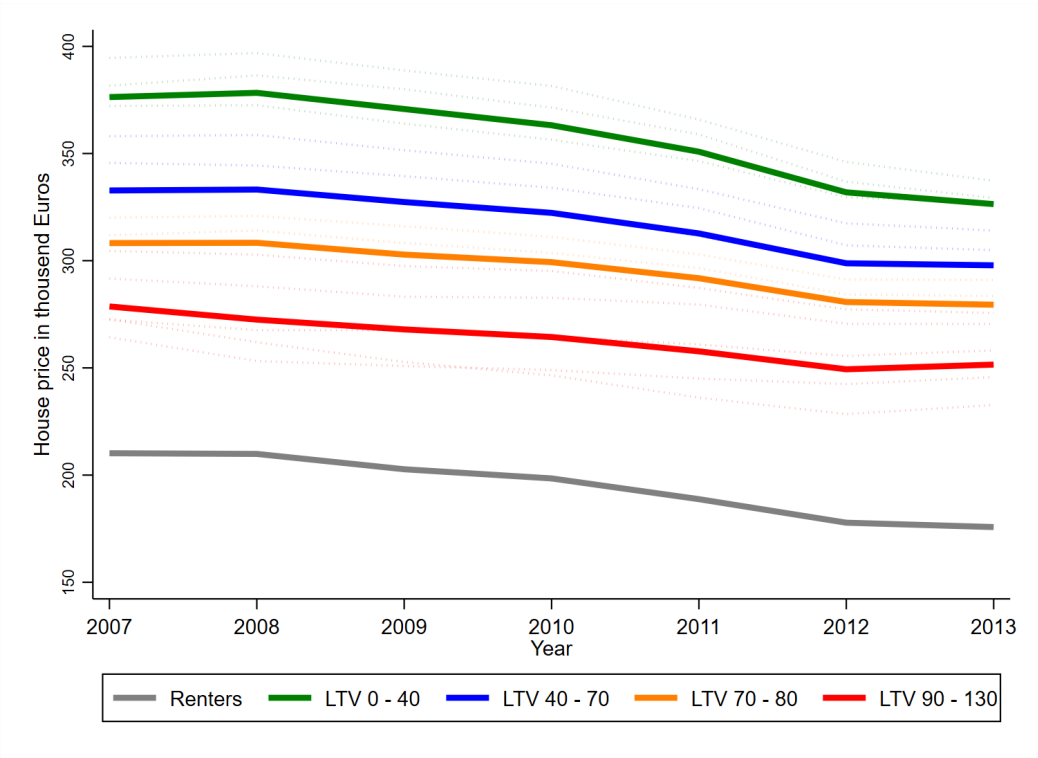
Note. The figure shows the average annual probability of bank credit for 14 groups with respect to their housing market status. The solid lines show averages for 4 groups in the legend. The dotted lines show the averages for the 14 different groups. Green lines indicate the 5 groups with LTV ratios from 0% to 40%, blue lines 2 groups with LTV ratios from 40% to 70%. LTV ratios from 70% to 90% are shown in orange and 90% to 130% are marked in red. Renters are shown in grey.

3.3.4 House price development and home ownership status

Figure 5 shows the house value development for renters and the different groups based on LTV ratios. Note that the figure shows the average nominal house price evaluation for each year. The trend is similar but weaker compared to the one in Figure 1. This can be due, for instance, to the fact that these entrepreneurs were living in other types of houses than the ones reflected in the national house price index. The figure clearly shows

that renting entrepreneurs, on average, were residing in lower-valued houses than home-owning entrepreneurs. In addition, entrepreneurs with the highest LTV ratios were found to live in lower valued houses than entrepreneurs with lower LTV ratios. However, the pattern of slightly increasing house values before 2008 and gradually declining house values after 2008 is very similar among all groups of entrepreneurs. It shows that all entrepreneurs were 'treated' in a similar way as the rest of the population, with regard to their home equity.

Figure 5: House price development & housing market status



The figure shows the average yearly house price for 14 different groups with respect to their housing market status. We split up the LTVs in 10% buckets. Green lines indicate the five groups with an LTV from $0-50\%$, blue lines two groups LTVs from $50-70\%$. LTVs from $70-100\%$ are orange and $100-130\%$ are marked in red. Renters are shown in grey.

3.3.5 Control variables

Our data contain a rich set of control variables at the entrepreneurial level. Because we combined multiple data sources, we obtained information on the business and house-

hold balance sheets with personal characteristics of the entrepreneur. Table 1 shows a summary of statistics for the sample of our main regressions. Appendix A also presents descriptive statistics for other subgroups, such as homeowners versus renters, and entrepreneurs with and without bank credit.

Firm and household balance sheet information. The first part of Table 1 shows summary statistics of all available balance sheet items of both household and firm. Among other things, we found the average outstanding firm bank credit to be about EUR $17,000$ (Standard deviation is more than EUR $60,000$) and the average home equity about EUR $10,000$ (Standard deviation is more than EUR $15,000$). Interestingly, the variation in all variables was found to be substantial.

Entrepreneurial characteristics. The last set of control variables contains information from national address registries. For our analysis, we used the age and marital status, their household composition, as well as adress-related information (e.g. municipality and local labour market).

4 Empirical strategy

We used a linear, reduced-form equation in which loan specifics and entrepreneurial success are explained by residential collateral. We distinguished three dependent variables. The first is the $0-1$ indicator *Loan incidence*, which was set to '1' if the entrepreneur's balance sheet included bank credit during the year (and '0' in all other cases).[15] The second dependent variable is the relative cost of the loan, which is defined as the total annual expenses for bank credit relative to the total amount of business loans on the entrepreneur's balance sheet. The third dependent variable is the probability of entrepreneurial exit.

[15]Note that the same loan-to-value ratio may indicate different absolute values of home equity for different house prices. Therefore we focused on the probability of obtaining bank credit. Because the total amount of home equity may influence the probability of having credit, we added this to X_{irt} as control variable.

Table 1: Descriptive statistics - full sample

	Mean	Standard Dev.	Median
Total outstanding credit (EUR million)	3,123	213	3,128
Fraction with bank credit (0-1)	0.27	0.45	0
Outstanding bank credit (EUR)	16,619	60,994	0
Rel. costs of bank credit (conditional on credit)	0.07	0.07	0
Distressed exit	0.003	0.058	0
Home equity (EUR)	9,984	15,148	4,190
Household income (EUR)	64,774	53,894	53,540
Value bonds of the household (EUR)	2,635	51,486	0
Total shareholdings of the household (EUR)	28,838	394,112	0
Immovable assets excl first home (EUR)	26,983	129,400	0
Entrepreneurial wealth of the household (EUR)	24,175	79,913	8,862
Other debt (EUR)	14,503	103,213	0
Age (years)	46	10	46
Fraction of men (0-1)	0.7	0.5	1
Fraction civil partnership (0-1)	0.8	0.4	1
Fraction with children (0-1)	0.5	0.5	1
Fraction married (0-1)	0.6	0.5	1
Fraction of renters (0-1)	0.23	0.42	0
Fraction of LTVs 0-10 (0-1)	0.08	0.27	0
Fraction of LTVs 10-20 (0-1)	0.04	0.20	0
Fraction of LTVs 20-30 (0-1)	0.05	0.22	0
Fraction of LTVs 30-40 (0-1)	0.06	0.23	0
Fraction of LTVs 40-50 (0-1)	0.06	0.24	0
Fraction of LTVs 50-60 (0-1)	0.06	0.24	0
Fraction of LTVs 60-70 (0-1)	0.06	0.24	0
Fraction of LTVs 70-80 (0-1)	0.06	0.24	0
Fraction of LTVs 80-90 (0-1)	0.06	0.24	0
Fraction of LTVs 90-100 (0-1)	0.07	0.25	0
Fraction of LTVs 100-110 (0-1)	0.07	0.25	0
Fraction of LTVs 110-120 (0-1)	0.06	0.23	0
Fraction of LTVs 120-130 (0-1)	0.04	0.19	0
Observations		1,322,326	

Note. The table reports the descriptive statistics for the estimation sample from 2007-2013 from Equation 1.

This variable is equal to one if we observe two years of negative profit followed by an exit.

