SVERIGES RIKSBANK
WORKING PAPER SERIES
452

Riding the Housing Wave: Home Equity Withdrawal and Consumer Debt Composition

Anna Grodecka-Messi, Jieying Li and Xin Zhang

July 2025

WORKING PAPERS ARE OBTAINABLE FROM

www.riksbank.se/en/research
Sveriges Riksbank • SE-103 37 Stockholm
Fax international: +46 8 21 05 31
Telephone international: +46 8 787 00 00

The Working Paper series presents reports on matters in
the sphere of activities of the Riksbank that are considered
to be of interest to a wider public.
The papers are to be regarded as reports on ongoing studies
and the authors will be pleased to receive comments.

Riding the Housing Wave: Home Equity Withdrawal and Consumer Debt Composition*

Anna Grodecka-Messi and **Jieying Li** and **Xin Zhang**§

Sveriges Riksbank Working Paper Series
No. 452†

July 2025

Abstract

Using a monthly panel dataset of individuals' debt, we show that house price changes can explain a significant fraction of personal debt composition dynamics. We exploit the variation in local house price growth as shocks to homeowners' housing wealth to study the consequential adjustment of debt portfolio. We present direct evidence that homeowners re-optimize their debt structure by using parts of withdrawn home equity to pay down comparatively expensive non-mortgage debt during a housing boom. The effect is strongest for homeowners that have a high debt-to-income ratio and live in a municipality with a high literacy level. We find evidence that macroprudential policy and interest rates are important for consumer debt decisions.

Keywords: Personal Debt Management, Home Equity Extraction, Household Debt, Housing, Financial Literacy, Macroprudential Policy.
JEL: D14, G21, G51, G53, R31.

*Author information: Anna Grodecka-Messi, Sveriges Riksbank, email: anna.grodecka.messi@riksbank.se. Jieying Li, Sveriges Riksbank, email: jieying.li@riksbank.se. Xin Zhang, Research Division, Sveriges Riksbank, email: xin.zhang@riksbank.se. We would like to thank Marieke Bos, Peter Englund, Andreas Fuster, Mariassunta Giannetti, Thomas Jansson, Peter van Santen, László Sándor, Antoinette Schoar, Karl Walentin, Basit Zafar, anonymous referees and the editor Pok-sang Lam, as well as various seminar and conference participants for their feedback and comments. We thank Gustav Alfelt for research assistance. The views expressed in this paper are solely the responsibility of the authors and should not be interpreted as reflecting the views of the Sveriges Riksbank.

§Corresponding author. email: xin.zhang@riksbank.se. Address: Sveriges Riksbank. 103 37 Stockholm, Sweden.

†The paper was previously circulated as Sveriges Riksbank working paper No. 343 under the title "House Prices, Home Equity, and Personal Debt Composition". This working paper supersedes and replaces WP No. 343.

1 Introduction

Housing is often the most important private wealth item for a typical household and the most valuable asset available to use as collateral for consumer borrowing.[1] In fact, mortgages constitute the majority of household debt in most countries. The exposure to the property market and liabilities related to housing undoubtedly affect households' asset accumulation and life-cycle consumption. In particular, house price[2] increases create opportunities for homeowners to tap into home equity to adjust their investment and debt structure and change their consumption and saving behavior accordingly. Different uses of home equity have distinct implications for household debt composition and household default risk. If households consolidate more expensive credit card debt or unsecured consumer loans through home equity withdrawals, they can reduce their debt service burden and improve their financial situation. In contrast, liquidity-constrained households can expand their consumption by borrowing excessively against home equity during a housing boom. This could lead to household defaults and depress consumption if house prices drop or interest rates increase. Therefore, it is important to understand the impact of house prices on a household's balance sheet and analyze how equity withdrawals affect homeowners' financial decisions.

Most existing evidence on the impact of house prices and the resulting equity withdrawals on the composition of household debt and other economic outcomes is based on the U.S. (see Mian and Sufi, 2011; Brown, Stein, and Zafar, 2015; Bhutta and Keys, 2016; McCully, Pence, and Vine, 2019). This research, based on annual or quarterly data, emphasizes the heterogeneous response of different homeowner groups to house price changes, but it finds limited evidence that households use equity withdrawals to substitute for more expensive types of debt. In general, it seems that less creditworthy and younger households increase their exposure to debt and default risk when house prices in the U.S. increase. In this paper, we contribute to this line of research by using a rich monthly individual-level panel data from Sweden to study how house prices affect household debt portfolios.[3] Due to the high quality of our data and its relatively high frequency, we are able to explore both cross-sectional and time-series differences in household behavior. We focus on

[1] Campbell and Cocco (2003) show that middle-class families in the United States have more than half of their assets in housing. Betermier, Calvet, and Sodini (2017) document that housing wealth is around 65 percent of total wealth for an average Swedish household in their sample.

[2] Throughout the paper, we use terms house price and housing price interchangeably.

[3] Andersen, Campbell, Nielsen, and Ramadorai (2020) use detailed annual administrative panel data from Denmark to study household credit decisions.

the changes in personal debt composition in response to the appreciation of house prices during the period 2010–2014. Sweden experienced substantial growth in both house prices and household indebtedness during this period.

We find that Swedish borrowers increase their debt exposure in response to rising house prices and use part of the equity they withdraw to pay back relatively expensive unsecured consumer loans. In fact, in Sweden, paying off more expensive debt is one of the most common uses of withdrawn home equity, and equity withdrawers pay back 53.5 percent of their unsecured consumer loans. In contrast, more expensive credit card balances are not affected by home equity withdrawal activities. This is because credit cards are often used in Sweden as a payment instrument within an interest-free period rather than as an actual source of credit. Perhaps not surprisingly, individuals that benefit the most financially are more likely to consolidate debt. We show that the discovered re-optimizing effect is strongest for borrowers who have higher debt-to-income (DTI) ratios and are living in municipalities with higher literacy levels. We also show that the decision to withdraw equity and the size of the withdrawal depend on the prevailing interest rates. In particular, borrowers react to interest rate spreads, which corroborates our findings about the role of financial literacy in making financial decisions.[4] Last, but not least, we are able to provide evidence on the role of macroprudential policy in home equity withdrawal decisions. In the period of our study, a loan-to-value (LTV) limit was introduced in Sweden, applying both to new mortgages and home equity withdrawals. We document that home equity withdrawers increased their unsecured loan holdings to circumvent the newly introduced restriction. Even for new mortgagors, we see an increased ratio of unsecured loans to mortgage debt under the tighter macroprudential policy. Given that the tighter macroprudential stance may force borrowers to deviate from their optimal debt portfolio, it may encourage debt re-optimization once the market conditions permit mortgagors to increase their mortgage. We also find that the interest rate differences between non-mortgage and mortgage debts are important drivers of home equity withdrawal activities.

Swedish mortgage contracts stand out in international comparison because most mortgages are based on three-month floating interest rates and, until June 2016 (i.e., in the period of our study), did not require amortization. Most borrowers in our sample were thus holding interest-only floating rate mortgages, which made them potentially more reactive to market movements than

[4]The results for interest rates and related discussion can be found in Section B.2 of the Appendix.

mortgagors in countries with fixed interest rates and an amortization scheme. Tax deductions on mortgage rates enhance the amortization-free culture. Notably, in Sweden, all mortgages are full recourse. The borrowers face a full obligation to make payments in accordance with the installment schedule for at least five years during an individual debt restructuring process under the supervision of the Swedish Enforcement Authority.[5] Difficult and rare consumer default procedures may encourage Swedish consumers to re-optimize their debt structure more than is the case in other countries. Despite these institutional differences, we find that Swedish borrowers, like their international counterparts, primarily withdraw equity for reasons other than debt consolidation. This is consistent with evidence for the U.S. (Brady, Canner, and Maki, 2000, Canner, Dynan, and Passmore, 2002, Mian and Sufi, 2011, Brown et al., 2015, Bhutta and Keys (2016)), the U.K. (Davey, 2001) and Norway (Almaas, Bystrøm, Carlsen, and Su, 2015).

