

Are Credit Constraints Important among Self Employed?

Søren Leth-Petersen, University of Copenhagen and SFI

Ramana Nanda, Harvard Business School

Abstract

Credit constraints are often referred to as one of the main impediments to firm growth, but the empirical literature has provided no clear evidence about the importance of such constraints. This paper investigates if firm performance of self-employed house owners is affected by an exogenous increase in access to credit provided by a credit market reform that in 1992 for the first time enabled Danish house owners to use housing equity as collateral for non-housing purposes. The analysis is based on administrative register data with information about firm activity, income and wealth for 75,000 business owners. We find that young business owners who were likely to be constrained but had substantial housing equity when the reform was enacted extracted more equity than business owners who were unlikely to be constrained. We find no effects on firm activity and that the equity extracted was used for consumption and/or for building up a financial reserve.

1. Introduction

In both the US and in Europe more than 90% of all businesses are small business, i.e. businesses with less than 50 employees. They employ a significant fraction of the private sector workforce. In the EU 50% of the private sector workforce is employed in SBs while the corresponding number in the US is about 30%. SBs have gained much policy attention, in particular through credit policies created in the belief that such policies will create jobs and overcome market failures facing small businesses.

There is, however, widespread disagreement about the importance credit market imperfections for SB performance. A number of models suggest that firms enter small and then grow because of the fact that they face financing constraints (Cooley and Quadrini, 2001, Evans and Jovanovic 1989, Gentry and Hubbard 2004, Cabral and Mata 2004, Holtz-Eakin, Joulfaian and Rosen 1994; Cagetti and De Nardi 2006, Buera, Koboski and Shin, 2011; Rajan and Zingales 1998). On the other hand, others have argued that financing constraints are not salient for small businesses, particularly in advanced economies where firms have adequate access to capital markets. According to this view, individuals may become entrepreneurs because of productivity differences across entrepreneurs (Jovanovic, 1979; Hopenhayn 1992) or alternatively because they have a taste for entrepreneurship (Hamilton, 2000; Hurst and Lusardi, 2004; Puglsey, 2011). Hurst and Pugsley (2011) show that most small firms stay small and do not want to grow and conclude that entrepreneurship is a consumption good and claim that the importance of credit constraints are overstated

Testing for the importance of financing constraints for small businesses is notoriously difficult. This is because differences in individual wealth that may lead some individuals to become and remain entrepreneurs more so than others, and this may be confounded with omitted variables such as individual ability, a preference for being one's own boss, ability to access better informal financing networks and the like. In fact, even shocks to wealth, such as bequests, winning lotteries, do not identify the effect of credit constraints because a shock to individual wealth (even if it is exogenous) can change life time earnings and hence drive the decision to become an entrepreneur. Wealth effects are also a potential main driver when exploring windfall gains in the housing market as is done by Adelino, Schoar, Severino (2012). What is more, comparing the effect of differential house price growth across geographical locations also runs the risk of comparing business owners in environments with different demand growth which could influence both house prices and investment behavior. Other papers trying to circumvent these problems by exploiting institutional reforms to examine the entry and growth of businesses are typically unable to unpack the

heterogeneity among entrepreneurs to understand which types of entrepreneurs benefit from such reforms (Black and Strahan 2002, Kerr and Nanda 2009; Cetorelli and Strahan 2006).

The objective of this paper is to test whether the business activity of self-employed is affected by credit constraints. To do this we exploit a unique Danish credit market reform that in 1992 for the first time unlocked home equity for other uses than home investment. The advantage of measuring the effect of such a reform is that it exogenously changes access to credit without affecting wealth. Credit extraction and firm performance is documented using administrative tax records for the universe of Danish self-employed individuals covering the years around the reform. Data for firm performance are collected from VAT accounts that are merged with detailed income tax records providing a total overview over the income and wealth of each business owner.

We find that young business owners who before the reform were likely to be constrained and who had substantial housing equity when the reform was enacted extracted more equity than business owners who were unlikely to be constrained. We find no effect on firm activity, but we find that owners affected by constraints accumulated a financial reserve and possibly increased consumption. The next section explains the details of the credit market reform and other relevant details of the Danish institutional environment. In section three we present an illustrative theoretical structure laying out how the credit market reform is expected to impact the behavior of business owners. Section four presents the data and section five the results. The final section sums up and concludes.

2. The credit market reform and institutions

2.1 The Mortgage Reform

The Danish credit market reform took effect on 21 May 1992. The crucial elements of the reform for the purpose of this paper are that it was unanticipated¹ and that it introduced the possibility for house owners to establish mortgage loans for financing non-housing expenditure. The financing of real property in Denmark takes place via mortgage banks offering loans where the borrower's real property is used as collateral for the loan. It is possible to mortgage up to 80% of the property value. Real credit loans are typically associated with lower costs than loans established in commercial banks. The house owner needs to provide other financing for the remaining 20% of the value of the house. Loans through the mortgage banks are funded by the issue of callable mortgage credit bonds

¹ To check when the reform became public knowledge we have gone through all issues of a popular monthly magazine on personal finance (Penge og Privatøkonomi) for the period 1990-1993. This is the first place one would expect to find mention of such plans. The first time the reform is mentioned is in the June 1992 issue. This supports the notion that the introduction of the possibility of accessing housing equity for consumption really was a surprise to households.

with fixed coupon rates. The principal of the loan depends on the price of the underlying bond. When the bond price is below par, a higher number of bonds must be sold to meet the funding requirements. This typically makes the principal of the loan larger than the loan proceeds paid out. Before the reform mortgage loans based on bonds had a maximum maturity of up to 20 years and they could only to be used to finance real property.

The reform changed the rules about mortgaging in three ways. The most important here is that the reform introduced the possibility of using the proceeds from a mortgage loan for purposes other than financing real property, i.e. the reform introduced the possibility to using housing equity as collateral for loans established through mortgage banks where the proceeds can be used for, among other things, sustaining a business.² The May 1992 bill introduced a limit of 60% of the house value for loans for non-housing purposes. This limit was extended to 80% in December 1992. Another feature of the reform is that the maximum maturity of real credit loans was expanded from 20 to 30 years. For people who were already mortgaged to the limit prior to the reform, and who therefore could not establish additional mortgage loans for non-housing consumption, this option potentially provided the possibility of acquiring more liquidity.

The final element of the reform gave the option to refinance. Refinancing makes it possible for borrowers to lower the cost of the loan when the market interest rate falls. A borrower is entitled to redeem a real credit bond at par at any time prior to maturity by prepayment. This enables the borrower to exploit changes in the market rate of interest in order to reduce the costs of funding. If the interest rate falls, the borrower may prepay his loan, and raise a new mortgage loan at the lower coupon rate. This may lower his monthly payment, but may also imply a larger principal of the new loan relative to the old loan if the price of the bond underlying the new loan is below par. While the first two parts of the reform influence the access to credit, this part of the reform provides house owners with the option to lock in low market interest rates in order to obtain lower monthly payments on their mortgages and an overall gain in wealth.

In this paper the interest is in the first two elements of the reform providing access to extra credit. These two elements should only be exploited by firm owners who are affected by credit constraints in order to smooth consumption or to boost firma activity. All households, whether affected by constraints or not, are likely to benefit from the third element of the reform, the re-mortgaging option. This suggests a differences-in-differences empirical specification.

² Leth-Petersen (2010) has shown that the reform lead to increased consumption growth among young house owners.

2.1 Other institutional features

By default business owners are taxed as wage earners, but they have the option to choose a favorable taxation scheme for business owners, the so called firm taxation scheme allowing them to retain profits in the firm in order to avoid full income taxation.

In the regular income-tax scheme earned income and income withdrawn from a firm is taxed as personal income. The income-tax schedule in operation in the data period covered in this paper was progressive and implied that business owners who extracted income were taxed at a marginal tax rate of 43-65% depending on the level of income. The firm taxation scheme introduced in 1987 allows business owners to retain profits in the firm. In this case profits are subject to a temporary tax of 34%. Business owners taking advantage of this scheme have to keep accumulated profits in separate accounts that can only be accessed for business purposes. If funds are withdrawn for private consumption they are subject to final taxation, i.e. the temporary tax is reimbursed and the money are taxed as personal income.