4.1 Baseline specification

We estimate the role of home equity as collateral channel with the following specification:

$$Y_{irt} = \sum_{c=1}^{13} \boldsymbol{\beta_c} \mathbb{1}[l_c \leq LTV_{irt} < u_c] + Z + \eta X_{irt} + \epsilon_{irt}$$

$$Y = \text{Loan incidence, Price, Exit}$$
$$i \in 1, ..., N \; r \in 1, ..., 40 \; t \in 2007, ..., 2013 \tag{1}$$

In all equations subscripts i, r and t respectively refer to entrepreneur i in local labour market r in year t. The parameters of interest are β_c. LTV_{irt} is a variable that takes 13 different values, based on our 13 LTV categories. Z is a vector with fixed effects. We estimated two different fixed effects model. The first model contains 280 fixed effects on the local labour market, interacted with the year dummy. The second model contains a fixed effect for every entrepreneur and dummies for each year. The key identifying assumption to estimate the effect of LTV- levels on entrepreneurial activity is that the control variables in X_{it} and the fixed effects capture all sources of potential endogeneity.

4.2 Comparing homeowners with renters

An important source of potential endogeneity are the effects on the *product demand* side of the entrepreneurs. If all home-owning entrepreneurs are affected by the same demand shocks and, therefore reduce their investments and demand for credit, our results were driven by these effects. In order to address this potential problem, we followed the strat-

egy of (Schmalz et al., 2017) and compared home-owning with renting entrepreneurs. There is strong evidence from the descriptive statistics that home-owning entrepreneurs were affected differently from renting entrepreneurs (see Figures 2, 3 and 4). The underlying idea being that, although renting entrepreneurs were affected by the same demand shocks on the product side, their creditworthiness was not influenced by changes to the value of their residential home.

We used the economic downturn and collapsing house prices after 2008 in the Netherlands as sources of unexpected changes in house prices. Here, we also used two sources of variation. We first estimated the capacity of homeowner to mitigate the effect of the crisis via the collateral channel with the following equation, using the variation within a local labor market in a given year:

$$\begin{aligned} Y_{irt} = \sum_{c=1}^{14} \delta_c \mathbb{1}[l_c \leq LTV_{irt} < u_c] \times \mathbb{1}[year > 2008] \\ + \beta \mathbb{1}[year > 2008] + \sum_{c=1}^{14} \gamma_c \mathbb{1}[l_c \leq LTV_{irt} < u_c] + Z + \eta X_{irt} + \epsilon_{irt} \\ Y = \text{Loan incidence, Price, Exit} \\ i \in 1, ..., N \; r \in 1, ..., 40 \; t \in 2007, ..., 2013 \end{aligned} \tag{2}$$

Our coefficients of interest are the estimates of δ_c. The coefficients are interpreted as the effect on Y_{irt} of being home owner with differing levels of home equity after the start of the financial crisis compared to being a renter. As in Equation, 1 the vector Z contains a set of fixed effects. We estimate models with fixed effects for each local labour market and year. In our preferred specification, we include entrepreneurial fixed effects and year dummies. X_{irt} covers time-varying observable characteristics on the firm and entrepreneurial household level as described in Section 3. ϵ_{irt} is an idiosyncratic error term.

4.3 Endogeneity

The two strategies capture important sources of endogeneity. First, we were able to control for all time invariant unobserved heterogeneity on entrepreneur level. Our results are therefore robust to the difference in innate entrepreneurial ability, business model or sector. Second, we captured important other sources of time-varying heterogeneity with a rich set of control variables in X_{irt}. Among other things, the vector contains the age of the entrepreneur, which for instance, is a good proxy for experience (Minola, Criaco & Obschonka, 2016). Third, demand effects on the product side of the entrepreneur - which may lead to a decrease in investment and demand for bank credit from her side - were captured in the comparison with renting entrepreneurs. By definition, all entrepreneurs were affected with by the same shock, but the latter have no home equity to put up as collateral. Fourth, local economic conditions may also have an impact. Differences in purchasing power or economic growth between regions may influence house price development and, thus, also affect the home equity of entrepreneurs (Mian & Sufi, 2011; Mian et al., 2013). We addressed this potential concern with fixed effects on the level of the local labour market region (40 COROP or NUT3- regions) in the entrepreneur- fixed effects regressions. We controlled for general economic trends with year dummies. In the other specifications, we added local labour market fixed effects, interacted with the year dummy.

5 Regression results

This section presents the main regression results. We only show the results of our main specifications in the form of coefficient plots. More detailed results in the form of regression tables are available in the appendix. First, the estimation results from Equation 1 are presented for the 13 groups of home- owning entrepreneurs, followed by the results from equation 2 for the difference in difference estimates between renting entrepreneurs and

various types of homeowners.[16]

The picture that emerges from the analyses is unambiguous: home ownership and especially positive home equity lead to a higher probability of bank credit, lower credit related costs and a lower probability of entrepreneurial exit.

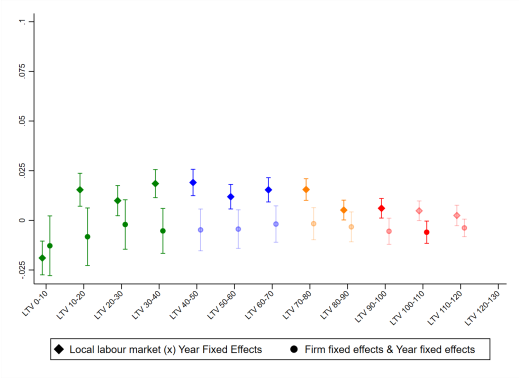
5.1 Bank Credit

Among the group of homeowners, home equity status was found to be weakly positively related to the incidence of bank credit. Figure 6a shows the negative relationship between the probability of bank credit and the LTV ratio of households when looking at the model that includes full controls and local labour market fixed effects, interacted with the year dummy. The incidence of bank credit was highest for LTV ratios of between 10% and 80%. The specification with fixed effects at the firm level revealed a similar pattern, with smaller effect size showing significant negative effects only for very low and very high LTV ratios.

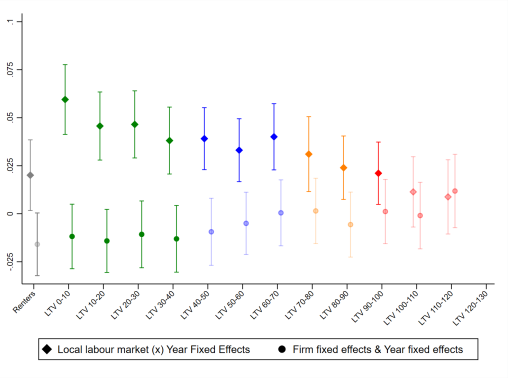
[16] All figures show the results of the interaction terms with the crisis. These are the coefficients of $\delta_c \mathbb{1}[l_c \leq LTV_{irt} < u_c] \times \mathbb{1}[year > 2008]$ in equation 2.

Figure 6: Incidence of Bank Credit & Housing Market Status

(a) Homeowners



(b) Housing market status in a housing crisis



Note: Panel a of the figure shows the estimates of Equation 1 and panel b shows the estimates of Equation 2. The dependent variable was set to '1' if the entrepreneur's balance sheet included bank credit during the year (and '0' in all other cases). The colours of the groups correspond to the groups in all previous figures. Green lines indicate the 5 groups with an LTV ratio from 0% to 50%, blue lines represent the 2 groups LTVs from 50% to 70%. LTV ratios from 70% to 100% are shown in orange, and those from 90% 120% are marked in red. Grey lines indicate renting entrepreneurs. The baseline group contains entrepreneurs with LTV ratios between 120% and 130%

A stronger picture emerged when we compared renters and homeowners during the housing market crisis. Home-owning entrepreneurs with positive home equity were significantly more likely to obtain bank credit in the economic crisis. In contrast, home-owning entrepreneurs with negative home equity seemed to have been treated like renters. The picture that emerges from Figure 6b shows that entrepreneurs with an LTV ratio of between 20% and 70% had an about 4 percentage points higher probability of having bank credit compared to entrepreneurs with LTV ratios of more than 120%. In relative terms, the probability of them having bank credit increased by about 15%.[17] Interestingly, as soon as homeowners faced negative home equity, the probability of them receiving bank credit during the crisis was found to not differ significantly from that of renters.

The empirical results changed as soon as we examined the model with firm fixed effects. Homeowners were not significantly more likely to have bank credit compared to renters. The most important explanation for the differences is that we used the variation

[17] We calculate this based on an overall unconditional incidence of bank credit of 27% in the whole sample period.

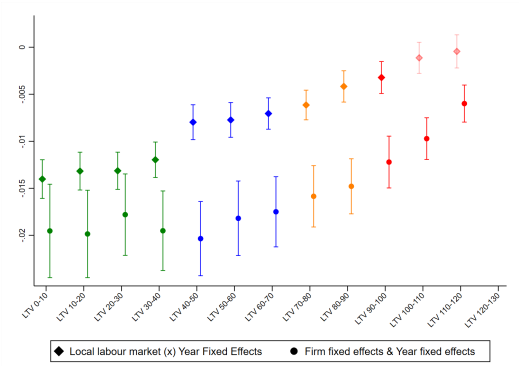
within a firm during the crisis to identify the results which has a different interpretation. These results were driven only by the entrepreneurs who experienced changes in the incidence of bank credit during the crisis. Hence, once entrepreneurs had bank credit, the importance of home equity seemed to become less important.