Our study provides empirical evidence that Swedish homeowners make rational credit decisions in a housing boom, but we do not intend to present our results only as a Swedish success story. It is a well-known fact that Swedish household indebtedness is very high and the average household DTI is roughly double that of the U.S. (OECD, 2022). This has been raising financial stability concerns for quite some time now. It is important to note that, among Swedish individuals who withdraw home equity, their overall debt levels do not decrease despite the debt re-optimization behavior we observe. Comelli (2021) links high debt levels in Scandinavian countries to welfare policies favoring young and poor households that borrow most, in line with the life-cycle theory. Despite the level differences, in our sample, just as in the U.S., younger people increase their debt in response to rising housing prices more than older people.

Lastly, we would like to note a few challenges in the empirical literature investigating the causal relationship between house price movements and household decisions. Firstly, households are exposed to various aggregate shocks in the economy. A common empirical challenge is the endogeneity problem due to omitted economic variables. It is a widespread empirical finding that house prices and local economic performance are correlated.[6] To control for common factors such as local economic conditions, in the similar spirit of identification strategy adopted in Schmalz,

[5]See the following link for detailed information on the personal bankruptcy and debt restructuring process in Sweden: `https://www.kronofogden.se/Kanintebetalaprivatperson.html`.

[6]For instance Loutskina and Strahan (2015) find that house price shocks can spur economic growth and Stroebel and Vavra (2014) document a causal response of local retail prices to local house price changes.

Sraer, and Thesmar (2017), we exploit variations between renters and mortgagors and additional heterogeneity among different types of homeowners. Another major challenge is to separate house demand effects from supply effects on the house price dynamics. As a robustness check, we use two instrumental variables (IVs) for house price growth: house price volatility from 1981–2005 and a construction regulation measure at the regional level. Our results are robust to the use of IVs.

The remainder of the paper is set up as follows. In Section 2, we present background information on the Swedish housing and credit market. In Section 3, we describe our data and present summary statistics. Section 4 presents identification strategy and empirical results. In Section 5 we provide a few robustness checks. Section 6 concludes.

2 Background information

2.1 The Swedish housing market

The Swedish housing market underwent a long period of rising housing prices, and even the financial crisis of 2007-2008, which shuttered some of the neighboring countries' housing markets, did not stop the appreciation of house prices in Sweden. The sharp rise in housing prices has been attributed to a limited supply of housing (Englund, 2011, Emanuelsson, 2015).

Emanuelsson (2015) provides an overview of the housing supply in Sweden during the period 1958–2015. Since the mid-1990s, when the recent positive trend in housing prices started, housing construction in Sweden has been historically low, both in a national context and in comparison to other countries, despite a substantial rise in population. More than 40 percent of municipalities report a housing shortage (recent numbers indicate that this share may be closer to 70 percent; see Boverket, 2021). This shortage is due to a number of factors, including increasing land and construction costs (which is, however, not different from other countries), lower state subsidies, and deliberate actions of certain private actors that may wish to limit construction in areas where they operate in pursuit of higher profits. From the long list of contributing factors, long planning processes stand out in international comparison. These drawn-out processes increase the uncertainty in the construction business and discourage new housing investment.[7]

A malfunctioning rental market in Sweden is also contributing to low housing construction.

[7] We use this feature of the Swedish housing market to construct an instrument in section 4.1.3.

Part of new construction is reserved for rental units that generate relatively low income due to rental regulation. Unlike in many other countries, in Sweden, the rental market traditionally has been subsidized by the government. This means that rental prices have been well below market prices. Rental apartments are allocated to tenants according to a queuing system. Depending on the location, the waiting times for a rental apartment may even reach close to 30 years (Östermalm, the most expensive neighborhood in Stockholm). This presents a mobility problem, in particular for young people.[8] In practice, it is not possible to rely on a functioning rental market; obtaining a long-run rental contract becomes a matter of patience, if not luck. There are also timing restrictions on renting out tenant-owned apartments, so the buy-to-let market has never had the chance to develop (Finocchiaro, Nilsson, Nyberg, and Soultanaeva, 2011). As a result, many households are "forced" to buy an apartment even if they prefer to rent, particularly in urban agglomerations. This implies that, for Swedish individuals, the choice of owning versus renting can hardly be viewed as an endogenous choice.

The Swedish homeownership rate has been fairly stable in recent years, averaging approximately 67 percent (Statistics Sweden). According to the Eurostat survey, in the years 2004–2020, 83.7 percent of Swedish homeowners had a mortgage or loan, and in the years covered by our study (2010–2014), the average share of homeowners that had credit exposure amounted to 90.5 percent. To put this number in context, a corresponding value for 2010–2014 in the European Union was only 38.7 percent. Hence, Swedish households rely much more on mortgages to finance their house purchases than the European average, and the credit exposure of Swedish homeowners was particularly high in the years covered by our study.

The characteristics of the Swedish housing market have an impact on the analysis conducted in this paper: while in some countries, homeowners and renters may be two distinct groups that differ by more than just their homeownership status, in Sweden, they are comparable under many aspects given that the choice of owning versus renting is to a large extent exogenous. What differentiates homeowners from renters is the mortgage contract. Notably, when it comes to other socioeconomic characteristics, both groups are relatively similar (see Table 1) in terms of age, income and credit score.

[8] While rental apartments have been historically an alternative to buying a house, in recent years, their number decreased as some were converted into tenant-owned apartments (see Sodini, Van Nieuwerburgh, Vestman, and von Lilienfeld-Toal, 2023 for a description of this process).

2.2 The Swedish credit market

The developments on the Swedish housing market have been accompanied by a corresponding growth in household indebtedness in Sweden. Debt has been increasing in both absolute and relative (as DTI) terms. There is also an evident geographical distribution of DTIs: They reach the highest levels around the largest cities, which is in line with the observed housing shortages in these regions (Blom and van Santen, 2017). In response to the increase in household indebtedness, the Swedish Financial Supervisory Authority (FSA) has systematically tightened its macroprudential stance over the years. For the period analyzed in this study, one particular macroprudential tool is of importance: the LTV regulation, which applied to mortgages as of October 1, 2010.[9] According to this regulation, banks should not extend mortgage credit above 85 percent of the value of the home. This refers both to new mortgagors and to households increasing the balance on an existing mortgage. Before October 2010, such a limit did not exist. Finansinspektionen (2012) reports that in 2011, after the introduction of the limit, the average LTV ratio for new loans decreased for the first time since at least 2002, when comparable data first began to be gathered. Grodecka (2020) documents that during the period 2011–2015, 41.4 percent of borrowers with new mortgage contracts in Sweden could be considered LTV-constrained, and there is considerable bunching at the 85 percent threshold. Tightened macroprudential rules may have induced some borrowers to increase their consumption debt, which is uncollateralized (van Santen, 2017). In particular, unsecured (consumer) loans, called *blanco* loans in Sweden, are used by some households as a means of providing the required 15 percent downpayment to buy a home. In fact, looking at the distribution of LTV among new mortgage borrowers in the years 2011–2015, we see that some consumers have a total LTV above 85 percent, indicating the usage of unsecured consumer loans, particularly among younger borrowers (Grodecka, 2020). Narrative evidence, too, suggests that banks started offering unsecured loans for borrowers who wish to have an LTV ratio above 85 percent. According to Finansinspektionen (2012), most Swedish banks offer the unsecured loans that help circumvent the regulations, and it has become more common to grant unsecured loans after the introduction of the mortgage cap. In Section 4.4, we show regression results supporting

[9] Other macroprudential measures directly affecting household lending, such as the amortization requirement, have been introduced after the period analyzed in this paper. See Grodecka, 2020 for a description of the mortgage process in Sweden.

this narrative.