We refer to le Maire and Schjerning (2012) for further details. The firm tax scheme gives a strong financial incentive to keep profits in the firm.

3. Conceptual framework

In this section we sketch a model of consumption/savings behavior of business owners. The model is intended to be illustrative and to direct attention to the relevant margins at which business owners would be affected by the credit market reform so as to guide the (reduced form) empirical analysis. The setup is closely connected to the work by Chah, Ramey and Starr (1995), Hurst and Stafford (2004), Alessie, Devereux and Weber (1997), and Browning and Crossley (2009), and Schjerning (2008).

The business owner is assumed to face the following intertemporal optimization problem

$$\max_{c_t, k_t, a_t} E_t \left[\sum_{l=0}^{\infty} \beta^l u(c_t) \right] \quad (1)$$

s.t.

$$a_t = (1+r)(a_{t-1} + \pi_t - c_t) \quad (2)$$

$$\pi_t = \theta k_t^\alpha - e_t \quad (3)$$

$$e_t = k_t - (1 - \delta)k_{t-1} \quad (4)$$

$$0 \leq A_t = a_t + \phi_{1t} + \phi_{2t} (p_t^H H_t - M_t) \quad (5)$$

$$H_t > 0 \quad (6)$$

(1) says that utility is derived from consumption over an infinite horizon. Equation (2) gives the period-to-period budget constraint; the household enters period t with liquid assets a_{t-1} earning returns r . Income is based on profits, π , from the firm, and c are consumption expenditures. Equation (3) is the profit function which is revenue, θk_t^α , as a function of inputs/capital, k_t , less the flow of capital, e_t , which is given by equation (4). Flow is given by purchase of inputs/capital less the depreciation of the existing stock. Equation (5) is central to the idea in this paper. It states that loans taken with housing as collateral should be within the limits of a constant ϕ_{1t} plus the ϕ_{2t} fraction of housing equity, $(p_t^H H_t - M_t)$. ϕ_{1t} is a parameter that indicates time varying access to credit. It may be a function of household specific characteristics, but cannot be a function of the choice variables in the optimization problem. ϕ_{2t} is a parameter that indicates the access to housing equity for consumption purposes. Before the reform $\phi_{2t} = 0$, and after the reform $\phi_{2t} = 1$ provided that $\phi_{2t} (p_t^H H_t - M_t) < 0.8 p_t^H H_t$, i.e. the household can maximally mortgage 80% of the total house value for non-housing expenditures^{3,4}. (6) states that we are only considering house owners.

³ Note, for a constant value of ϕ_{1t} (5) dictates that if p_t^H is decreasing then the consumer should pay back the part of the collateralized loan that exceeds the new and lower housing equity. House prices were actually decreasing in the period 1987-1993. ϕ_{1t} is allowed to vary across time so that lenders do not require this to happen. It is crucial, though, that changes in ϕ_{1t} are not a result of actions taken by the individual as part of his optimization problem.

⁴ In this way the model assumes that people do not have access to credit before the reform. In reality, people may have access to credit, but at higher lending rates, so that borrowing rates are exceeding lending rates by more before the reform than after. Analytically, the case where borrowing rates exceed lending rates is similar to the one developed here, see for example Browning and Lusardi (1996).

House prices steadily declined up to 1993 and started to increase drastically hereafter, see Leth-Petersen (2010). House price changes have two effects. First, they affect life time wealth to the extent the changes are perceived permanent. Second, house price changes imply changes in credit access in post reform years, and a house price increase can provide access to credit for households that did not have any housing equity before.

In order to derive simple expressions for the first order conditions assume that $r = \beta = \delta = 0$ and remove expectations operators. Denoting μ_t the shadow price of the collateralized loans constraint one of the first order conditions is the Euler equation for consumption (6)

$$\frac{\partial u_t}{\partial c_t} - \mu_t = \frac{\partial u_{t+1}}{\partial c_{t+1}} \quad (6)$$

(6) states that if the business owner is constrained in period t then marginal utility of consumption is higher in t than in $t+1$. If the utility function is monotone then this amounts to saying that consumption is lower in periods where the owner is constrained.

The firm owner maximizes profits in the firm by choosing the level of input/capital. The business owner can be in three different states:

$$\frac{d\pi_t}{dk_t} = \alpha\theta k_t^{\alpha-1} - 1 = 0 \Leftrightarrow k_t^1 = \left(\frac{1}{\alpha\theta}\right)^{\frac{1}{\alpha-1}} \quad (7)$$

$$k_t^2 < k_t^1 \leq a_t + \phi_{1t} + \phi_{2t} (p_t^H H_t - M_t) \quad (8)$$

$$k_t^3 = 0 \text{ if } \alpha\theta k_t^{\alpha-1} - 1 < 0 \quad (9)$$

(7) is the interior solution where the firm owner maximizes profits. (8) is the constrained solution where input/capital is limited by the constraint (5). (9) is the corner solution where business activity is not profitable and the firm owner opts out. The observed level is $k_t = \min(k_t^1, k_t^2, k_t^3)$.

The first order condition with respect to input/capital is given by

$$\frac{\partial u_t}{\partial c_t} (\alpha\theta k_t^{\alpha-1} - 1) + \frac{\partial u_{t+1}}{\partial c_{t+1}} = 0 \quad (10)$$

Equation (10) says that a unit extra capital input is valued in terms of its consumption value. Combining first order conditions (6) and (10) yields

$$\frac{\partial u_t}{\partial c_t} \left(1 + (\alpha \theta k_t^{\alpha-1} - 1) \right) = \mu_t \quad (11)$$

If the business owner is constrained then $(\alpha \theta k_t^{\alpha-1} - 1) > 0$ and if not then $(\alpha \theta k_t^{\alpha-1} - 1) = 0$, so that for a given level of μ a business owner operating a firm that is not at the profit maximizing optimum will depress consumption, i.e. inflate marginal utility, in order to minimize the adverse effect of the constraint on firm performance. Equation (11) thus says that when the constraint is relieved we should expect to see an increase in consumption and perhaps an increase in firm activity depending on whether the business owner has been able to reduce consumption sufficiently so as to free financial resources in order to reach the profit maximizing level of activity in the firm. We have ignored the role of uncertainty in this exposition. In that scenario constraints may affect current behavior even if constraints are not currently binding so as to motivate the business owner to accumulate financial reserves to buffer future adverse events.

4. Data

The empirical analysis is based on merged Danish administrative register data. The key variables are collected from the income-tax register and from the VAT records of personally owned firms. Besides this we use a host of other administrative registers with information about the usual battery of demographic information such as family composition, education, age etc.

The income-tax register data are collected for the period 1987-1996. The income tax register contain information about total taxable income and transfers, taxable wealth, and total final tax payments. The income and wealth information exists because Denmark had a wealth tax in this period. One notable feature of the register data is that the data on assets and liabilities can be divided into a number of categories. Unfortunately, the definitions of these categories are not stable across the observation period, and the level of detail decreases in the latest years of the sample period, particularly after the reform, for both assets and liabilities.

Up to 1992 assets are given in six different categories: housing assets, shares, deposited mortgage deeds, cash holdings, bonds, and other assets. Housing assets are defined as the cash value of property as set by the tax authorities. Tax assessed values potentially deviate from market prices

and we have therefore scaled house values with the annual ratio of sales to tax assessed values for traded houses at the municipal level. Shares, bonds, and deposited mortgage deeds contain the market value of each of these, respectively. Cash is cash in the bank. We only observed the sum of assets in these categories. No information is held about accumulated pension funds, but we observe contributions to privately organized pension schemes.

Liabilities are available on four different categories up to 1992: mortgage debt, bank debt, secured debt and other debt. Importantly, the size of the mortgage is known up to 1993. After this point definitions of the available variables are changed. A measure of liabilities that is consistent across the entire observation period can only be obtained for the total size of the liability stock.