5.2 Costs of credit

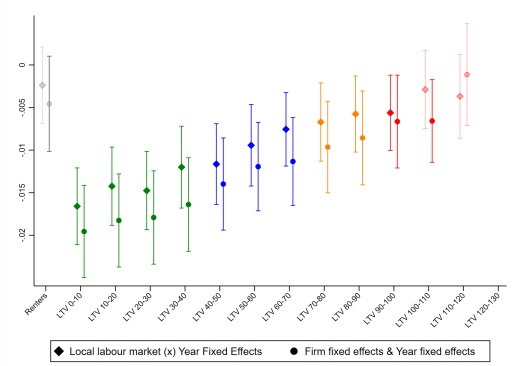
Positive home equity status was found to strongly reduce the costs of credit. Homeowners with a LTV ratio of between 0% and 40% were found to pay about 1 percentage point less for their bank credit than those with an LTV ratio more than 100%. In relative terms, this equals around 14% reduction in costs. The results become more pronounced when firm-fixed effects were added. However, note that, we used a different source of variation. Since we only exploited the variation at the entrepreneur level, the results must be interpreted differently: conditional on them having bank credit, we observed that entrepreneurs faced overall lower costs if their bank credit stretched over multiple years.

Figure 7: Costs of Bank Credit & Housing Market Status

(a) Homeowners



(b) Homeowners vs. Renters in a Housing Crisis



Note. Panel a of the figure shows the estimates of Equation 1 and panel b shows the estimates of Equation 2. The dependent variable in all specifications is the relative costs of bank credit. The colours of the groups correspond to the groups in all previous figures. Green lines indicate the 5 groups with an LTV ratio from 0% to 50%, blue lines represent the 2 groups LTVs from 50% to 70%. LTV ratios from 70% to 100% are shown in orange, and those from 90% 120% are marked in red. Grey lines indicate renting entrepreneurs. The baseline group contains entrepreneurs with LTV ratios between 120% and 130%

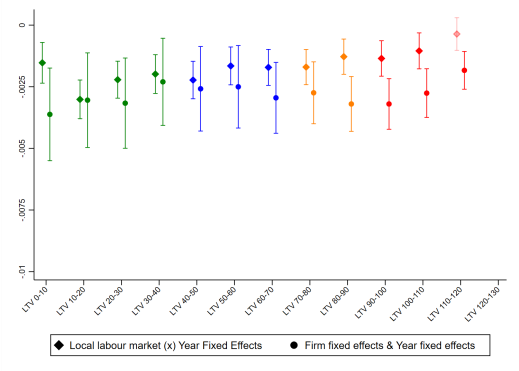
Home-ownership status was found to have a strong impact on the costs of business credit during the housing market crisis. Renting entrepreneurs paid significantly more for their business credit than home-owning entrepreneurs with positive home equity. As Panel b of Figure 7 clearly shows, LTV ratios from 0% to 80% are associated with up to 1.5 percentage point reduction in relative credit costs. This is a relative discount of more than 20%. The figure also shows a very consistent pattern: As soon as homeowners had negative home equity (LTV ratios of more than 100%) the home equity discount disappeared and they would need to pay the same price for their loan as renting entrepreneurs. These results are very similar for the specifications with local labour market fixed effects, interacted with the year and firm fixed effects.

5.3 Exits

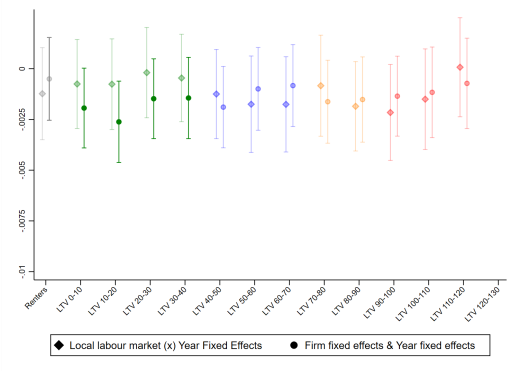
Home equity status was found to reduce the probability of market exit. Figure 8 shows the relationship between LTV ratio and the probability of firms exiting the market. Compared to homeowners with an LTV ratio of more than 120%, all homeowners had a lower probability of exit. The probability of market exit was seen to increase with LTVs ratios of more than 80%. Note that relative effect sizes are not small since the average exit probabilities are also quite low in the whole sample (Figure 4).

Figure 8: Entrepreneurial Exits & Housing Market Status

(a) Homeowners



(b) Homeowners vs. Renters in a Housing Crisis



Note. Figure 8a of the figure shows the estimates of equation 1 and figure 8b shows the estimates of equation 2. The dependent variable in all specifications takes the value one if a firm exits in the year afterwards. The colours of the groups correspond to the groups in all previous figures. Green lines indicate the 5 groups with an LTV ratio from 0% to 50%, blue lines represent the 2 groups LTVs from 50% to 70%. LTV ratios from 70% to 100% are shown in orange, and those from 90% 120% are marked in red. Grey lines indicate renting entrepreneurs. The baseline group contains entrepreneurs with LTV ratios between 120% and 130%

Home-ownership and positive home equity also seemed to slightly to dampen the effects of entrepreneurial exits during a housing market crisis, but the overall relationship is weak. The point estimates for exits during the crisis are highest for renting entrepreneurs and those with negative home equity but they were noisily estimated and difference are not statistically significant. Only high levels of home equity, LTV ratios between 0% and 40% could be associated with statistically significant lower probabilities of entrepreneurial exit.

5.4 Robustness: Imputed house price changes

We looked at house value on the individual, but there is another potential endogeneity concern with respect to our identification strategy. Although the evaluation method of house prices is independent process that reflects the market value of a house, homeowners can potentially lodge a complaint against the estimated value. Such a complaint can lead to an upward or downward 'correction' of the estimated value. In order to in-

crease their lending potential, entrepreneurs may apply for the municipality's evaluation of their property to be increased. They may apply for downward correction in cases where entrepreneurs wish to decrease their tax base to lower the wealth tax they need to pay. We addressed this potential source of endogeneity by predicting the change in house price with the changes in house prices in the municipality (m) and excluded individual house price changes ($\Delta\overline{hp}_{-i}$). Equation 3 shows the estimation.

$$\Delta hp_{imt} = \alpha_m + \beta\Delta\overline{hp}_{-i} + \epsilon_{imt} \tag{3}$$

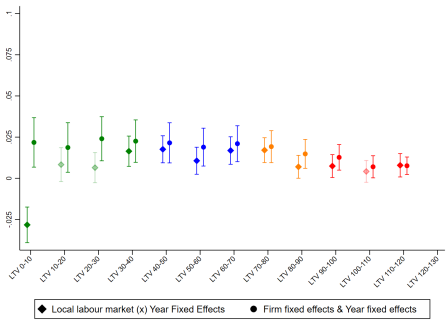
In a second step, we imputed changes in the house price based on the estimated $\Delta\hat{hp}_{imt}$ and recalculated the LTV ratio. Subsequently, we estimated Equation 1 with the imputed LTV ratios:

$$\begin{aligned} Y_{irt} = \sum_{c=1}^{13} \boldsymbol{\beta_c} \mathbb{1}[l_c \leq \widehat{LTV}_{irt} < u_c] \\ + \gamma X_{irt} + Z + \epsilon_{irt} \\ Y = \text{Loan incidence, Price, Exit} \\ i \in 1, ..., N \; r \in 1, ..., 40 \; t \in 2007, ..., 2013 \end{aligned} \tag{4}$$

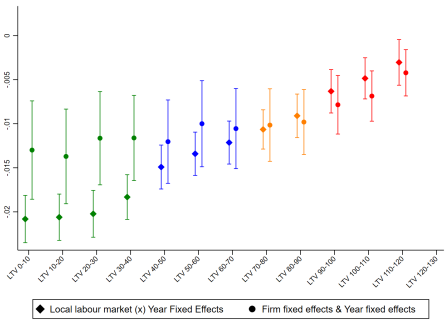
Results. The robustness checks confirm the previous results in a consistent way. Positive home equity was found to increase the probability of bank credit, lower the credit related cost and lower the probability of entrepreneurial exits. The results for the three variables of interest are shown in Figure 9 (Panel a, b and c).