Mortgage loans account for 82 percent of household debt in Sweden (Finansinspektionen, 2021). The majority of mortgage loans in Sweden are effectively short-term (three-month) floating rate contracts, unlike in many other countries. Consumer loans consist mainly of unsecured loans and credit card debt, and these are the forms of non-mortgage debt that we focus on in this study. Other non-mortgage debt may include installments and secured loans but accounts for a very low share of household debt in Sweden as presented in Section 3. It is worth noting that despite consumer loans still playing a relatively minor role in Swedish households' debt portfolio, they account for a substantial share of household interest expenses due to their much higher interest rates (see van Santen, 2017). Generally, given the riskier nature of unsecured consumer loans, their interest rates have historically been on average two to three times higher than those of mortgage loans (see van Santen, 2017 and Statistics Sweden, 2020 for a comparison of historical interest rates). There is thus potential to substitute this relatively expensive debt with cheap mortgage financing. Figure B1a in the Appendix shows the average interest rates of unsecured loans, mortgage debts and credit card debts along with the central bank policy rate (the repo rate) for the period of our study, sampled from major Swedish commercial banks. Credit card debt has the highest average interest rate, followed by unsecured loans. Mortgage debt has a much lower interest rate, on average between 2.5 percent and 3 percent in our sample.

When it comes to the practicalities of loan contracts in Sweden, mortgages and unsecured consumer loans are usually co-signed in the case of couples/people belonging to the same household. In contrast, credit card debt and other types of unsecured debts are usually issued at an individual level. Our dataset allows us to distinguish between individual and co-signed debt, and we carefully take this distinction into consideration while performing our empirical analysis.

2.3 Home equity withdrawal in Sweden

In Sweden, home equity withdrawal occurs only by increasing the existing mortgage amount against an updated valuation of the home, which is different from the U.S., where borrowers can extract home equity through a cash-out refinancing, separate home equity line of credit (HELOC), or home equity loan, see Bhutta and Keys (2016). Households that wish to withdraw home equity in Sweden need to obey the aforementioned 85 percent limit on LTV after October 2010. Future borrowers

need to undergo a credit check just like for a completely new mortgage loan. However, most of this process is fairly simple and automatic and can be done online. Some banks, but not all, have a minimum amount for equity withdrawal, SEK 100,000. This is consistent with our evidence on median equity withdrawal size in Figure 1b.

The cost of equity withdrawal differs for apartment owners and houseowners: The fees for apartment owners are not dependent on the price of the apartment, nor the withdrawn amount. Borrowers who wish to withdraw funds pay a fixed administration fee to the bank, around SEK 700 (approximately USD 73), and a fixed fee to the association managing the apartments, around SEK 750 (approximately USD 79).

The cost of equity withdrawal for houseowners may be higher if they wish to extend the existing collateral. Houseowners also pay a fixed administration fee to the bank, but if they wish to extend their maximum collateral allowance (this amount depends on the maximum loan ever taken out on a given property, by either the previous or current owners), they will need to pay an additional fee of SEK 375 (approximately USD 39) to Land Survey, which registers the ownership and collateralization of real estate in Sweden, and 2 percent of the increased collateral valuation. Note that we do not have the exact collateral value of the properties so we cannot determine with certainty the equity withdrawal costs. However, we do find that, conditional on the withdrawal decision and other observable factors, houseowners withdraw lower amounts, which indicates that withdrawal costs, despite being relatively low, are non-negligible. The results are available upon request.

3 Data and statistics

3.1 Data

We use data from three different sources in the empirical analysis. Individual credit and loan information is sourced from Upplysningscentralen (UC), the Swedish credit bureau. Housing prices at the parish[10] level are from Valueguard, a data vendor specialized in constructing housing price indices in Sweden. Lastly, we obtain from Statistics Sweden data on the education level of individuals

[10]Parish was the basic geographical unit under the management of the Church of Sweden in history. For statistic purpose, Sweden is still using parish as the geographical unit today with 1,426 parishes in the nation. The municipality, *kommun* in Swedish, is a higher level administrative division. There are 290 municipalities today in Sweden.

living in a given municipality.[11]

The UC dataset is based on credit reports from the eight biggest Swedish banks. It contains approximately 80 percent of the household credit volume and 97 percent of household mortgage loans.[12] The dataset contains detailed information about outstanding mortgage and other non-mortgage household debt on a monthly basis from July 2010 to July 2014. Due to the data coverage, we are able to account for almost the whole universe of mortgage loans in Sweden. Moreover, we focus on credit card debt and unsecured consumer loans because these two types of loans are the most commonly used non-mortgage debt formats in Sweden. In our sample, roughly 23 percent of individuals have credit card debt and 10 percent have unsecured consumer loans. Only 1.67 percent of the population uses other non-mortgage debt, including installments and secured loans.

The investigations in the paper are conducted on the individual level. Mortgage and unsecured loans are mostly co-signed by individuals living in the same household. We are able to identify households using the tax authority data provided by UC. In the case of a co-signed debt, we equally split the debt between the individuals who signed the contract. Our division of debt between household members is thus based on reliable, contractual information.[13]

Our dataset also contains information on individuals' credit scores,[14] age, disposable income, and self-employment status during the same period. The entire database covers around 4.8 million individuals, which accounts for 62 percent of the adult population in Sweden.[15] The empirical analyses in this paper are based on a random sample of about 150,000 individuals from the UC dataset. The distributions of key variables between the random sample and the whole sample are quite comparable. We define an individual as a homeowner if they have a mortgage during the entire sample period and as a renter if they only have non-mortgage debt during the entire sample period. This is a reasonable assumption given that the majority of housing is financed through

[11] Appendix Table A1 provides a summary of data variable definitions.

[12] The UC dataset includes only loans issued by large banks and credit institutions in Sweden. The eight largest banks in Sweden play a dominant role in the Swedish credit market and due to reliable reporting, are often used as benchmark in studies based on Swedish banks' data, see e.g. Cao, Dinger, Grodecka-Messi, Juelsrud, and Zhang (2021).

[13] An alternative would be to consider households as the base for our analysis. However, this would require from us making assumptions about the household bargaining process in the division of debt, income etc. among household members. We decide to proceed with a definition that relies entirely on loan contracts. Our results do not differ qualitatively if we run regressions with households instead.

[14] The credit score provided by UC is the estimated probability of default for an adult individual in the next 12 months, which is different from the FICO score used in the United States. Lower UC credit score means higher creditworthiness.