House value, cash holdings, mortgage debt and bank debt are reported automatically by banks and other financial intermediaries to the tax authorities for all Danish tax payers and are therefore considered very reliable. The remaining components are self-reported, but subject to auditing by the tax authorities.

Information about the performance of self-employed is collected from a register recording the VAT balances of the firms. This register contains records about the identity of the owner, when the firm is established and the date at which the firm is liquidated, if that happens in the data period. We also observe the number of employees in the firm as well as purchases and sales. Purchases include all purchases of goods and services for the firm except salaries for employees and sales include all sales. We calculate a measure of profits as the difference between purchases and sales and note that this measure does not include salary costs to employees. The VAT register covers the period 1990-1996.

The sample used in the analysis is the full population of business owners with personally owned firms. We limit the sample to consider business owners who had an active firm in 1991, who were house owners and aged at most 60 years. The resulting sample consists of 75,530 business owners.

A crucial part of the analysis is to split the sample into two groups according to the levels of financial asset in 1991, the year before the reform. A similar approach is often applied in consumption studies, for example Zeldes (1989), Runkle (1991), Ziliak (1998), and Leth-Petersen (2010), and it follows naturally from the framework presented in section 3 suggesting that prior to the reform business owners will run down liquid assets if they experience an adverse consumption shock or an adverse shock to the firm, and will face a binding constraint when liquid assets have

been exhausted.⁵ Somewhat arbitrarily we split the sample at financial asset holdings corresponding to 1% of the house value.⁶ In table 1 we show descriptive stats for the two groups and for the sum of the two groups. The first three columns present numbers for the full sample and column 3-6 presents numbers for the sample that in 1991 had more than 50% equity relative to the house value. The reform only gives access to use the equity in the house as collateral for loans for the part of the equity exceeding 40% at the point of the introduction of the reform. This restriction was decreased to 20% by the end of 1992. This subsample is picked so as to make sure that we are looking at a set of business and house owners who were actually affected by the reform.

[Table 1 about here]

Considering the first three columns of table Table 1 shows that the firms that we classify as affected by constraints are on average younger and have less equity but own slightly more valuable houses and are slightly more likely to be female. We also note that the level of education among business owners is generally not high. The table also shows that the primary sector, mostly farmers make up about 1/3 of the firms in our sample, but there does not appear to be important imbalances between the two groups in terms of industry classification. When limiting the sample to include owners with more than 50% ETV the average level of equity is 87%. Those classified as affected by constraints now own slightly less valuable houses, are slightly younger and own slightly younger firms. The fraction of farmers is now 50%.⁷

We now turn to consider the development of debt and firm outcomes: purchases, sales, profits and number of employees in the firm. All outcomes are normalized on the value of the home as it is measured in 1991, the year before the reform. There is much heterogeneity and the idea is to measure everyone on the same scale. The ideal normalization would be ‘permanent income’, but this is of course unobserved and cannot be proxied by income observed in the data, as it is potentially affected by constraints. The house value is stable and the choice of house is less affected by short lived adverse demand shocks affecting the firm.

⁵ Liquid asset holding is not a perfect indicator of constrained status, Jappelli (1990). For the test implemented here a sufficient requirement is that the high liquid asset group is not constrained. It is not required that households with low liquid assets are all restricted, only that some households in the low liquid asset group are affected by constraints.

⁶ The test is obviously also potentially sensitive to the exact cut-off. We have experimented with cut offs at 0%, 2%, and 3%, but that did not change the results fundamentally.

⁷ We have repeated the entire analysis on a subsample where farmers were omitted. This did not change the results importantly.

[figure 1 about here]

Figure 1 presents the level of debt for the two groups for the full sample and for the subsample of owners with ETV of more than 50%. The debt level is generally higher for owners classified as being affected by constraints. Considering the full sample it is noteworthy that the level of debt is declining up to 1994 after which it increases only moderately. It is difficult to visually identify any difference in the evolution between the two groups across the sample period and in particular after the reform period. Turning to the right hand-side panel covering the subsample, the debt level is evidently increasing already from 1992. The picture also seems to suggest that the debt growth after the reform was more rapid for the group affected by constraints.

[figure 2 about here]

Figure 2 presents business activity measures (purchases, sales, profits, number of employees) for the two groups for the full sample. Firms affected by constraints generally operate at a lower level, and it is difficult to visually identify any differential movement across the two groups for any of the measures.

[figure 3 about here]

In figure 3 the figures are reproduced for the subsample who had at least 50% ETV in 1991. Also in this case it is difficult to visually identify any differential change in the firm activity measures.

Plotting the levels of debt and firm activity for the two groups could visually mask differential changes between the group. We therefore go on to plot the evolution of debt and firm outcome measures in figures 4-6. In this set of graphs we present long differences of the outcome variables where we have fixed the level of changes to be 0 in 1990. Specifically, if the outcome is denoted Q_{it} then the figures plot $(Q_{it} - Q_{i1990})$ for $t = 1988, \dots, 1996$.

[figure 4 about here]

Figure 4 shows the evolution of debt for the full sample and for the subsample. Considering the full sample it appears that owners affected by constraints are actually decreasing their debt faster than those not affected by constraints. However focusing on those who entered the reform period with equity the picture is reversed, and households likely to be affected by constraints now exhibit fast debt growth after the reform.

[figure 5 about here]

Figure 5 plots firm outcomes for the full sample. It appears that firms affected by constraints grow faster according to all measures. As there was no differential growth in liabilities that appears to suggest that the sample split based on financial assets simply identifies low and high grow firms rather than firms affected by constraints.

Figure 6 presents the corresponding pictures for the subsample entering the reform with at least 50% equity. The patterns observed for this group corresponds closely to the patterns observed in figure 5. For the subsample, figure 4 suggested that the groups affected by constraints actually took out equity at a faster rate than those not affected by constraints, and taken in isolation figure 6 therefore is consistent with the idea that the reform released equity that was funneled in to the firm in order to increase business activity. The corresponding graphs for the subsample with $ETV < 0.5$ (not reported) show slower debt growth, but equal firm performance. This explains, for the full sample, why debt appears not to move differentially while firm performance is growing at the same time. The results presented in figure 4 and 5 highlights the need to control for potential confounding factors, and to test whether the differences observed in the figures are actually significant. This is the objective of the next section.

[figure 6 about here]

5. Results

To estimate the effect of the reform we run a sequence of regressions

$$Q_{it} - Q_{i1990} = \beta_{0t} + \beta_{1t}X_i + \beta_{2t}D_i + \varepsilon_{it} \quad , \quad t=1991, \dots, 1996$$

Where Q_{it} is the outcome for individual i at time t . We estimate these models for a range of outcomes, debt growth, firm sales, purchases, gross profits, and income taken out from the firm. Q_{i1990} is the level of the outcome variable in 1990, and $Q_{it} - Q_{i1990}$ thus measures the growth in the outcome from 1990 to year t . X_i is a vector of control variables that are all measured in 1991, the year before the reform. It includes equity-to-house-value, age, age of firm, dummies for short, medium, and long education of the business owner, a variable measuring the number of years in the period 1987-1990 that the owner was recorded as self-employed, a dummy for whether the owner is a women, a dummy for whether the owner is single, and a series of industry dummies. β_{2t} are the parameters of interest giving the estimate of the excess growth for owners affected by constraints relative to those not. The results are presented in a series of graphs plotting the time series of β_{2t} for each of the outcome variables.

Figure 7 present estimates of β_{2t} for debt growth. Panel (a) presents the estimated effect when β_{2t} is estimated on the full sample. This picture corresponds figure 4 and is an estimate of the difference in debt growth between those affected by constraints and those not where we have controlled for covariates. Dashed lines are confidence bands. Consistent with figure 4, panel (a) suggests that firms affected by constraints have had negative debt growth after the reform. Panel (b) focuses on the subsample who entered the reform with more than 50% equity. In this panel debt growth is now positive, but not significant.