Figure 9: Robustness: Imputed house price changes

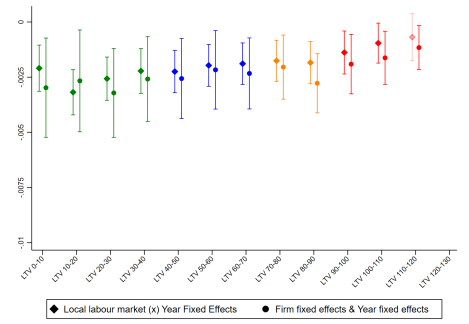
(a) Home equity & the probability of bank credit



(b) Home equity & relative costs of bank credit



(c) Home equity & firm exit



Note. The figure shows the estimates of Equation 4. The dependent variables are the incidence of bank credit, relative costs of bank credit and entrepreneurial exit. We show the coefficients for the following groups - the colours of the groups correspond to the groups in all previous figures. Green lines indicate the 5 groups with an LTV ratio from 0% to 50%, blue lines represent the 2 groups LTVs from 50% to 70%. LTV ratios from 70% to 100% are shown in orange, and those from 90% 120% are marked in red. The baseline group contains entrepreneurs with LTV ratios between 120% and 130%

6 Conclusion

For this study, we investigated the effect of private housing collateral on entrepreneurial lending in the Netherlands. We used a panel data set on sole-proprietors in the 2007 – 2013 period. The data set contains information on business credit, house value, mortgage debt, and a rich set of background characteristics of entrepreneurial households. The use of this data set makes our study unique in the sense that previous studies observed at least one of the variables at a higher aggregation level. The data on individual level on

actually obtained business credit and the related costs allowed us to *directly* test the collateral channel. The group of sole-proprietors is an interesting and important group for testing the collateral lending channel, because these entrepreneurs do not have limited liability. The underlying idea being that entrepreneurs are able to use their residence as collateral for obtaining bank credit.

To identify the importance of the collateral lending channel in the Netherlands, we used the decline in house prices over the $2009 - 2013$ period to represent an unexpected shock to private collateral values. In a first set of regressions, we compare homeowners with differing LTV ratios. The hypothesis being that it is more difficult for entrepreneurs with negative home equity finance their activities with debt, compared to those with lower private debt ratios.

In a second set of regressions, we compared renting and home-owning entrepreneurs with differing LTVs. Here, the underlying idea was that the collateral value for renters would not have been affected by the house price drop since 2008, while homeowners faced a decline in the collateral value that they could use to obtain business credit. However, from the bank's perspective, homeowners may be 'safer' borrowers during a crisis and, thus, have easier access to credit than renters, despite the drop in the value of their collateral. Given that home equity may be what really matters to lenders, we made a comparison between entrepreneurs with differing levels of exposure to the house price shock, depending on their LTV ratios. We focus on three main outcome variables: the business loan incidence, the relative costs of business credit and the probability of exit due to bankruptcy.

Our main conclusions are threefold. First, we found that access to entrepreneurial bank credit is easier for home-owning entrepreneurs, at both the intensive and extensive margin. We saw that, during the crisis, the gap actually widened between homeowners and renters with respect to their access to credit, despite the lower market value of the homeowners' collateral. Second, and in line with the collateral lending channel hypoth-

esis, we found that homeowners with lower home equity were less likely to have bank credit. When they did, they had to pay more for this credit, compared to homeowners with a higher home equity. This can be explained by the fact that lenders charge a higher risk premium to entrepreneurs with less valuable collateral.

Our third conclusion concerns the availability of collateral, which allows entrepreneurs to be more financially resilient. The probability of exit due to bankruptcy was found to be indeed lower for home-owning entrepreneurs and entrepreneurs with high levels of home equity. All our findings support the collateral channel hypothesis and expand on it by showing that, in line with Schmalz et al. (2017), the use of house collateral can improve an entrepreneur's financial resilience during a crisis.

References

Adelino, M., Schoar, A., & Severino, F. (2015). House prices, collateral, and self-employment. *Journal of Financial Economics*, *117*(2), 288–306.

Arena, M., Chen, T., Choi, S. M., Geng, N., Gueye, C. A., Lybek, T., Papageorgiou, E., Zhang, Y. S., et al. (2020). Macroprudential policies and house prices in europe. *IMF Departmental Paper*.

Avery, R. B., Bostic, R. W., & Samolyk, K. A. (1998). The role of personal wealth in small business finance. *Journal of Banking & Finance*, *22*(6), 1019–1061.

Bahaj, S., Foulis, A., & Pinter, G. (2020). Home values and firm behavior. *American Economic Review*, *110*(7), 2225–2270.

Berger, A. N., Frame, W. S., & Ioannidou, V. (2016). Reexamining the empirical relation between loan risk and collateral: The roles of collateral liquidity and types. *Journal of Financial Intermediation*, *26*, 28–46.

Bernanke, B. & Gertler, M. (1989). Agency costs, net worth, and business fluctuations. *American Economic Review*, *79*(1), 14–31.

Bracke, P., Hilber, C. A., & Silva, O. (2018). Mortgage debt and entrepreneurship. *Journal of Urban Economics*, *103*, 52–66.

Corradin, S. & Popov, A. (2015). House prices, home equity borrowing, and entrepreneurship. *Review of Financial Studies*, *28*(8), 2399–2428.

DNB (2017). Overzicht financiële stabiliteit - najaar 2017. *De Nederlandsche Bank*.

Iacoviello, M. (2005). House prices, borrowing constraints, and monetary policy in the business cycle. *American Economic Review*, *95*(3), 739–764.

Kattenberg, M. A. & Hassink, W. H. J. (2017). Who moves out of social housing? the effect of rent control on housing tenure choice. *De Economist*, *165*(1), 43–66.

Kerr, S., Kerr, W. R., & Nanda, R. (2015). House money and entrepreneurship. *National Bureau of Economic Research Working Paper No. w21458*.

Kiyotaki, N. & Moore, J. (1997). Credit cycles. *Journal of Political Economy*, *105*(2), 211–248.

Luck, S. & Santos, J. A. (2019). The valuation of collateral in bank lending. *Federal Reserve Bank of New York, Working Paper*.

Mian, A., Rao, K., & Sufi, A. (2013). Household balance sheets, consumption, and the economic slump. *The Quarterly Journal of Economics*, *128*(4), 1687–1726.

Mian, A. & Sufi, A. (2011). House prices, home equity-based borrowing, and the us household leverage crisis. *American Economic Review*, *101*(5), 2132–2156.

Mian, A. & Sufi, A. (2014). What explains the 2007–2009 drop in employment? *Econometrica*, *82*(6), 2197–2223.

Minola, T., Criaco, G., & Obschonka, M. (2016). Age, culture, and self-employment motivation. *Small Business Economics*, *46*(2), 187–213.

Mrkaic, M., Hassine, M., & Saksonovs, S. (2014). Kingdom of the netherlands. *IMF Country Report*, *No. 14/328*.

Pence, K. M. (2006). Foreclosing on opportunity: State laws and mortgage credit. *Review of Economics and Statistics*, *88*(1), 177–182.

Schmalz, M. C., Sraer, D. A., & Thesmar, D. (2017). Housing collateral and entrepreneurship. *The Journal of Finance*, *72*(1), 99–132.

Tirole, J. (2010). *The theory of corporate finance*. Princeton University Press.

Appendix A Additional Descriptive Statistics

This appendix presents tables with detailed descriptive statistics on our regression sample. Table A.1 shows mean, standard deviation and median for entrepreneurial renters and homeowners. Table A.2 shows the statistics that distinguish entrepreneurs with and without bank credit.