[15] The population of adults is 7.76 million in Sweden in 2014.

mortgages in Sweden; see Section 2.1. There is a small group of individuals who were renters but became mortgage holders or were mortgage holders but became renters during the sample period. We exclude this group because of our identification design. There are 100,896 individuals remaining in the sample, of which 81,667 (81 percent) are homeowners.[16] The homeownership rate in our sample is higher than that in the overall Swedish population. However, given our focus on home equity withdrawals, what is most important for our study is that we capture the extent to which homeowners use mortgages to finance the purchase of the home. Our dataset allows us to cover approximately all household mortgage loans issued in the country.

House price growth at the parish level is calculated using the house price index from Valueguard. Valueguard provides a monthly house price index for both apartments and single-family houses at the parish level for the same sample period. For each parish, we calculate house price index growth as the weighted average of the apartment price index and the single-family house price growth. The weights are determined by the number of households in the parish owning single-family houses or apartments. We then merge house price growth with the UC dataset using the parish code of an individual's address.

3.2 Home equity withdrawal

Home equity can be viewed as the difference between the market value of the home and the outstanding mortgage balance. When an individual buys a house or an apartment, the initial home equity is the down payment. Over time, home equity might increase if the individual pays back the mortgage or if house prices go up. Because the majority of mortgage borrowers in Sweden have traditionally taken interest-only loans, the increases in home equity in our sample mainly come from the increase in house prices. Also, in Sweden, home equity is withdrawn mainly by increasing the existing mortgage amount as described in Section 2.3. Therefore, we identify home

[16]The UC data allow us to identify homeowners with mortgage outstanding; thus we might miss the homeowners who purchased their houses with cash or who had mortgages but have already paid back fully before the sample period. However, these two cases are rare in Sweden. We can plausibly assume that the mortgage takers covered by the UC data can well represent homeowners in Sweden.

equity withdrawals for individual i in month t through the following formula:

$$EquityWithdrawal_{i,t} = MortgageOutstanding_{i,t} - MortgageOutstanding_{i,t-1} \quad (1)$$

if the outstanding mortgage change is positive.

Based on this definition, we find 63,905 home equity withdrawal cases during the sample period. Because we focus on the effect of home equity on activities that are not property investment, we need to exclude the cases in which individuals cash out home equity for the purpose of purchasing a new home. We can observe whether individuals changed their house type, purchased a second house, or moved to another address during the same month or after they withdrew home equity.[17] After excluding all the cases in which the home equity withdrawals are used for purchasing a new home, we have 52,748 cases. Because there is a cost[18] of tapping into home equity in Sweden, we use SEK 20,000 as the threshold for home equity withdrawal identification to avoid measurement errors. This amount is equivalent to the average monthly disposable income of an individual in our sample (the average annual disposable income is SEK 232,700, as shown in Table 1). In the end, we obtain 46,499 home equity withdrawal events for the final sample.

3.3 Summary statistics

Panel A of Table 1 gives the summary statistics for the full sample. Individuals in our sample are, on average, 51 years old, with an annual disposable income of SEK 232,700. The average mortgage size is SEK 662,700 for homeowners, and the distribution is right-skewed. The average outstanding debt balance is SEK 3,100 for credit card debt and SEK 18,300 for unsecured consumer loans. Renters in our sample, on average, have higher credit card debt and unsecured consumer loans. It is worth pointing out that homeowners and renters are similar in terms of age distribution, income and other observable dimensions, although homeowners have slightly higher average disposable income than renters.

[17] We cannot rule out the case that an individual borrows against home equity to purchase a new home of the same property type (apartment or small houses) in the same address. However, this case is rare; hence, it should not affect our identification of home equity withdrawal.

[18] See Section 2.3.

We can further categorize individuals in our sample into separate groups. The first categorization gives us the benchmark group of renters versus homeowners as presented in Panel A of Table 1. Both are exposed to local economic developments and unobserved common economic shocks, which serves as the base of our identification strategy. The second categorization separates homeowners into four groups: home equity withdrawers (EWs), amortizers (AMs), house traders (HTs), and others. Based on the household mobility record, we identify individuals as active HTs if they were buying and selling their houses/apartments to climb the property ladder.[19] EWs are mortgagors who have withdrawn home equity at least once in the sample as per definition presented in section 3.2. AMs are homeowners who actively reduced their mortgages at least three times by a total of more than SEK 150,000. We choose this cut-off to define amortization because it corresponds to approximately the 5 percent lowest decreases among observed debt reductions.

The rest of the mortgagors have not traded their home or changed the size of their mortgages significantly. Figure 1a shows that the fraction of EWs is 0.7–1.6 percent each month (or 8.4–19.2 percent per year), which is close to the result of Bhutta and Keys (2016) using U.S. household data. Figure 1b illustrates the median value of the withdrawn amount over time.

Panel B of Table 1 shows summary statistics on mortgage and non-mortgage debt for the four subcategories of homeowners. It appears that age distribution is similar across different groups. House traders have the highest disposable income and highest probability of default. They also have much higher credit card debt and unsecured consumer loans than both home equity withdrawers and amortizers. This could indicate that house traders might need to borrow money in addition to their home equity to finance home purchases as house prices increase dramatically during the sample period. Home equity withdrawers have the highest average outstanding mortgage debt; their outstanding non-mortgage debt is lower than that of house traders, but higher than that of amortizers. Compared to home equity withdrawers and house traders, amortizers have much lower mortgages and outstanding non-mortgage debt.

We plot the median values of different sorts of debt over time across different homeowner groups (see Figure 2). From Figure 2a, we see that both home equity withdrawers and house traders experienced a substantial increase of mortgage balances during the four-year sample period, but house

[19] As we can observe the home location of individuals, we define HTs as the individuals who moved during the sample period.

traders increased their mortgage balances at a much higher speed than home equity withdrawers. In terms of total non-mortgage debt, which is presented by Figure 2b, the median value of outstanding debt demonstrates similar decreasing patterns across different homeowner types during the sample period. When broken down by non-mortgage debt type, we see that all homeowner types have almost parallel trends for outstanding credit card debt that decrease over time during the sample period (Figure 2c). However, the three groups demonstrate different patterns regarding the dynamics of unsecured consumer loans, with home equity withdrawers decreasing their unsecured consumer loans over time and house traders increasing them; see Figure 2d.

Lastly, given that education and financial constraints can affect individuals' debt decisions, in Table 2 we show the summary statistics of subsamples based on borrowers' DTI ratios and the financial literacy levels of the municipalities where the borrowers live. Panel A shows the statistics for above- and below-median DTI individuals. Unsurprisingly, the mortgage debt of high DTI borrowers is seven times larger than that of low DTI borrowers. We also find that the high DTI borrowers are younger and have a higher level of credit debt and unsecured loans. These observations are in line with the survey results in Almenberg, Lusardi, Säve-Söderbergh, and Vestman (2021) that suggest younger respondents have a more positive attitude toward debt and that this is reflected in their debt-taking behavior. The default probability is similar across the two groups, but the low DTI group contains a few outliers that skewed the mean of the credit score. Panel B contains summary statistics of borrowers grouped by the financial literacy levels of the municipalities in which they reside.[20] Borrowers from high financial literacy areas have higher disposable income and higher DTIs, mostly driven by mortgage debt. However, their unsecured loans are smaller on average than those of borrowers from low literacy areas.

Equipped with this basic knowledge about individuals in our sample, we proceed with the empirical analysis.

[20]For each municipality, we calculate for each year the share of individuals with a post-high school education and then rank all municipalities based on this share. We define a municipality as a high (low) financial literacy area if the calculated share of highly educated residents for that municipality is higher (lower) than the national median. The financial literacy category for a municipality can change each year.