[figure 7 about here]

Confidence bands are relatively wide in panel (a) and (b). This is likely because the debt data are noisy. As outlined in the previous section Danish mortgages are based on underlying bonds, and we observe the market value of these bonds. The market value fluctuates considerably from year to year, and the fluctuations will vary across owners if they have mortgages based on different bonds. This could, for example, arise if mortgages have been established at different points in time. This variation adds noise. In order to try to circumvent this problem we also try a threshold approach where we for each year calculate the median growth in the entire sample and define a dummy variable that for each owner takes the value one if his growth was above median growth in the sample in that year. A similar approach has been applied in Chetty *et al.* (2012) in the context of pension saving. Panel (c) and (d) present results for this approach for the full sample and for the restricted sample. Panel (c) suggests positive debt growth, but the estimates are not significant. However, turning to panel (d), based on the sample entering the reform with positive equity, we find significant excess debt growth after the reform for the group that we have defined as being affected by constraints. We take this as evidence that the reform triggered excess debt growth for those who enter the reform with equity and who were likely to be affected by constraints

Figure 8 presents estimates for the firm performance variables: sales, purchases, profits and number of employees. In the figure we present estimates based on the direct approach and estimates based on threshold approach. For none of the outcomes do we find significant effects, except in some cases for 1991-1992, where performance seem to be worse for those affected by constraints. We also find persistently negative estimates for the development in the number of employees when we consider the threshold approach.

[figure 8 about here]

In figure 9 we repeat the same set of graphs for the subsample that entered the reform with more than 50% equity. Results are roughly the same, except that estimated profit effects are borderline significant in panel (e), but we do not find any excess growth of firm inputs, i.e. purchases and number of employees.

[figure 9 about here]

The results so far indicate that some firm owners, that we have classified as being affected by constraints actually take out equity. We are not able to trace these funds in the performance of the firm. In figure 10 we present estimates of the effect on income extracted from the firm. The figure presents estimates from using the direct approach and the threshold approach and for both the full sample and the subsample with equity. These pictures show a very similar pattern where income was extracted more rapidly in 1988 and 1989, but turned negative in 1991 and then leveled from 1992. The dip in 1991 is consistent with our definition of being affected by constraints. The idea underlying the split is, as is outlined in the theory section, that owners face an adverse shock after which they run down financial asset.

[figure 10 about here]

We have defined those with few financial assets in 1991 as being more likely to be exposed to constraints. This is obviously an incomplete indicator of being affected by constraints. In fact it may just select business owners who are generally more risk seeking or who discount the future more than members of the group that we classify as being unaffected by constraints. In that case, we would expect those affected by constraints to always persistently hold lower levels of financial assets. In figure 11 we plot the estimated effect for financial asset.

[figure 11 about here]

Figure 11 clearly indicates that the group, which we classify as being affected by constraints, are depleting financial assets in the period leading up to 1991, the year where we fix them. The pictures, however, also show a clear build-up of assets in 1992, in particular, but also in the following years. This pattern suggests that our classification of business owners being affected by

constraints is not just picking a selection of owners that, for example, are relatively impatient or risk seeking.

One possible reason for the excess extraction of equity could be that the group of business owners with low levels of financial assets in 1991 have experienced larger housing wealth gains than the members of the other group. In figure 12 we show estimates for house values. The figure clearly documents that those classified as being affected by constraints have not experienced excess housing wealth growth. On the contrary, they have experienced slower growth in house values than the group who are classified as not being affected by constraints.

6. Summary and conclusion

This study presents an analysis of the effect of a Danish mortgage reform that suddenly allowed house owners to extract equity for spending them for purposes unrelated to the house. We document the behavior of business owners through a new data set constructed from income tax records merged with the VAT records of the firms. We find that people have been extracting equity. We trace the flows in and out of the firm and find little evidence that the funds were circulated through the firm. This means that money extracted most likely have been allocated for consumption. We do, however, also find a clear accumulation financial asset suggesting that business owners who went through hard times just before the reform, take the opportunity to build up a buffer to counter future adverse events. The data can thus not reject the hypothesis that business owners have depressed consumption while going through a difficult period in order to keep the firm running as close as possible to the optimal level. Overall, we find little evidence that credit constraints are important for business activity among personally owned firms.

References

- Adelino, M., A. Schoar and F. Severino (2013); "House Prices, Collateral and Self-Employment" *NBER Working Paper No.* 18868.
- Alessie, R. and Devereux, M. and Weber, G. (1997); Intertemporal Consumption, Durables and Liquidity Constraints: A Cohort Analysis; *European Economic Review*, 41, pp.37-59.
- Black, S. E. and P. E. Strahan (2002). "Entrepreneurship and bank credit availability." *Journal of Finance* 57(6): 2807-2833.
- Browning, M. and T.F. Crossley (2009); "Shocks, Stocks and Socks: Smoothing Consumption over a Temporary Income Loss," *Journal of the European Economic Association*, 7(6):1169-1192.
- Browning, M. and Lusardi, A (1996); Household Saving: Micro Theories and Micro Facts; *Journal of Economic Literature*, 34, pp. 1797-1855.
- Buera, Francisco J., Joseph P. Kaboski, and Yongseok Shin. 2011. Finance and Development: A Tale of Two Sectors." *American Economic Review* 101 (5):1964-2002.
- Cabral, L. M. B. and J. Mata (2003). "On the evolution of the firm size distribution: Facts and theory." *American Economic Review* 93(4): 1075-1090.
- Cagetti, M. and M. De Nardi. 2006. Entrepreneurship, frictions, and wealth." *Journal of Political Economy* 114 (5):835-870.
- Cetorelli, N. and P. E. Strahan (2006). "Finance as a barrier to entry: Bank competition and industry structure in local US Markets." *Journal of Finance* 61(1): 437-461
- Chah, E. Y., Ramey, V. A. and Starr, R. M. (1995); Liquidity Constraints and Intertemporal Consumer Optimization: Theory and Evidence from Durable Goods; *Journal of Money, Credit and Banking*, 27, 1, pp. 272-282.
- Chetty, Raj; Friedman, John N.; Leth-Petersen, Soren; Nielsen, Torben & Olsen, Tore, (2012) "Active vs passive decisions and crowdout in retirement savings accounts: Evidence from Denmark" from *NBER Working Paper No. 18565* pp.1-71, NBER
- Cooley, T. F and Quadrini, V. (2001) "Financial Markets and Firm Dynamics"; *The American Economic Review*, Vol. 91, No. 5 (Dec., 2001), pp. 1286-1310
- Evans, D. S. and Jovanovic, B. "An Estimated Model of Entrepreneurial Choice under Liquidity Constraints." *Journal of Political Economy*, 1989, 97(4), pp. 808-27
- Gentry, W. M. and Hubbard, R. G.. "Entrepreneurship and Household Saving." *Advances in Economic Policy and Analysis*, 2004, 4(1)
- Hamilton, B. H. (2000). "Does entrepreneurship pay? An empirical analysis of the returns to self-employment." *Journal of Political Economy* 108(3): 604-631.
- Holtz-Eakin, D., D. Joulfaian, et al. (1994). "Sticking It out - Entrepreneurial Survival and Liquidity Constraints." *Journal of Political Economy* 102(1): 53-75.