Table A.1: Descriptive statistics - by home-ownership status

	Renters			Home owners		
	Mean	Standard Dev.	Median	Mean	Standard Dev.	Median
Total outstanding credit (EUR million)	312	29	291	2,812	189	2,836
Fraction of bank credit (0-1)	0.23	0.42	0	0.29	0.45	0
Outstanding bank credit (EUR)	7,158	35,847	0	19,498	66,528	0
Rel. costs of bank credit (cond. on credit)	0.07	0.08	0	0.07	0.06	0
Distressed exit	0.004	0.067	0	0.003	0.055	0
Home equity (EUR)	0	0	0	13,021	16,116	9,500
Household income (EUR)	40,314	34,294	32,602	72,217	56,507	60,500
Value bonds of the household (EUR)	564	19,384	0	3266	57,806	0
Total shareholdings of the household (EUR)	6,343	194,267	0	35,684	436,930	0
Immovable assets excl first home (EUR)	9,885	80,598	0	32,186	140,525	0
Entrepreneurial wealth of the (EUR)	10,801	52,486	3,758	28,245	86,141	11,453
Other debt (EUR)	4,402	52,887	0	17,577	114,032	0
Age (years)	44	11	45	46	10	46
Fraction of men (0-1)	1	0	1	1	0	1
Fraction with registered partnership (0-1)	0.6	0.5	1	0.8	0.4	1
Fraction with children (0-1)	0.4	0.5	0	0.6	0.5	1
Fraction married (0-1)	0.4	0.5	0	0.6	0.5	1
Fraction of Tenants (0-1)	1.0	0.0	1	0	0	0
Fraction of LTV 0-10 (0-1)	0	0	0	0.10	0.31	0
Fraction of LTV 10-20 (0-1)	0	0	0	0.05	0.23	0
Fraction of LTV 20-30 (0-1)	0	0	0	0.07	0.25	0
Fraction of LTV 30-40 (0-1)	0	0	0	0.08	0.26	0
Fraction of LTV 40-50 (0-1)	0	0	0	0.08	0.27	0
Fraction of LTV 50-60 (0-1)	0	0	0	0.08	0.27	0
Fraction of LTV 60-70 (0-1)	0	0	0	0.08	0.27	0
Fraction of LTV 70-80 (0-1)	0	0	0	0.08	0.27	0
Fraction of LTV 80-90 (0-1)	0	0	0	0.08	0.28	0
Fraction of LTV 90-100 (0-1)	0	0	0	0.09	0.28	0
Fraction of LTV 100-110 (0-1)	0	0	0	0.09	0.28	0
Fraction of LTV 110-120 (0-1)	0	0	0	0.07	0.26	0
Fraction of LTV 120-130 (0-1)	0	0	0	0.05	0.21	0
Observations		308,529			1,013,797	

Note. The table shows the descriptive statistics for the sample of the estimation in Equation 1 split into renters and homeowners.

Table A.2: Descriptive statistics - by lending status

	Credit			No Credit		
	Mean	Standard Dev.	Median	Mean	Standard Dev.	Median
Total outstanding credit (mln €)	3,157	215	3,128	3,110	211	3,128
Fraction of bank credit (0-1)	1.00	0.00	1	0.00	0.00	0
Outstanding bank credit (€)	60,882	104,568	22,390	0	0	0
Rel. costs of bank credit (cond. on credit)	0.07	0.07	0	0	0	0
Distressed exit	0.002	0.045	0	0.004	0.062	0
Home equity (€)	10,680	14,867	5,859	9,721	15,244	3,500
Household income (€)	59,620	47,383	49,969	66,708	56,021	55,143
Value bonds of the household (€)	1,116	43,214	0	3,206	54,256	0
Total shareholdings of the household (€)	13,387	258,255	0	34,639	434,138	0
Immovable assets excl first home (€)	32,265	123,164	0	25,000	131,611	0
Entrepreneurial wealth of the household (€)	17,891	106,613	3,117	26,534	67,052	10,294
Other debt (€)	15,389	79,946	0	14,170	110,691	0
Age (years)	46	10	46	45	10	45
Fraction of men (0-1)	1	0	1	1	0	1
Fraction with registered partnership (0-1)	0.8	0.4	1	0.8	0.4	1
Fraction with children (0-1)	0.6	0.5	1	0.5	0.5	1
Fraction married (0-1)	0.6	0.5	1	0.6	0.5	1
Fraction of Tenants (0-1)	0.2	0.4	0	0.2	0.4	0
Fraction of LTV 0-10 (0-1)	0.08	0.27	0	0.08	0.27	0
Fraction of LTV 10-20 (0-1)	0.05	0.21	0	0.04	0.20	0
Fraction of LTV 20-30(0-1)	0.06	0.24	0	0.05	0.22	0
Fraction of LTV 30-40 (0-1)	0.07	0.25	0	0.05	0.23	0
Fraction of LTV 40-50 (0-1)	0.07	0.25	0	0.06	0.23	0
Fraction of LTV 50-60 (0-1)	0.07	0.25	0	0.06	0.23	0
Fraction of LTV 60-70 (0-1)	0.07	0.25	0	0.06	0.24	0
Fraction of LTV 70-80 (0-1)	0.07	0.25	0	0.06	0.24	0
Fraction of LTV 80-90 (0-1)	0.07	0.25	0	0.06	0.24	0
Fraction of LTV 90-100 (0-1)	0.07	0.25	0	0.07	0.25	0
Fraction of LTV 100-110 (0-1)	0.07	0.25	0	0.07	0.25	0
Fraction of LTV 110-120 (0-1)	0.05	0.22	0	0.06	0.23	0
Fraction of LTV 120-130(0-1)	0.03	0.17	0	0.04	0.19	0
Observations		360,948			961,378	

Note. The table shows descriptive statistics for the sample of the estimation in Equation 1 split into entrepreneurs with and without bank credit.

Appendix B Additional Results

This appendix shows the full regression estimates of all estimated specifications and dependent variables. All tables are similarly structured. The first column contains a basic specification with only year fixed effects. The second column shows the specification that includes all control variables in the matrix Z (see Equation 1 for a description of these variables). The third column includes regional fixed effects on the level of the local labour market. The fourth and fifth columns show the regression results presented in the figures of the main text.

B.1 Additional Results to Section 5

Table B.1: Probability of bank credit, homeowners

	(1)	(2)	(3)	(4)	(5)
	b/se	b/se	b/se	b/se	b/se
LTV 0-10	-0.004	0.011*	-0.018***	-0.019***	-0.013
	0.004	0.005	0.004	0.004	0.008
LTV 10-20	0.035***	0.040***	0.016***	0.015***	-0.008
	0.003	0.005	0.004	0.004	0.007
LTV 20-30	0.028***	0.031***	0.010**	0.010*	-0.002
	0.003	0.004	0.004	0.004	0.006
LTV 30-40	0.037***	0.037***	0.019***	0.018***	-0.005
	0.003	0.004	0.004	0.004	0.006
LTV 40-50	0.036***	0.035***	0.019***	0.019***	-0.005
	0.003	0.004	0.003	0.003	0.005
LTV 50-60	0.031***	0.026***	0.012***	0.012***	-0.004
	0.003	0.003	0.003	0.003	0.005
LTV 60-70	0.034***	0.026***	0.016***	0.015***	-0.002
	0.003	0.003	0.003	0.003	0.005
LTV 70-80	0.031***	0.024***	0.016***	0.016***	-0.002
	0.003	0.003	0.003	0.003	0.004
LTV 80-90	0.015***	0.010***	0.005*	0.005*	-0.003
	0.003	0.003	0.003	0.003	0.004
LTV 90-100	0.011***	0.008**	0.006*	0.006*	-0.005
	0.003	0.003	0.003	0.003	0.003
LTV 100-110	0.007**	0.005*	0.005*	0.005	-0.006*
	0.003	0.003	0.003	0.003	0.003
LTV 110-120	0.003	0.003	0.003	0.002	-0.004
	0.003	0.003	0.003	0.003	0.002
No. of observations	1,020,222	1,013,797	1,013,797	1,013,797	918,825
Adjusted R^2	0.017	0.106	0.114	0.114	0.729
Cluster		Labour market × year			
Year FE	YES	YES	YES	YES	NO
Controls	NO	YES	YES	YES	YES
Local FE	NO	NO	YES	NO	NO
Firm FE	NO	NO	NO	NO	YES
Year x local FE	NO	NO	NO	YES	YES

Note. The table presents estimates of linear probability models. The dependent variable takes the value of '1' if firms have bank credit on their balance sheet in a specific year. Reference category is the group of homeowners with LTV ratios of between 120% and 130%. Control variables are household income, marital status, partner status, gender, an indicator variable on whether the household includes children, the absolute level of home equity and year dummies. Robust standard errors are clustered on the level of 240 local labour market and year combinations. *** p<0.01, ** p<0.05, * p<0.10