4 Empirical analysis and results

4.1 House price growth and personal debt composition

4.1.1 Effect on cumulative personal debt changes

We start the analysis by investigating a simple relationship between the increase in regional house prices and debt growth over the whole sample period.

Figure 3 shows the dynamics of aggregate debt balances of homeowners during the period of July 2010–July 2014. Figure 3a presents the total aggregate mortgage and non-mortgage debt balances of homeowners and the house price index. During the period in our sample, housing prices grew rapidly in Sweden. The house price index rose by 20 percent during the four-year period, especially after January 2012 when house prices grew dramatically following a slight drop during the second half of 2011. Correspondingly, aggregate mortgages have increased by 16 percent. Aggregate non-mortgage debt has also increased during the same period.

Next, we conduct a more formal analysis to quantitatively assess the patterns observed in Figure 3. In the first step, we focus on homeowners only. Equation (2) shows the cross-sectional regression specification, which is comparable to Brown et al. (2015):

$$\Delta Debt^{j}{}_{i,c,t_2-t_1} = \beta HPGrowth_{c,t_2-t_1} + \gamma X_{i,c,t_2-t_1} + \mu_{i,c,t_2-t_1}. \tag{2}$$

$\Delta Debt^{j}{}_{i,c,t_2-t_1}$ is the difference in the debt balance (total debt, mortgage, total non-mortgage debt, credit card debt, and unsecured consumer loans) of individual i in parish c between July 2010 (t_1) and July 2014 (t_2). j denotes the debt type. $HPGrowth_{c,t_2-t_1}$ is the house price index growth during the same period, which is defined as $\frac{HP_{c,t_2}-HP_{c,t_1}}{HP_{c,t_1}}$. X_{i,c,t_2-t_1}, presents a vector of observable individual characteristics, including credit score (predicted default probability), age, and disposable income. Individual i's credit score and age are fixed at their corresponding values from July 2010. Disposable income is the difference in individual i's disposable income between July 2010 and July 2014.

Panel A in Table 3 reports the estimates of relationships between house price growth and personal debt during the entire four-year sample period. Column (1) shows the effect on the change in total debt. The coefficient on *HPgrowth* is 92.67 with significance at the 1 percent level,

which indicates that a one percentage point increase in house prices in an individual's parish is associated with an increase of SEK 926.7 in total debt. This is equivalent to a 4 percent increase in house value.[21] The positive relationship between house prices and total debt is largely driven by the positive relationship between house prices and mortgages. This is demonstrated by the coefficient on *HPgrowth* in Column (2) of Panel A in Table 3. However, the relationship between house price growth and total non-mortgage debt is negative (see Column (3) of Panel A in Table 3) but not statistically significant. From Column (4) and Column (5) we can see that the responses of credit card debt and unsecured consumer loans to house prices demonstrate different patterns, with increasing credit card debt and decreasing unsecured loans, although the negative relationship between house price growth and unsecured loans is not statistically significant.

Our first inference regarding house prices and personal debt is thus that we observe a large increase in total debt in response to house price growth, driven by a large increase in mortgages as well as an increase in credit card debt.

The above results should be treated with caution as increasing debt and house price growth could be correlated for different reasons. A simple explanation could be that both increases may be attributable to regional economic development. To account for the spurious relationship due to omitted variables, such as local economic growth and other common regional factors, we use renters as the control group. The identification assumption is that the unobserved local economic conditions, which drive both house price growth and individuals' debt profiles, affect renters and homeowners in a similar fashion. As mentioned in Section 2.1, because the Swedish rental market is highly regulated and uses a queuing system, this alleviates the concern that a household's choice of being a renter or homeowner is based on individuals' wealth. Because the regulated rent is below the market rent, many renters will stay in the rental system without considering entry into the real estate market. Also, in Sweden, the rental market is geographically evenly distributed, and there is no significant difference between homeowners and renters regarding accessibility to the rental market. Therefore, renters can be viewed as a good control group for homeowners given their similarities in individual characteristics regardless of their homeownership choices. This motivates our identification strategy in using renters as the control group that cannot benefit directly from

[21] According to Statistics Sweden, the average purchase price of residential property in one- and two-dwelling buildings in Sweden was 2.15 million SEK between 2010 and 2014. Thus, a one percentage point increase in house prices is equivalent to a SEK 21,500 increase in house value.

rising house prices and homeowners as the treatment group that has access to the home equity-based financing channel.

The regression specification is

$$\Delta Debt^{j}{}_{i,c,t_2-t_1} = \beta_1 HPGrowth_{c,t_2-t_1} * Homeowner_i + \beta_2 HPGrowth_{c,t_2-t_1} + \beta_3 Homeowner_i + \gamma X_{i,c,t_2-t_1} + \mu_{i,c,t_2-t_1}. \quad (3)$$

Panel B in Table 3 summarizes the results.[22] The coefficient on *Homeowner* is positively significant across all columns of Panel B in Table 3, indicating that homeowners in general experienced a larger increase in personal debt than renters during the four-year sample period. From Column (1) we can see that a one percentage point increase in house prices in a homeowner's parish leads to a SEK 959.1[23] increase in total debt, which is slightly higher than the magnitude observed with the regression specification that does not use renters as the benchmark group. Similar to Panel A of Table 3, the effect of house price growth on total non-mortgage debt is still negative, but not significant. However, regression results for changes in credit card and unsecured consumer loan balances suggest a different story. In Column (4), the interaction term between house price growth and the homeowner dummy is neither economically nor statistically significant, implying that the positive significant relationship between house price growth and the change in credit card debt observed in Panel A in Table 3 may be mainly driven by local common factors that affect both homeowners and renters. On the other hand, the interaction term between house price growth and homeowner dummy in Column (5) is negative and significant. Combined with the estimate of the coefficient on house price growth, we can infer that a one percentage point increase in house prices leads to a SEK 25.4 decrease in unsecured loans for homeowners.[24] These results are robust to the alternative econometric specification using instrumental variables regressions, which will be

[22] We also tried to augment the regression with $X_{i,c,t_2-t_1} * Homeowner_i$ as additional control variables. The results do not change and the interaction terms are mostly insignificant.

[23] Note that the ΔTotal debt is in SEK thousand, so to get the effect of a one percentage point increase in the house price has on debt, we need to multiply the obtained coefficients from the table by 10 (multiplied by 1,000 to get the value in SEK and then divided by 100 for the one percentage point house price increase). For homeowners, a one percentage point increase in house prices is associated with an increase in total debt of (107.40-11.49)*10=SEK 959.1

[24] Note that ΔUnsecured loans is in SEK thousand. As previously presented, we need to multiply the obtained coefficients from the table by 10. For homeowners, a one percentage point increase in house prices is associated with a decrease in unsecured loans by (72.3-46.9)*10=SEK 25.4.

discussed in Section 4.1.3. In supplementary analysis in the Appendix B.1, we further explore time series dynamics of personal debt composition, which shows the continuous shift in the household debt portfolio over time in response to house price changes. The results are consistent with the findings here.

The results obtained so far show opposite directions of mortgage and non-mortgage debt in response to the house price growth (consistent with Figure 2), implying a substitution mechanism between mortgage debt and non-mortgage debt, particularly unsecured consumer loans. Since mortgages constitute collateralized debt, typically associated with lower interest rates than uncollateralized non-mortgage debt such as unsecured consumer loans, it is plausible that homeowners borrow against home equity when house prices increase to replace more expensive unsecured loans with mortgage debt. We investigate the debt re-optimization behavior closely in Section 4.2.