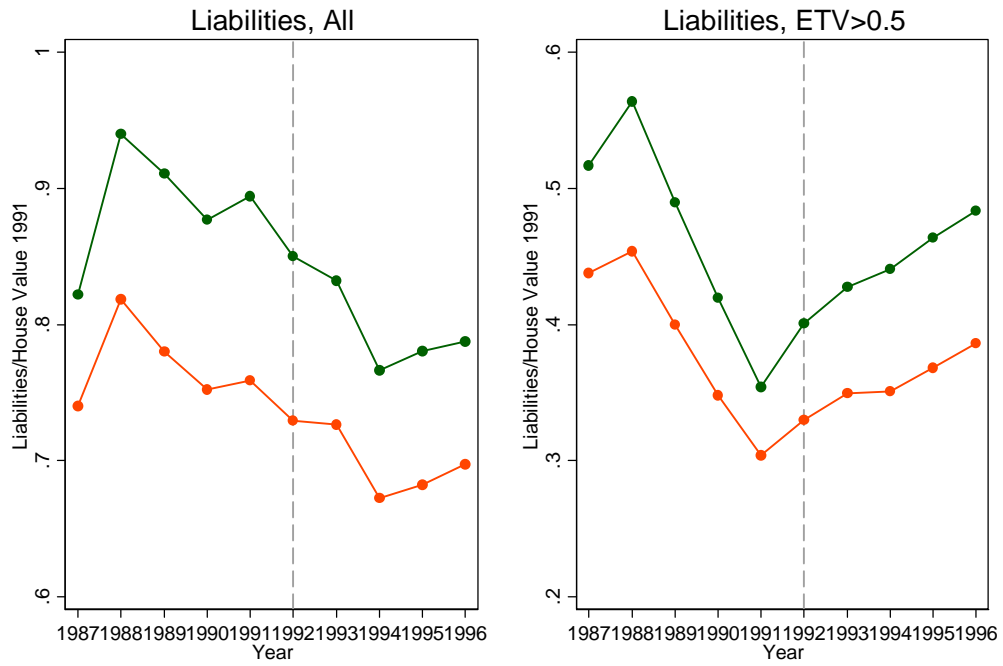
- Hopenhayn, H.A. 1992. Entry, exit, and firm dynamics in long run equilibrium." *Econometrica* 60 (5):1127-1150
- Hurst, E. and A. Lusardi (2004). "Liquidity constraints, household wealth, and entrepreneurship." *Journal of Political Economy* 112(2): 319-347.
- Hurst and Pugsley (2011); "What Do Small Businesses Do?" *Brookings Papers on Economic Activity*. Fall 2011
- Hurst, E. and Stafford, F. (2004); Home is Where the Equity Is: Liquidity Constraints, Refinancing and Consumption; *Journal of Money, Credit and Banking*; 36(6), pp. 985-1014.
- Jappelli, T. (1990); Who is Credit Constrained in the U.S. Economy?; *Quarterly Journal of Economics*; 104, pp. 219-234.
- Jovanovic, B. (1982). "Selection and the Evolution of Industry." *Econometrica* 50(3): 649-670.
- Kerr, W. and R. Nanda (2009). "Democratizing Entry: Banking Deregulation, Financing Constraints and Entrepreneurship." *Journal of Financial Economics* 94(October): 124-149.
- Leth-Petersen, Søren (2010); "Intertemporal Consumption and Credit Constraints: Does Consumption Respond to An Exogenous Shock to Credit?"; *American Economic Review*, 100, pp. 1080-1103.
- le Maire, D. and Schjerning, B. (2012); "Tax Bunching, Income Shifting and Self-employment" ; EPRU Working Paper Series No. 2012-04
- Pugsley, Benjamin W. 2011 "Selection and the Role of Small Business Owners in Firm Dynamics" Working paper
- Rajan, Raghuram G & Zingales, Luigi, 1998. "Financial Dependence and Growth," *American Economic Review*, vol. 88(3), pages 559-86, June
- Runkle, D. E (1991); Liquidity Constraints and the Permanent-Income Hypothesis: Evidence from Panel Data; *Journal of Monetary Economics*; 27, pp. 73-98.
- Schjerning (2008); "Entrepreneurship, Savings and Credit Constraints"; chapter 2 in *Dynamic Aspects of Entrepreneurial Behavior*, PhD thesis, Department of Economics, University of Copenhagen
- Zeldes, S. P. (1989); Consumption and Liquidity Constraints: An Empirical Investigation; *Journal of Political Economy*, 97, no 2, pp. 305-346.
- Ziliak, J. (1998); Does the Choice of Consumption Measure Matter? An Application to the Permanent-Income Hypothesis; *Journal of Monetary Economics*, 41, pp. 201-16.

Tables and figures

Table 1. Summary Statistics, 1991

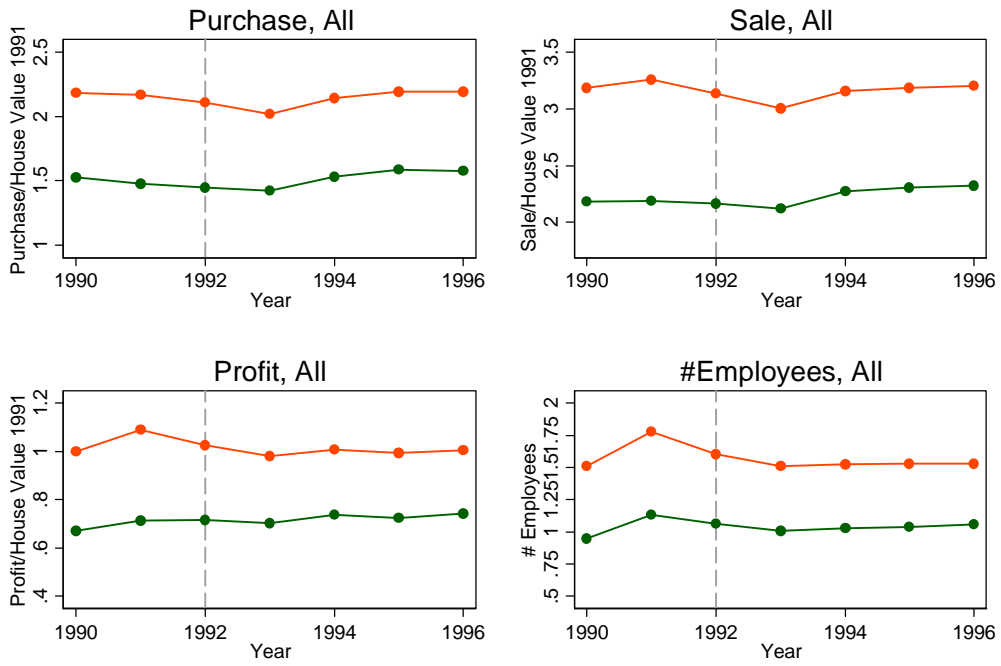
	Full sample			ETV>0.5		
	All	Not Constrained	Constrained	All	Not Constrained	Constrained
House Equity to Value (ETV) %	54	55	47	87	87	86
House value (1000 DK)	536	536	537	501	502	489
Age Firm	11,98	12,22	10,46	14,46	14,65	13,00
Age owner	44,11	44,38	42,35	46,46	46,69	44,67
Female %	17	17	22	14	14	17
Single %	14	12	23	14	13	24
Years as selfemployed 1987-1994	3,2	3,2	2,9	3,4	3,4	3,2
Education, none %	39	38	41	44	44	45
Education, short %	53	53	52	50	50	50
Education, medium %	4	5	4	4	4	3
Education, long %	4	4	2	3	3	2
Industry, Primary %	35	36	31	50	50	47
Industry, Industry %	7	7	9	6	6	7
Industry, Energy %	0	0	0	0	0	0
Industry, Construction %	10	10	10	9	9	8
Industry, Trade %	22	22	25	18	17	20
Industry, Transport %	5	5	5	3	3	4
Industry, Finance %	10	10	10	7	7	6
Industry, Service %	10	9	10	8	8	8
Liabilities (1000 DKr)	465	460	502	208	209	203
Sales (1000 DKr)	1.558	1.647	980	1.463	1.526	971
Pofits (1000 DKr)	515	545	318	475	497	301
Gross Income, extracted from firm (1000 DKr)	299	312	216	296	306	213
# observations	75.350	65.211	10.139	40.249	35.714	4.535