Table B.2: Propensity to have bank credit, homeowners vs renters

	(1)	(2)	(3)	(4)	(5)
	b/se	b/se	b/se	b/se	b/se
Renters $\times \mathbb{1}(year > 2008)$	0.034*	0.030*	0.024*	0.020*	-0.016
	0.014	0.012	0.010	0.009	0.008
LTV 0-10 $\times \mathbb{1}(year > 2008)$	0.067***	0.064***	0.060***	0.059***	-0.012
	0.011	0.010	0.009	0.009	0.009
LTV 10-20 $\times \mathbb{1}(year > 2008)$	0.058***	0.053***	0.046***	0.046***	-0.014
	0.010	0.010	0.009	0.009	0.008
LTV 20-30 $\times \mathbb{1}(year > 2008)$	0.056***	0.053***	0.047***	0.047***	-0.011
	0.010	0.010	0.009	0.009	0.009
LTV 30-40 $\times \mathbb{1}(year > 2008)$	0.049***	0.045***	0.039***	0.038***	-0.013
	0.010	0.009	0.009	0.009	0.009
LTV 40-50 $\times \mathbb{1}(year > 2008)$	0.051***	0.046***	0.040***	0.039***	-0.009
	0.010	0.009	0.008	0.008	0.009
LTV 50-60 $\times \mathbb{1}(year > 2008)$	0.044***	0.040***	0.034***	0.033***	-0.005
	0.009	0.009	0.008	0.008	0.008
LTV 60-70 $\times \mathbb{1}(year > 2008)$	0.050***	0.046***	0.041***	0.040***	0.000
	0.010	0.009	0.009	0.009	0.009
LTV 70-80 $\times \mathbb{1}(year > 2008)$	0.042***	0.038***	0.032**	0.031**	0.001
	0.011	0.011	0.010	0.010	0.009
LTV 80-90 $\times \mathbb{1}(year > 2008)$	0.040***	0.032***	0.025**	0.024**	-0.006
	0.010	0.009	0.008	0.008	0.009
LTV 90-100 $\times \mathbb{1}(year > 2008)$	0.035***	0.028**	0.023**	0.021*	0.001
	0.010	0.009	0.008	0.008	0.008
LTV 100-110 $\times \mathbb{1}(year > 2008)$	0.025*	0.016	0.012	0.011	-0.001
	0.010	0.010	0.009	0.009	0.009
LTV 110-120 $\times \mathbb{1}(year > 2008)$	0.017	0.012	0.009	0.009	0.012
	0.011	0.010	0.010	0.010	0.010
No. of observations	1,331,673	1,322,326	1,322,326	1,322,326	1,188,613
Adjusted R^2	0.021	0.099	0.107	0.107	0.713
Cluster		Labour market $\times$ year			
Year FE	YES	YES	YES	YES	NO
Controls	NO	YES	YES	YES	YES
Local FE	NO	NO	YES	NO	NO
Firm FE	NO	NO	NO	NO	YES
Year x local FE	NO	NO	NO	YES	YES

Note. The table presents estimates of linear probability models. The dependent variable takes the value of '1' if firms have bank credit on their balance sheet in a specific year. Reference category is the group of homeowners with LTV ratios of between 120% and 130%. Control variables are household income, marital status, partner status, gender, an indicator variable on whether the household includes children, the absolute level of home equity and year dummies. Robust standard errors are clustered on the level of 240 local labour market and year combinations. *** p<0.01, ** p<0.05, * p<0.10

Table B.3: Relative costs of credit, homeowners

	(1)	(2)	(3)	(4)	(5)
	b/se	b/se	b/se	b/se	b/se
LTV 0-10	-0.019***	-0.015***	-0.014***	-0.014***	-0.020***
	0.001	0.001	0.001	0.001	0.003
LTV 10-20	-0.017***	-0.014***	-0.013***	-0.013***	-0.020***
	0.001	0.001	0.001	0.001	0.002
LTV 20-30	-0.016***	-0.014***	-0.013***	-0.013***	-0.018***
	0.001	0.001	0.001	0.001	0.002
LTV 30-40	-0.015***	-0.013***	-0.012***	-0.012***	-0.020***
	0.001	0.001	0.001	0.001	0.002
LTV 40-50	-0.010***	-0.009***	-0.008***	-0.008***	-0.020***
	0.001	0.001	0.001	0.001	0.002
LTV 50-60	-0.010***	-0.008***	-0.008***	-0.008***	-0.018***
	0.001	0.001	0.001	0.001	0.002
LTV 60-70	-0.009***	-0.008***	-0.007***	-0.007***	-0.017***
	0.001	0.001	0.001	0.001	0.002
LTV 70-80	-0.008***	-0.007***	-0.006***	-0.006***	-0.016***
	0.001	0.001	0.001	0.001	0.002
LTV 80-90	-0.005***	-0.004***	-0.004***	-0.004***	-0.015***
	0.001	0.001	0.001	0.001	0.001
LTV 90-100	-0.004***	-0.003***	-0.003***	-0.003***	-0.012***
	0.001	0.001	0.001	0.001	0.001
LTV 100-110	-0.002	-0.001	-0.001	-0.001	-0.010***
	0.001	0.001	0.001	0.001	0.001
LTV 110-120	-0.001	-0.001	-0.000	-0.000	-0.006***
	0.001	0.001	0.001	0.001	0.001
Observations	270,898	269,515	269,515	269,515	239,977
Adjusted R^2	0.029	0.041	0.042	0.042	0.428
Cluster			Labour market × year		
Year FE	YES	YES	YES	YES	NO
Controls	NO	YES	YES	YES	YES
Local FE	NO	NO	YES	NO	NO
Firm FE	NO	NO	NO	NO	YES
Year x local FE	NO	NO	NO	YES	YES

Note. The table shows results from OLS estimates. The dependent variable is the relative costs of bank credit. Reference category is the group of homeowners with LTV ratios of between 120% and 130%. Control variables are household income, marital status, partner status, gender, an indicator variable on whether the household includes children, the absolute level of home equity and year dummies. Robust standard errors are clustered on the level of 240 local labour market and year combinations. *** p<0.01, ** p<0.05, * p<0.10

Table B.4: Relative costs of credit, homeowners vs renters

	(1)	(2)	(3)	(4)	(5)
	b/se	b/se	b/se	b/se	b/se
Renters $\times \mathbb{1}(year > 2008)$	-0.003	-0.002	-0.002	-0.002	-0.005
	0.002	0.002	0.002	0.002	0.003
LTV 0-10 $\times \mathbb{1}(year > 2008)$	-0.017***	-0.017***	-0.017***	-0.017***	-0.020***
	0.002	0.002	0.002	0.002	0.003
LTV 10-20 $\times \mathbb{1}(year > 2008)$	-0.015***	-0.014***	-0.014***	-0.014***	-0.018***
	0.002	0.002	0.002	0.002	0.003
LTV 20-30 $\times \mathbb{1}(year > 2008)$	-0.015***	-0.015***	-0.015***	-0.015***	-0.018***
	0.002	0.002	0.002	0.002	0.003
LTV 30-40 $\times \mathbb{1}(year > 2008)$	-0.012***	-0.012***	-0.012***	-0.012***	-0.016***
	0.003	0.002	0.002	0.002	0.003
LTV 40-50 $\times \mathbb{1}(year > 2008)$	-0.012***	-0.012***	-0.012***	-0.012***	-0.014***
	0.002	0.002	0.002	0.002	0.003
LTV 50-60 $\times \mathbb{1}(year > 2008)$	-0.010***	-0.009***	-0.009***	-0.009***	-0.012***
	0.002	0.002	0.002	0.002	0.003
LTV 60-70 $\times \mathbb{1}(year > 2008)$	-0.008***	-0.008***	-0.008***	-0.008***	-0.011***
	0.002	0.002	0.002	0.002	0.003
LTV 70-80 $\times \mathbb{1}(year > 2008)$	-0.007**	-0.007**	-0.007**	-0.007**	-0.010***
	0.002	0.002	0.002	0.002	0.003
LTV 80-90 $\times \mathbb{1}(year > 2008)$	-0.006*	-0.006*	-0.006*	-0.006*	-0.009**
	0.002	0.002	0.002	0.002	0.003
LTV 90-100 $\times \mathbb{1}(year > 2008)$	-0.006*	-0.006*	-0.006*	-0.006*	-0.007*
	0.002	0.002	0.002	0.002	0.003
LTV 100-110 $\times \mathbb{1}(year > 2008)$	-0.003	-0.003	-0.003	-0.003	-0.007**
	0.002	0.002	0.002	0.002	0.002
LTV 110-120 $\times \mathbb{1}(year > 2008)$	-0.004	-0.004	-0.004	-0.004	-0.001
	0.003	0.003	0.003	0.003	0.003
Observations	333,571	331,641	331,641	331,641	292,300
Adjusted R^2	0.034	0.044	0.045	0.045	0.424
Cluster		Labour market $\times$ year			
Year FE	YES	YES	YES	NO	YES
Controls	NO	YES	YES	YES	YES
Local FE	NO	NO	YES	NO	NO
Firm FE	NO	NO	NO	NO	YES
Year x local FE	NO	NO	NO	YES	NO

Note. The table reports results of OLS estimates. The dependent variable is the relative costs of bank credit. Reference category is the group of homeowners with LTV ratios of between 120% and 130%. Control variables are household income, marital status, partner status, gender, an indicator variable on whether the household includes children, the absolute level of home equity and year dummies. Robust standard errors are clustered on the level of 240 local labour market and year combinations. *** p<0.01, ** p<0.05, * p<0.10