4.1.2 Heterogeneous responses by homeowner type

Homeowners might increase their mortgages with the aim of changing residential properties, which is usually driven by reasons exogenous to local house price changes (such as family size or job relocation). For those who have not moved, the change in their mortgages in response to house price growth might reflect differences in the purpose of the debt and the financial conditions of the homeowners. Therefore, it is necessary to investigate heterogeneous effects of house price changes on personal debt structure by homeowner type.

In the following analysis, we first run the same regressions as in the last subsection but divide households into subsamples of renters and different subcategories of homeowners (home equity withdrawers, house traders, and amortizers as presented in Section 3.3). Table 4 reports the effect of house price growth on the change in debt during the period of July 2010–July 2014 using homeowner type subsamples. The table shows that there is considerable heterogeneity among the response of different homeowner types to house prices. The most important finding is that substitution between mortgage and non-mortgage debt, and unsecured loans in particular, only exists among equity withdrawers. Other borrowers do not demonstrate such credit-savvy behavior.

Panel A presents the estimates of the coefficient on house price growth in regression equation (2). We find that both equity withdrawers and house traders experience substantial debt accumulation, most of which is accumulated in a mortgage. The mortgage growth in response to a one percentage

point increase in house prices for house traders is roughly twice the magnitude as that for home equity withdrawers. These findings are not surprising and are consistent with the trend of median mortgage by homeowner type presented in Figure 2a. What is interesting is that the three types of homeowners demonstrate heterogeneous behavior regarding their non-mortgage debt in response to house prices. When borrowing against home equity, home equity withdrawers decreased their total non-mortgage debt, especially unsecured loans. This indicates that they are sophisticated borrowers who replace expensive unsecured debt with cheap mortgages when the housing market is booming. However, the credit card balance for equity withdrawers increases in response to house prices during the sample period. House traders, who trade real estate to climb the property ladder, increase non-mortgage debt. It is important to point out that both the credit card debt and the unsecured debt, and therefore total non-mortgage debt, of the benchmark group renters increased during the sample period. This is not surprising because renters cannot benefit from home equity-based borrowing in the booming housing market; thus, they must rely solely on non-mortgage debt to boost their consumption. Meanwhile, the growth in renters' debt also implies that unobservable local common factors might have driven house price increases and personal debt growth. This may explain why we observe an increase in credit card debt in response to house price growth for equity withdrawers even though they have substantially smaller unsecured loans.

Panel B in Table 4 presents the estimates of the coefficient on the interaction term between house price growth and the homeowner type for the regression specification using renters as the control group. After controlling for unobservable local common factors, the heterogeneity of personal debt changes in response to house price growth among different homeowner groups still persists. Moreover, for equity withdrawers, the substitution between mortgage and non-mortgage debt, and unsecured loans in particular, is more significant. Meanwhile, the change in credit card debt in response to house price growth becomes insignificantly negative.[25] In addition, the positive relationship between total non-mortgage and house prices for house traders is no longer significant when adding renters as the benchmark group.

[25]In the literature, studies including Mian and Sufi (2011) and Brown et al. (2015) focus on credit card debt. However, in Sweden, credit card debt does not play such an important role as in the United States, and it is mostly used as a payment instrument. Unsecured consumer loans are a relatively more important form of non-mortgage debt than credit card debt.

4.1.3 Instruments for house price growth

The empirical challenge to our identification is that house price movements are endogenous to housing demand. This could bias our estimates because the household credit decisions are responding to housing demand as well. We alleviate this concern by employing two instrumental variables to capture the housing supply effects.[26] With the help of IV regressions, we are able to verify the credit decision that is responding to housing prices rather than unobserved housing demand. Using instrumental variables is also important because, while our Difference-in-Difference (DiD) approach accounts for omitted variable bias, it may not address the issues occurring due to measurement errors. This should not be a problem in our case since the debt is recorded by the credit bureau and house prices are based on transaction data. However, if there is still some measurement error, the presented estimates could be biased. Our instrumental variable regressions should alleviate this concern.

Palmer (2015) finds that historical housing market volatility over the 1980s is a strong predictor of the house price cycle experienced over the 2000s in an MSA in the United States. House-price volatility can be used as the instrumental variable and is treated as a predictor of house price growth over the 2000s; see Brown et al. (2015) and Guren, McKay, Nakamura, and Steinsson (2021). We follow the same approach and use historical house price volatility 1981–2005 for each municipality as an instrument for the house price growth in the corresponding regions during the period of July 2010–July 2014.[27] Panels C and D in Table 3 report the results of the relationship between house price growth and cumulative personal debt changes using the Palmer instrument.[28] Panels C and D in Table 4 show the results by homeowner type. The results using the Palmer instrument confirm our conclusions about the evolution of total debt and unsecured loans in response to house price growth. The estimates of coefficients using the Palmer instrument are generally larger.[29]

[26] Figures A1 and A2 in the Appendix present the heat maps of the two instrument variables.

[27] Because Valueguard only provides the house price index data from 2005, the historical house prices 1981–2005 we use is the annual average house price per transaction in SEK at the municipal level from Statistics Sweden.

[28] Due to space restrictions, we have not reported the results for the first-stage IV regression in Table 3. However, we have commented in the notes under Table 3 that the estimated coefficient for the instrument variable in the first-stage IV regression is 0.00022 and significant at 1 percent, and the F-test result if 38.41, which indicates that the historical house price volatility for the period 1981–2005 is a strong instrument.

[29] The findings in the IV regressions are broadly consistent with the OLS regression results. The standard errors in the IV regressions are larger, potentially due to the relatively low correlation between the instruments and the endogenous variable. Housing market fluctuations are driven by many factors, so the instrumental variable cannot fully explain the variation. However, the magnitude of the standard error increase is not too far from the literature.

As a robustness check, we use a second instrument, the results of which are presented in the Appendix. Our alternative instrument uses the fact that Sweden is known for its restrictive regulatory environment for housing supply, as mentioned in Section 2.1. The municipal planning process is complicated and involves various interest groups; thus, construction must go through a lengthy planning process with a high probability of appeals. Even though construction companies obtain building permits from the municipality, local residences might appeal to the county against the new construction. The county that the municipality belongs to will decide whether to overrule the appeal or not. We use the portion of municipal appeals that has been overruled by the county as the instrument to measure how building-friendly or in favor of promoting regional development the local politicians may be. A higher portion of municipal appeals overruled by the county means a more building-friendly environment and therefore less constraints on housing supply. The metric is created based on the planning and building survey by Sweden's National Board of Housing, Building and Planning in 2013.[30]

Tables A2 and A3 in the Appendix report results similar to Tables 3 and 4 but using the *Buildingfriendly* instrument. We find evidence of higher house price growth in the less building-friendly municipalities along with evidence of repayment of unsecured loans by equity withdrawers, which is in line with our main results.