Figure 1: The Level of Debt. Constrained vs. Unconstrained Businesses



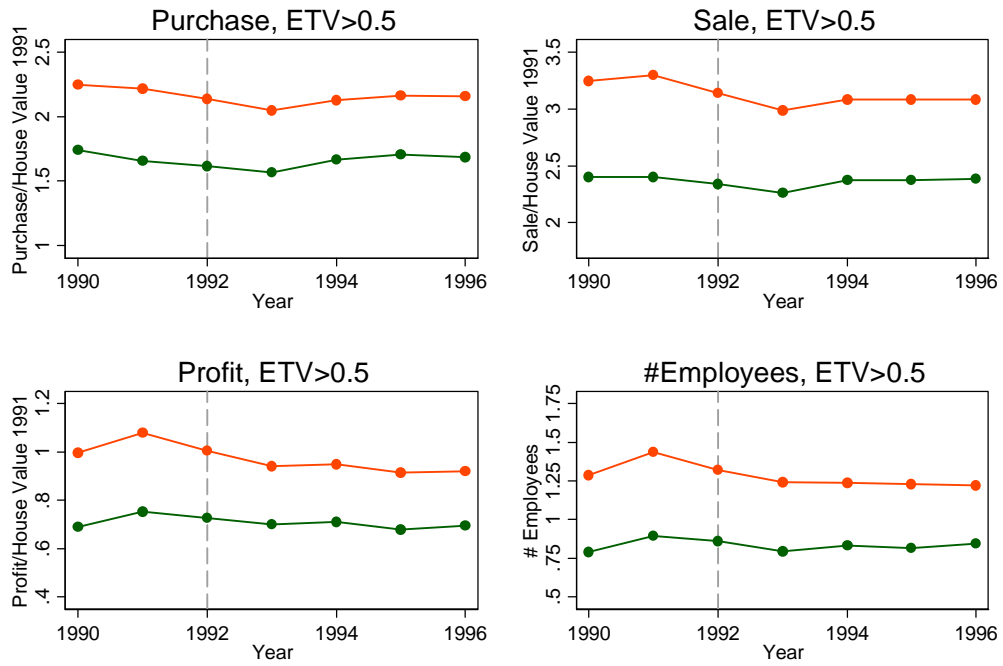
green=constrained red=not constrained

Figure 2: The Level of Business Activity. Constrained vs. Unconstrained Businesses. Full sample



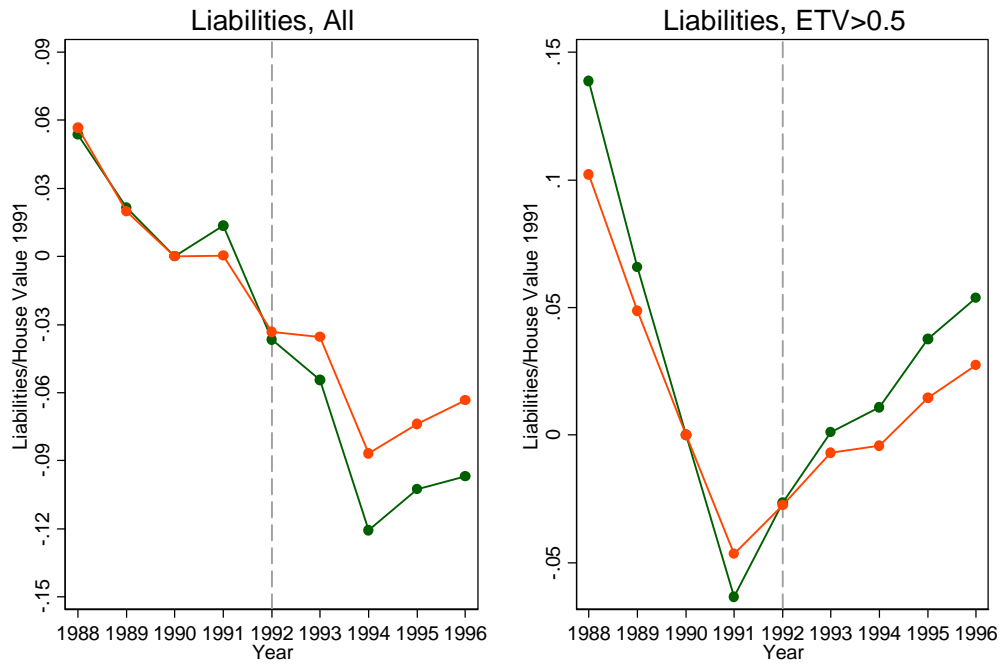
green=constrained red=not constrained

Figure 3: The Level of Business Activity. Constrained vs. Unconstrained Businesses. ETV>0.5



green=constrained red=not constrained

Figure 4: Debt Growth. Constrained vs. Unconstrained Businesses.



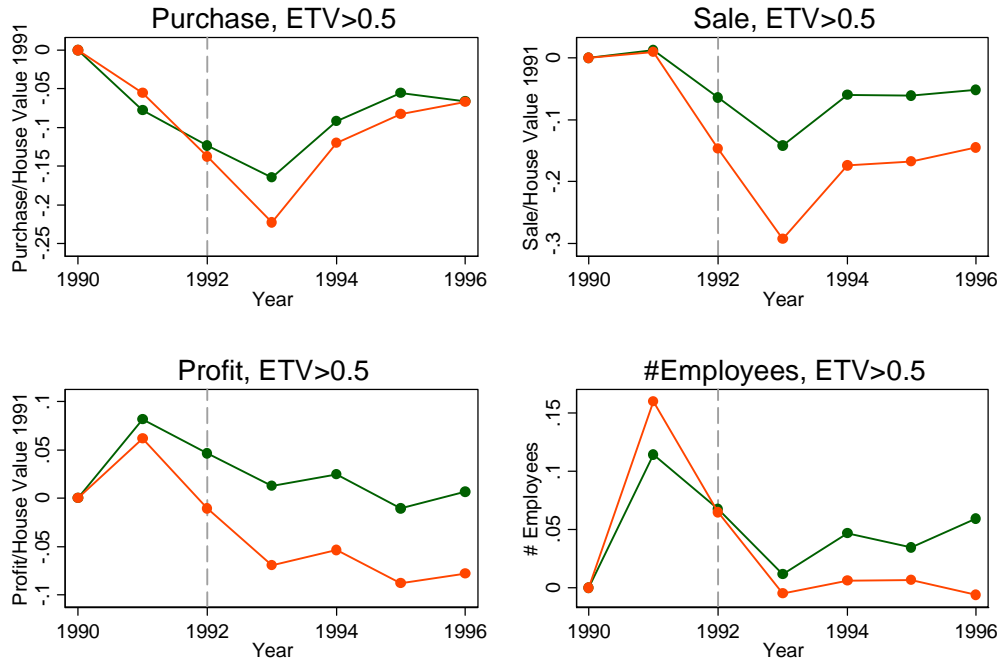
green=constrained red=not constrained

Figure 5: The Growth of Business Activity. Constrained vs. Unconstrained Businesses. Full sample



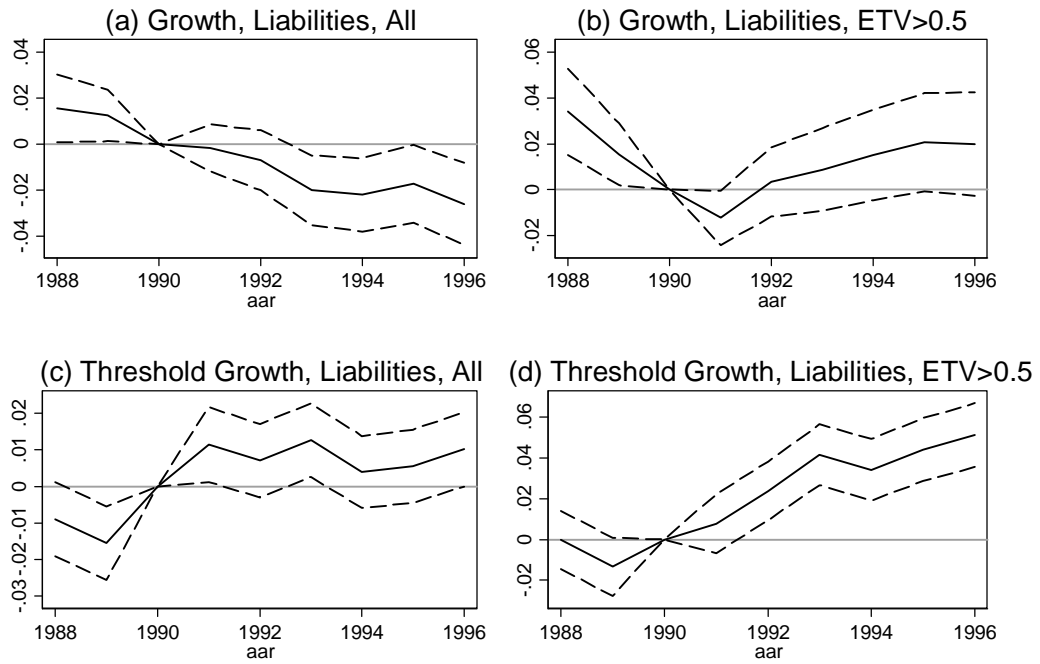
green=constrained red=not constrained

Figure 6: The Growth of Business Activity. Constrained vs. Unconstrained Businesses. $ETV > 0.5$