Table B.5: Distressed firm exit, homeowners

	(1)	(2)	(3)	(4)	(5)
	b/se	b/se	b/se	b/se	b/se
LTV 0-10	-0.003***	-0.002***	-0.002***	-0.002***	-0.004***
	0.000	0.000	0.000	0.000	0.001
LTV 10-20	-0.005***	-0.003***	-0.003***	-0.003***	-0.003**
	0.000	0.000	0.000	0.000	0.001
LTV 20-30	-0.004***	-0.002***	-0.002***	-0.002***	-0.003***
	0.000	0.000	0.000	0.000	0.001
LTV 30-40	-0.003***	-0.002***	-0.002***	-0.002***	-0.002*
	0.000	0.000	0.000	0.000	0.001
LTV 40-50	-0.003***	-0.002***	-0.002***	-0.002***	-0.003**
	0.000	0.000	0.000	0.000	0.001
LTV 50-60	-0.002***	-0.002***	-0.002***	-0.002***	-0.003**
	0.000	0.000	0.000	0.000	0.001
LTV 60-70	-0.002***	-0.002***	-0.002***	-0.002***	-0.003***
	0.000	0.000	0.000	0.000	0.001
LTV 70-80	-0.002***	-0.002***	-0.002***	-0.002***	-0.003***
	0.000	0.000	0.000	0.000	0.001
LTV 80-90	-0.002***	-0.001***	-0.001***	-0.001***	-0.003***
	0.000	0.000	0.000	0.000	0.001
LTV 90-100	-0.001**	-0.001***	-0.001***	-0.001***	-0.003***
	0.000	0.000	0.000	0.000	0.001
LTV 100-110	-0.001*	-0.001**	-0.001**	-0.001**	-0.003***
	0.000	0.000	0.000	0.000	0.001
LTV 110-120	-0.000	-0.000	-0.000	-0.000	-0.002***
	0.000	0.000	0.000	0.000	0.000
No. of observations	1,020,222	1,013,797	1,013,797	1,013,797	918,825
Adjusted R^2	0.000	0.002	0.002	0.002	0.160
Cluster		Labour market × year			
Year FE	YES	YES	YES	YES	NO
Controls	NO	YES	YES	YES	YES
Local FE	NO	NO	YES	NO	NO
Firm FE	NO	NO	NO	NO	YES
Year x local FE	NO	NO	NO	YES	YES

Note. The table reports results of OLS estimates. The dependent variable takes the value of '1' one if a firm exits in a given year proceeded by 2 years of negative profits. Reference category is the group of homeowners with LTV ratios of between 120% and 130%. Control variables are household income, marital status, partner status, gender, an indicator variable on whether the household includes children, the absolute level of home equity and year dummies. Robust standard errors are clustered on the level of 240 local labour market and year combinations. *** p<0.01, ** p<0.05, * p<0.10

Table B.6: Distressed firm exit - homeowners vs. renters

	(1)	(2)	(3)	(4)	(5)
	b/se	b/se	b/se	b/se	b/se
Renters $\times \mathbb{1}(year > 2008)$	-0.003*	-0.001	-0.001	-0.001	-0.001
	0.001	0.001	0.001	0.001	0.001
LTV 0-10 $\times \mathbb{1}(year > 2008)$	-0.002	-0.001	-0.001	-0.001	-0.002
	0.001	0.001	0.001	0.001	0.001
LTV 10-20 $\times \mathbb{1}(year > 2008)$	-0.001	-0.001	-0.001	-0.001	-0.003*
	0.001	0.001	0.001	0.001	0.001
LTV 20-30 $\times \mathbb{1}(year > 2008)$	-0.000	-0.000	-0.000	-0.000	-0.001
	0.001	0.001	0.001	0.001	0.001
LTV 30-40 $\times \mathbb{1}(year > 2008)$	-0.001	-0.000	-0.000	-0.000	-0.001
	0.001	0.001	0.001	0.001	0.001
LTV 40-50 $\times \mathbb{1}(year > 2008)$	-0.002	-0.001	-0.001	-0.001	-0.002
	0.001	0.001	0.001	0.001	0.001
LTV 50-60 $\times \mathbb{1}(year > 2008)$	-0.002	-0.002	-0.002	-0.002	-0.001
	0.001	0.001	0.001	0.001	0.001
LTV 60-70 $\times \mathbb{1}(year > 2008)$	-0.002	-0.002	-0.002	-0.002	-0.001
	0.001	0.001	0.001	0.001	0.001
LTV 70-80 $\times \mathbb{1}(year > 2008)$	-0.001	-0.001	-0.001	-0.001	-0.002
	0.001	0.001	0.001	0.001	0.001
LTV 80-90 $\times \mathbb{1}(year > 2008)$	-0.003*	-0.002	-0.002	-0.002	-0.002
	0.001	0.001	0.001	0.001	0.001
LTV 90-100 $\times \mathbb{1}(year > 2008)$	-0.004**	-0.002	-0.002	-0.002	-0.001
	0.001	0.001	0.001	0.001	0.001
LTV 100-110 $\times \mathbb{1}(year > 2008)$	-0.003*	-0.001	-0.001	-0.002	-0.001
	0.001	0.001	0.001	0.001	0.001
LTV 110-120 $\times \mathbb{1}(year > 2008)$	-0.001	0.000	0.000	0.000	-0.001
	0.001	0.001	0.001	0.001	0.001
No. of observations	1,331,673	1,322,326	1,322,326	1,322,326	1,188,613
Adjusted R^2	0.001	0.002	0.002	0.002	0.163
Cluster		Labour market $\times$ year			
Year FE	YES	YES	YES	YES	NO
Controls	NO	YES	YES	YES	YES
Local FE	NO	NO	YES	NO	NO
Firm FE	NO	NO	NO	NO	YES
Year x local FE	NO	NO	NO	YES	YES

Note. The table reports results of OLS estimates. The dependent takes the value of '1' if a firm exits in a given year proceeded by 2 years of negative profits. Reference category is the group of homeowners with LTV ratios of between 120% and 130%. Control variables are household income, marital status, partner status, gender, an indicator variable on whether the household includes children, the absolute level of home equity and year dummies. Robust standard errors are clustered on the level of 240 local labour market and year combinations. *** p<0.01, ** p<0.05, * p<0.10

B.2 Additional results to Section 5.4

Table B.7: Probability of have bank credit, homeowners with imputed LTV ratios

	(1)	(2)	(3)	(4)	(5)
	b/se	b/se	b/se	b/se	b/se
LTV 0-10	-0.025***	0.004	0.004	-0.028***	0.022**
	0.005	0.006	0.006	0.005	0.008
LTV 10-20	0.017***	0.034***	0.034***	0.008	0.019*
	0.005	0.006	0.006	0.005	0.008
LTV 20-30	0.015***	0.028***	0.028***	0.006	0.024***
	0.004	0.005	0.005	0.005	0.007
LTV 30-40	0.026***	0.036***	0.036***	0.016***	0.023***
	0.004	0.005	0.005	0.005	0.007
LTV 40-50	0.027***	0.034***	0.034***	0.018***	0.022***
	0.004	0.004	0.004	0.004	0.006
LTV 50-60	0.023***	0.025***	0.025***	0.011*	0.019**
	0.004	0.004	0.004	0.004	0.006
LTV 60-70	0.029***	0.028***	0.028***	0.017***	0.021***
	0.004	0.004	0.004	0.004	0.006
LTV 70-80	0.027***	0.025***	0.025***	0.017***	0.019***
	0.004	0.004	0.004	0.004	0.005
LTV 80-90	0.013***	0.012**	0.012**	0.007*	0.015**
	0.004	0.004	0.004	0.004	0.004
LTV 90-100	0.010**	0.009*	0.009*	0.007*	0.013**
	0.004	0.004	0.004	0.004	0.004
LTV 100-110	0.005	0.004	0.004	0.004	0.007*
	0.004	0.003	0.003	0.003	0.003
LTV 110-120	0.008*	0.008*	0.008*	0.008*	0.008**
	0.004	0.004	0.004	0.004	0.003
No. of observations	712,466	708,877	708,877	708,877	657,358
Adjusted R^2	0.014	0.104	0.104	0.113	0.748
Cluster			Labour market × year		
Year FE	YES	YES	YES	YES	NO
Controls	NO	YES	YES	YES	YES
Local FE	NO	NO	YES	NO	NO
Firm FE	NO	NO	NO	NO	YES
Year x local FE	NO	NO	NO	YES	YES

Note. The table shows results from linear probability models. The dependent variable takes the value one if a firm has bank credit on its balance sheet in a specific year. Reference category is the group of homeowners with LTV ratios of between 120% and 130%. Control variables are household income, marital status, partner status, gender, an indicator variable on whether the household includes children, the absolute level of home equity and year dummies. Robust standard errors are clustered on the level of 240 local labour market and year combinations. *** p<0.01, ** p<0.05, * p<0.10