4.2 Home equity withdrawal and non-mortgage debt repayment

In this section, we show direct evidence that homeowners withdraw home equity to repay non-mortgage debt. Previous literature suggests that households can have inefficient behavior regarding personal debt management, for example keeping excess liquid wealth and large mortgage balances at the same time (Vissing-Jørgensen, 2007). Because we cannot observe the wealth of Swedish households during the sample period,[31] it is possible that individuals increase their mortgage for consumption and at the same time pay down their non-mortgage debt using other assets. Evidence on the stock changes in mortgages and non-mortgages does not necessarily imply that homeowners borrow against home equity to pay down the more expensive non-mortgage debt and re-optimize

[30] Sweden's National Board of Housing, Building and Planning only has on its website the open data of the planning and building survey from 2013–2015. We decided to create the instrumental variable using the survey in 2013 because it is the earliest year which is fully covered in our sample period.
http://www.boverket.se/sv/om-boverket/publicerat-av-boverket/oppna-data/plan--och-byggenkaten/

[31] Statistics Sweden stopped collecting personal wealth data in 2008 due to the removal of inheritance taxes.

their debt structure. Focusing on the flow between mortgage and non-mortgage debt and controlling for disposable income, which takes into account the effect of wealth through the realized capital gain, we can clearly identify the debt re-optimization behavior of homeowners.

Taking advantage of the monthly data on debt balances at the individual level, we can track the corresponding changes in debt balances by month for equity withdrawers and examine whether there is a subsequent decrease in non-mortgage debt following an increase in a mortgage. The idea is that if homeowners withdraw home equity in month t with the intention to pay down comparatively expensive non-mortgage debt such as unsecured loans, we should observe a subsequent substantial decrease in non-mortgage debt balances in month $t+1$. We continue to employ the identification strategy of the DiD approach using renters as the benchmark group to control for unobservable local common factors.[32] The regression specification is shown in Equation (4):

$$\Delta Debt^{j}_{i,c,t+1} = \beta_1 EquityWithdrawal_{i,t} + \beta_2 Homeowner_i + \gamma X_{i,t} + \theta_{c,t} + \mu_{i,c,t}. \tag{4}$$

$\Delta Debt^{j}_{it+1}$ is the change of non-mortgage debt type j of individual i located in parish c in month $t+1$. $EquityWithdrawal_{i,t}$ is the equity withdrawal measure. We use two equity withdrawal measures here: (1) *EW dummy*, a dummy variable that equals one if individual i withdraws home equity in month t and 0 otherwise; and (2) *EW size*, the amount of home equity in terms of SEK thousand that individual i withdraws in month t. As described in Section 3.2, we identify an equity withdrawal event if individual i withdraws at least SEK 20 thousand of home equity in month t. $X_{i,t}$ represents a vector of personal characteristics including age, disposable income, and credit score. We control for parish-month fixed effects and cluster standard errors at the parish level.

Since $EquityWithdrawal_{i,t}$ is a positive number (1 for dummy measure and a positive number for size measure) or zero for homeowners and only zero for renters, the interaction term $EquityWithdrawal_{i,t} * Homeowner_i$ is equivalent to $EquityWithdrawal_{i,t}$ and therefore does not show up in Equation (4). In this analysis, we only include home equity withdrawers and renters in the sample because home equity withdrawers are the primary homeowner group that shows the sophisticated credit-savvy behavior of substituting expensive unsecured loans with comparatively inexpensive mortgage debt.

[32] The results hold if we use other homeowners as the control group.

Table 5 reports the results. The odd columns present the average effect of homeowners using withdrawn home equity to pay down comparatively more expensive non-mortgage debt. The even columns present the marginal effect on the size of substitution between the withdrawn home equity and non-mortgage debt. The table shows that homeowners withdraw home equity to pay back non-mortgage debt, in particular unsecured loans, confirming the findings in Section 4.1. On average, if a homeowner withdraws home equity in month t, they will pay back 2.4 percent of credit card debt and 53.5 percent of unsecured debt balances in month $t+1$.[33] So more than half of the unsecured loan balance is reduced after the home equity withdrawal in Sweden, which is a large number compared to the U.S., where the reduction of uncollateralized debt corresponds to 16.7 percent of outstanding balances after home equity withdrawal, according to Bhutta and Keys (2016).

The repayment of a credit card debt balance is not economically significant, and the estimate of the coefficient on the size measure of the equity withdrawal in Column (2) is not statistically significant either, which implies that the usage of home equity for paying down credit card debt is negligible. This may be because credit cards are mainly used as a payment tool instead of a credit instrument in Sweden. The grace period for credit cards can be 30–45 days depending on the issuing bank.

The estimated coefficient on the size measure of the equity withdrawal in Column (4) of Panel A is 2.98 percent, indicating that, on average, only 2.98 percent of the total withdrawn home equity money is used to pay down the comparatively expensive unsecured consumer loans. The average effect of debt re-optimization for all home equity withdrawers seems to be quite small. This is because the majority of individuals in our data, especially homeowners, do not have outstanding non-mortgage debt in the sample period. Thus, there is no need for these borrowers to repay any unsecured loans. In order to better understand the debt re-optimization behavior of homeowners, we restrict our sample to home equity withdrawers who had outstanding unsecured loans before the withdrawal and repaid at least part of their unsecured loans in the month after the withdrawal and then repeat the above analysis. The results are reported in Panel B in Table 5. The estimated coefficients on EW dummy and the size measure in Columns (3)–(6) suggest a much larger debt re-optimization effect for homeowners that may have the need to repay their unsecured loans.

[33] Credit card debt is paid back by SEK 73.3 and unsecured loans by SEK 9,624, which means the total non-mortgage debt is decreased by SEK 9,698. Home equity withdrawers have average outstanding credit card debt of SEK 3,100 and outstanding unsecured loans of SEK 18,000 across the 48-month period (see Panel B in Table 1).

The outstanding unsecured loan balances decreased by SEK 55,040, which is almost six times the magnitude of all home equity withdrawers. Also, the portion of the withdrawn home equity that is used for unsecured loan repayment increases to 17.7 percent, which is also around six times the magnitude of all home equity withdrawers. Although the majority of the withdrawn home equity has been used for other purposes, as we discuss in Section 5.3, debt re-optimization is an important motivation for homeowners with outstanding unsecured loans.

4.3 The role of DTI constraints and financial literacy

What drives the debt re-optimization behavior shown in the data? In this section, we test whether financial constraints and financial literacy can explain borrowers' debt optimization decisions. Financially constrained borrowers are more likely to make an effort to lower their debt service cost and actively rebalance their debt profiles, while education can increase the financial literacy of borrowers, helping them make credit savvy decisions such as substitution of costly uncollateralized debt with cheaper mortgage debt.

To investigate how the borrowers' credit constraint and financial literacy levels influence their debt optimization decisions, we employ a difference-in-difference-in-difference (DDD) approach by interacting the equity withdrawal dummy or size together with the borrower's credit constraint and financial literacy indicators.[34] We define a borrower as a high (low) DTI borrower in month t if their DTI ratio is higher (lower) than the median of DTI ratios for all borrowers in month t. For the financial literacy level, we do not have information on the education or financial literacy measures at the individual level; therefore, we compare borrowers between municipalities, for which the education levels of the population are reported and can be used as a proxy for the financial literacy level for that area.[35] We define a municipality as a high financial literacy area if its share of inhabitants with a post-high school education is larger than the national median in the corresponding year. A potential concern is that regions where more borrowers are educated are usually urban regions where borrowers' DTI ratios are also much higher. However, the DDD approach helps to mitigate such a concern. The regression specification is shown in Equation 5:

[34] We also use a difference-in-difference (DiD) approach by interacting the equity withdrawal dummy or size measure together with borrower's credit constraint or financial literacy indicators separately. The results are quite similar (see Tables A10 and A11 in the Appendix).