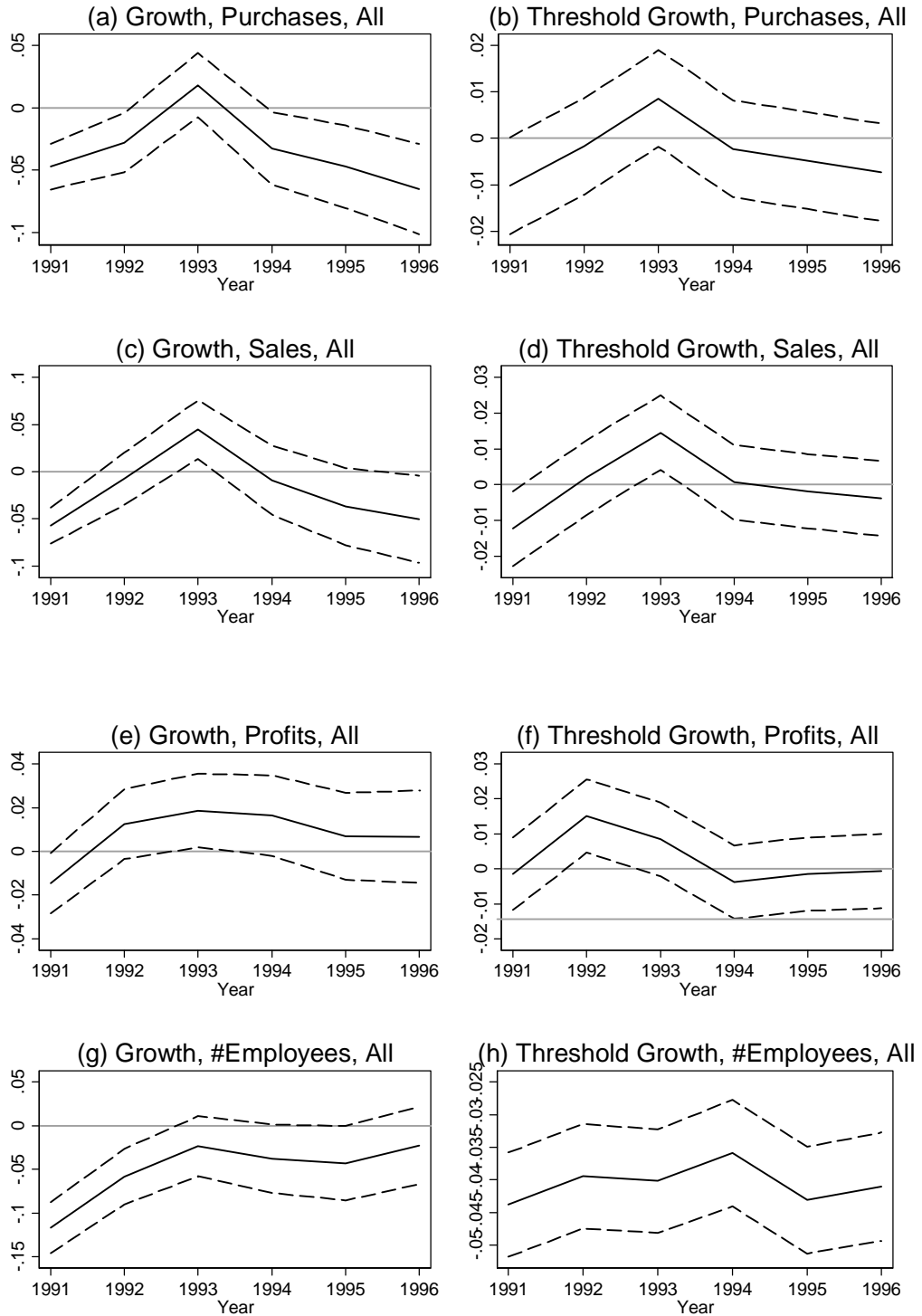
green=constrained red=not constrained

Figure 7: Estimated Debt Growth for Constrained Businesses.



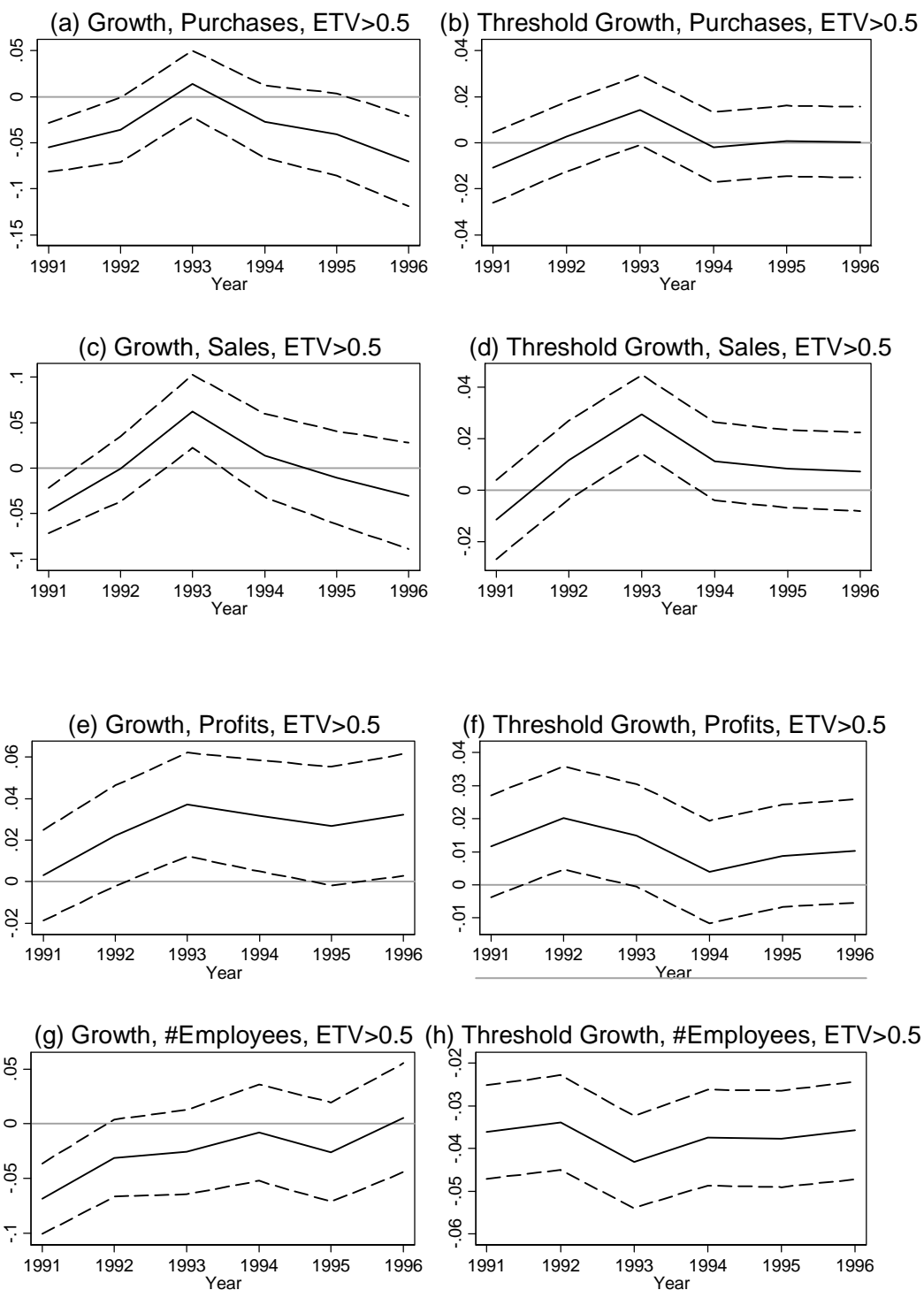
Note: Solid: parameter estimates; dashed: confidence intervals based on robust standard errors

Figure 8: Estimated Business Performance Effects for Constrained Businesses. Full Sample.