Table B.8: Relative costs of credit, homeowners with imputed LTV ratios

	(1)	(2)	(3)	(4)	(5)
	b/se	b/se	b/se	b/se	b/se
LTV 0-10	-0.028***	-0.022***	-0.021***	-0.021***	-0.013***
	0.001	0.001	0.001	0.001	0.003
LTV 10-20	-0.026***	-0.022***	-0.021***	-0.021***	-0.014***
	0.001	0.001	0.001	0.001	0.003
LTV 20-30	-0.025***	-0.021***	-0.020***	-0.020***	-0.012***
	0.001	0.001	0.001	0.001	0.003
LTV 30-40	-0.022***	-0.019***	-0.018***	-0.018***	-0.012***
	0.001	0.001	0.001	0.001	0.002
LTV 40-50	-0.018***	-0.016***	-0.015***	-0.015***	-0.012***
	0.001	0.001	0.001	0.001	0.002
LTV 50-60	-0.016***	-0.014***	-0.013***	-0.013***	-0.010***
	0.001	0.001	0.001	0.001	0.002
LTV 60-70	-0.014***	-0.013***	-0.012***	-0.012***	-0.011***
	0.001	0.001	0.001	0.001	0.002
LTV 70-80	-0.013***	-0.011***	-0.011***	-0.011***	-0.010***
	0.001	0.001	0.001	0.001	0.002
LTV 80-90	-0.011***	-0.009***	-0.009***	-0.009***	-0.010***
	0.001	0.001	0.001	0.001	0.002
LTV 90-100	-0.007***	-0.006***	-0.006***	-0.006***	-0.008***
	0.001	0.001	0.001	0.001	0.002
LTV 100-110	-0.005***	-0.005***	-0.005***	-0.005***	-0.007***
	0.001	0.001	0.001	0.001	0.001
LTV 110-120	-0.003*	-0.003*	-0.003*	-0.003*	-0.004**
	0.001	0.001	0.001	0.001	0.001
Observations	182,552	181,814	181,814	181,814	165,788
Adjusted R^2	0.033	0.047	0.049	0.049	0.464
Cluster			Labour market × year		
Year FE	YES	YES	YES	YES	NO
Controls	NO	YES	YES	YES	YES
Local FE	NO	NO	YES	NO	NO
Firm FE	NO	NO	NO	NO	YES
Year x local FE	NO	NO	NO	YES	YES

Note. The table shows results from OLS estimates. The dependent variable is the relative costs of bank credit. Reference category is the group of homeowners with LTV ratios of between 120% and 130%. Control variables are household income, marital status, partner status, gender, an indicator variable on whether the household includes children, the absolute level of home equity and year dummies. Robust standard errors are clustered on the level of 240 local labour market and year combinations. *** p<0.01, ** p<0.05, * p<0.10

Table B.9: Distressed firm exit, homeowners with imputed LTV ratios

	(1)	(2)	(3)	(4)	(5)
	b/se	b/se	b/se	b/se	b/se
LTV 0-10	-0.004***	-0.002***	-0.002***	-0.002***	-0.003**
	0.000	0.001	0.001	0.001	0.001
LTV 10-20	-0.005***	-0.003***	-0.003***	-0.003***	-0.003*
	0.000	0.001	0.001	0.001	0.001
LTV 20-30	-0.004***	-0.003***	-0.003***	-0.003***	-0.003**
	0.000	0.000	0.000	0.000	0.001
LTV 30-40	-0.003***	-0.002***	-0.002***	-0.002***	-0.003**
	0.000	0.001	0.001	0.001	0.001
LTV 40-50	-0.003***	-0.002***	-0.002***	-0.002***	-0.003**
	0.000	0.000	0.000	0.000	0.001
LTV 50-60	-0.003***	-0.002***	-0.002***	-0.002***	-0.002*
	0.000	0.000	0.000	0.000	0.001
LTV 60-70	-0.003***	-0.002***	-0.002***	-0.002***	-0.002**
	0.001	0.000	0.000	0.000	0.001
LTV 70-80	-0.002***	-0.002***	-0.002***	-0.002***	-0.002**
	0.001	0.000	0.000	0.000	0.001
LTV 80-90	-0.002***	-0.002***	-0.002***	-0.002***	-0.003***
	0.001	0.000	0.000	0.000	0.001
LTV 90-100	-0.002**	-0.001**	-0.001**	-0.001**	-0.002**
	0.001	0.000	0.000	0.000	0.001
LTV 100-110	-0.001*	-0.001*	-0.001*	-0.001*	-0.002**
	0.001	0.000	0.000	0.000	0.001
LTV 110-120	-0.001	-0.001	-0.001	-0.001	-0.001*
	0.001	0.001	0.001	0.001	0.001
No. of observations	712,466	708,877	708,877	708,877	657,358
Adjusted R^2	0.000	0.002	0.002	0.002	0.135
Cluster		Labour market × year			
Year FE	YES	YES	YES	YES	NO
Controls	NO	YES	YES	YES	YES
Local FE	NO	NO	YES	NO	NO
Firm FE	NO	NO	NO	NO	YES
Year x local FE	NO	NO	NO	YES	YES

Note. The table shows results from OLS estimates. The dependent takes the value of '1' if a firm exits in a given year preceded by 2 years of negative profits. Reference category is the group of homeowners with LTV ratios of between 120% and 130%. Control variables are household income, marital status, partner status, gender, an indicator variable on whether the household includes children, the absolute level of home equity and year dummies. Robust standard errors are clustered on the level of 240 local labour market and year combinations. *** p<0.01, ** p<0.05, * p<0.10

Appendix C Construction of the Data Set

This appendix describes the construction process of our core data set. Our final data set results from a merging process of more than 10 independent administrative data sets.

1. We started with a registry data set 'ZELFSTANDIGENTAB' from the years 2007 to 2013, containing all self-employed individuals in the Netherlands.
2. We merged this data set with a person-specific identifier, using 'ZELFSTANDIGENKOPPEL' to match information on firms to individuals.
3. We merged these data with a building-specific identifier in the data set 'GBADRESSOBJECTBUS'.
4. We added information on housing value in the data set 'EIGENDOMWOZTAB'.
5. We added information on legal entity using the general nation-wide company register ('ABR'). We limited our sample to only include sole-proprietors.
6. We merged this data set with a tailor-made data set that contained the balance sheet information of all sole-proprietors. The most important variables are outstanding bank credit and the costs of outstanding bank credit.
7. We added information on household composition and marital status using 'GBAHUISHOUDENBUS'.
8. We used 'GBAPERSOONSTAB2014' to add personal information on the head of the household, such as age and gender.
9. We further augmented these data with information on annual household income and financial wealth in the data sets 'IHI' and 'IVB' from the years 2007 to 2014. All information was backdated to the situation on 31 December of each respective year. This means, for instance, that information on wealth from 1 January 2014 was backdated to the year 2013.
10. In this step, we added information on the postal code areas of the respective residences of the self-employed ('VSLGWB'). This produced a baseline unbalanced panel data set of $3,474,879$ firm-year observations.
11. Subsequently, we cleaned the data set in several ways. This process is shown in Table C.1

Table C.1: Construction of an unbalanced panel of sole-proprietorships

	Selection description	N×T	Unique firms
1	Raw, fully merged data: Full population of sole-proprietors who file tax returns that combine their business and personal income statement, merged with information on housheold composition [GBAHUISHOUDENBUS], address [GBAADRESOBJECTBUS], house value [EIGENDOWOZTAB], household income [IHI], household balance sheet [IVB] and general company register [ABR]. Identifiers are: individual id (variable names: rinpersoon, rinpersoons), building (rinobjectnummer, soortobjectnummer), tax identifier (vep_finr).	3,474,879	856,416
2	Focus on entrepreneurs between 21 and 65 years of age	3,325,607	831,772
3	Exclude buildings that are not indicated as private *first* homes	3,210,184	811,461
4	Exclude sectors fewer than 500 year-individual observations	3,208,731	811,038
5	Exclude households with more than 4 bread winners and those that do not have the business as their main source of income	3,117,149	798,567
6	Exclude households with negative incomes	2,998,519	783,179
7	Exclude individuals whom housing status we could not identify and homeowners for whome LTV ratios were missing	2,976,451	781,285
8	Exclude: entrepreneurs who change from being homeowner to becoming a renter (and vice versa)	2,398,224	667,258
9	Exclude residential moves	2,134,949	613,738
10	Exclude house values below 100*k* & LTV ratios in 2007 of more than 140%	2,079,357	592,809
11	Exclude renters with a mortgage debt & those for whom housing status could not be identified	2,023,149	580,977
12	Exclude increases in mortgages & LTV ratios greater than 130%	1,889,810	560,491
13	Exclude entrepreneurs which flow out of the sample and back into the sample	1,529,789	478,167
14	Exclude entreprenuers with bank credit of more than EUR 1 million	1,331,643	410,882