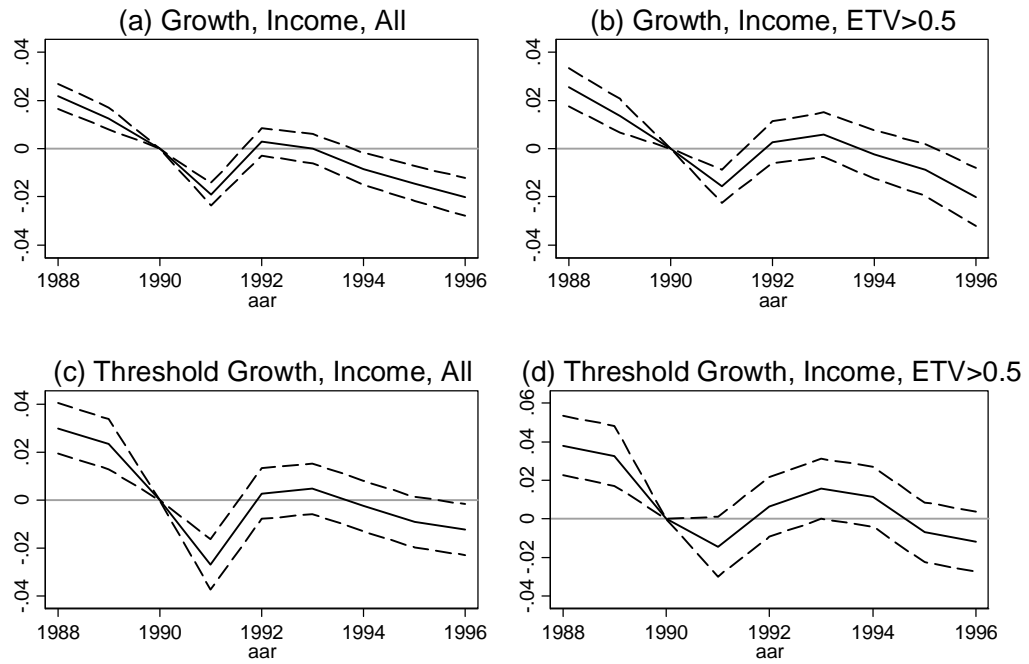
Note: Solid: parameter estimates; dashed: confidence intervals based on robust standard errors

Figure 9: Estimated Business Performance Effects for Constrained Businesses. $ETV > 0.5$



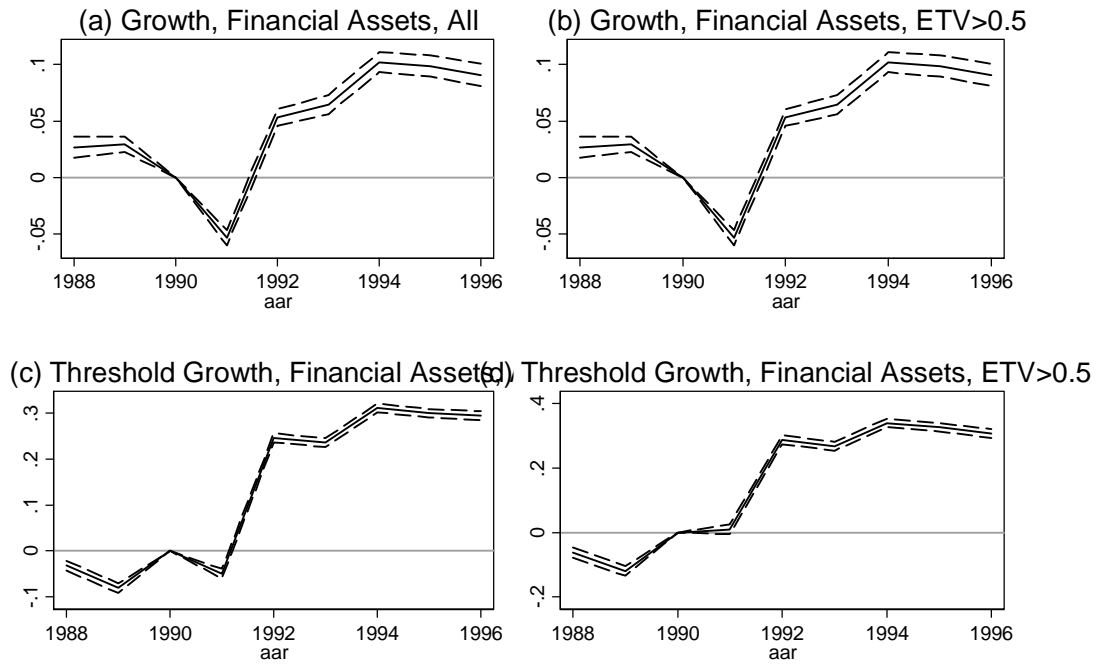
Note: Solid: parameter estimates; dashed: confidence intervals based on robust standard errors

Figure 10: Estimated Income Withdrawal Effects for Constrained Businesses.



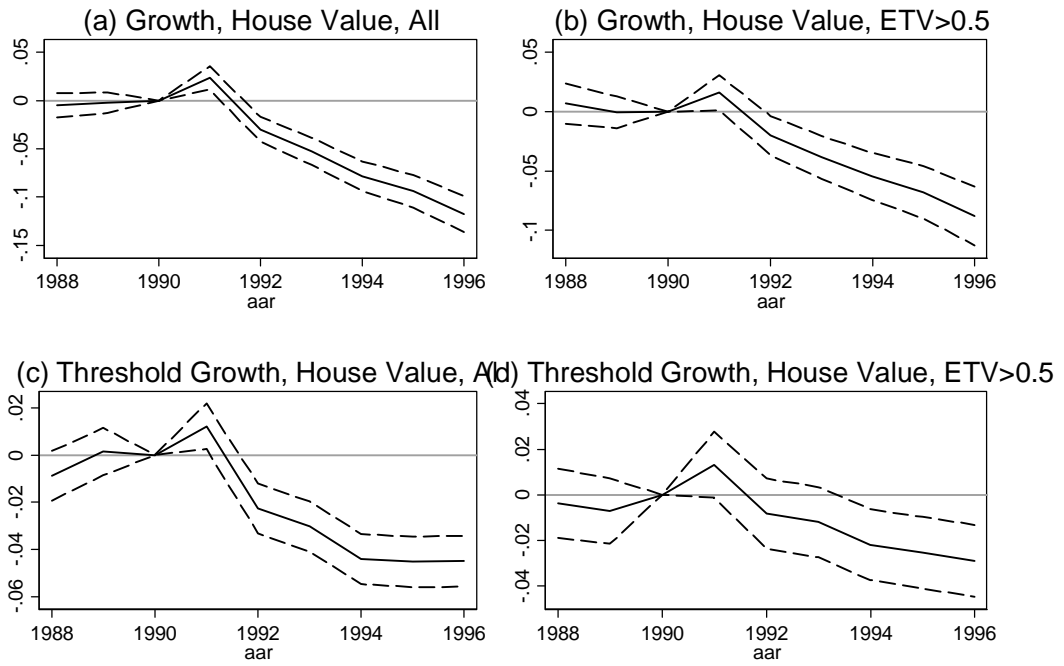
Note: Solid: parameter estimates; dashed: confidence intervals based on robust standard errors

Figure 11: Estimated Effect on Accumulation of Financial Assets for Constrained Business Owners



Note: Solid: parameter estimates; dashed: confidence intervals based on robust standard errors

Figure 12: Estimated House Value Effects for Constrained Businesses.



Note: Solid: parameter estimates; dashed: confidence intervals based on robust standard errors