[35] As shown in Lusardi and Mitchell (2014), there is a high correlation between education and financial literacy.

$$\Delta Debt^{j}_{i,c,t+1} = \beta_1 EquityWithdrawal_{i,t} + \beta_2 HighDTI_{i,t} + \beta_3 EquityWithdrawal_{i,t} * HighDTI_{i,t}$$
$$+\beta_4 HighLit_{c,t} + \beta_5 EquityWithdrawal_{i,t} * HighLit_{c,t} + \beta_6 HighDTI_{i,t} * HighLit_{c,t}$$
$$+\beta_7 EquityWithdrawal_{i,t} * HighDTI_{i,t} * HighLit_{c,t} + \gamma_1 X_{i,t} + \gamma_2 Homeowner_i + \theta_c + t + \mu_{i,c,t}. \quad (5)$$

Table 6 reports the regression results. In general, debt-optimization behavior is mainly associated with financially constrained borrowers, which is indicated by the negatively significant coefficients for $HighDTI$ and its interaction terms with equity withdrawal dummy or size. The negatively significant coefficients for the triple interaction terms $EquityWithdrawal_{i,t} * HighDTI_{i,t} * HighLit_{c,t}$ in Columns (3)–(6) suggest that borrowers with high DTI ratios living in areas with highly educated residents are most likely to use home equity withdrawals to actively re-optimize their debt portfolio. After withdrawing home equity, they paid down almost SEK 10,000[36] more in unsecured loans than the amount repaid by borrowers with high DTI ratios living in low-education areas. Also, a larger share of the withdrawn home equity has been used to repay the unsecured loans by the borrowers with high DTI ratios living in high-education areas than the share used by other types of borrowers. These findings are consistent with the literature and survey evidence that financially literate borrowers are usually more careful in managing their credit and investments (i.e., Disney and Gathergood, 2013, Lusardi and Mitchell, 2007, Lusardi and Tufano, 2015, and van Rooij, Lusardi, and Alessie, 2011).

4.4 The role of macroprudential policy

The Swedish FSA introduced a maximum LTV ratio of 85 percent in October 2010 in response to the rapidly rising house prices and household indebtedness. In this subsection, we investigate the effect of this newly introduced macroprudential policy on the household debt composition and its interaction with the housing price movements. As our sample starts in July 2010, only three months before the introduction of LTV cap, it leaves us with quite a short pre-restriction period

[36] Column (3) reports -9.913, and Column (5) reports -9.966, both of which are statistically and economically significant. Note that these non-mortgage debts are in SEK thousand, so the coefficient should be multiplied by 1000 – the debt reduction is around SEK 10,000.

as a benchmark. Therefore, we construct two subsamples, three months before and three months after the macroprudential policy change, and then repeat the analysis from Subsection 4.1.1.

First, we investigate the relationship between house price movements and household debt separately for the period before and after the introduction of the LTV cap. The regression specification is shown as follows:

$$\Delta Debt^{j}{}_{i,c,t_2-t_1} = \beta HPGrowth_{c,t_2-36,t_2} + \gamma X_{i,c,t_2-t_1} + \mu_{i,c,t_2-t_1}. \tag{6}$$

The dependent variables are the changes in household debt in different categories: total, mortgage, non-mortgage, credit card, and unsecured consumer loans. We calculate the changes in debt balances within the three-month window in the two subsamples. $HPGrowth_{c,t_2-36,t_2}$ is the house price growth over a period of 36 months for parish c, measured at the end of the three-month window.[37] We calculate the cumulative measure going three years back in time to allow the house price growth to be large enough to affect the household decision on debt, similar to Bhutta and Keys (2016).

Secondly, we combine the two cross-sectional subsamples and add an interaction term between house price growth and the dummy variable of the LTV-constrained subsample in the regression. Then we investigate whether the difference in debt reaction to house price growth under different LTV regimes is significant. The regression specification becomes

$$\begin{aligned}\Delta Debt^{j}{}_{i,c,t_2-t_1} = \beta_1 HPGrowth_{c,t_2-36,t_2} + \beta_2 LTV + \beta_3 HPGrowth_{c,t_2-36,t_2} * LTV \\ + \gamma X_{i,c,t_2-t_1} + \mu_{i,c,t_2-t_1},\end{aligned} \tag{7}$$

where LTV is a dummy variable that takes the value one after the introduction of the LTV cap. The coefficient on the interaction term between LTV and $HPGrowth_{c,t_2-36,t_2}$ is of main interest in this regression.

Table 7 presents the results for the above regressions. Panel A shows that, before the LTV constraint was introduced, the difference in debt balances does not respond significantly to house

[37] We also run regressions with 1-year, 2-year, and 4-year house price growth in the same regression. The results are qualitatively similar, but the statistical significance may change and is weaker for a shorter house price calculation window.

price growth. This is true for all considered debt types. On the contrary, after the LTV limit was introduced, all debt types increase significantly in the areas with higher cumulative house price growth, as shown in Panel B. In Panel C, we see that the coefficient on the interaction term between house price growth and the change in non-mortgage debt is positively significant, which is mainly driven by the increase in unsecured consumer loans. Under tighter LTV policy, borrowers show a stronger increase in their exposure to non-mortgage debt in response to house price growth compared to the periods before the introduction of the LTV regulation. These results suggest that the new LTV regulation encouraged people to increase their unsecured loan holdings in order to circumvent the newly imposed limits, at least in the short term. It is consistent with the narrative from the regulatory reports discussed in 2.2.

Next, we investigate whether the introduction of the LTV limit has an impact on the debt-optimization behavior we found in previous sections. For brevity, we report those results in the Appendix in Table A12.[38] We find evidence that borrowers use the withdrawn home equity to repay unsecured loans both before and after the introduction of the LTV limit. However, the interaction terms between the LTV constraint and the equity withdrawal indicators (both dummy and size) are not significant, which indicates that the debt-optimization behavior has not been affected by the implementation of the LTV limit.

Note that during the six-month event window of LTV introduction, interest rates were on an increasing trajectory (even though the credit spread showed a slightly different pattern, according to Figure B1 in the Appendix). Given the relatively short period considered around the LTV introduction, the reason we do not find significant differences in repayments under different macro-prudential regimes could be the limited sample size. Nonetheless, the results shown in Table 7 suggest that the newly implemented LTV limits do have impact on the debt market.

So far, in our empirical analysis, we have mainly focused on the existing homeowners and excluded new (or first-time) mortgage borrowers. Since the newly implemented LTV restriction applies both to home equity withdrawers and new mortgagors, we test using a simple additional exercise whether the ratio between the unsecured loans and mortgages for new mortgage borrowers

[38] Table A12 presents the results for the analysis on the relationship between home equity withdrawal and non-mortgage debt repayment (similar to Section 4.2) using the six-month event window around the introduction of the LTV limit. Panels A and B show the results before and after the introduction of the LTV limit, respectively. Panel C shows the results for the analysis with an add-on of the interaction between the LTV limit and home equity withdrawal indicators (both dummy and size) during the whole six-month event window.

(conditional on other observables) changed after the introduction of the LTV constraint. We use the same six-month event window of July 2010–December 2010 in this analysis. The panel data regression equation is as follows

$$\frac{Unsecuredloans_{i,t}}{Mortgage_{i,t}} = \beta_1 LTV + \beta_2 HPGrowth_{c,t-36,t} + \gamma X_{i,t} + \mu_{i,t}. \tag{8}$$

The dependent variable is the initial debt ratio between the unsecured loans and the mortgage debt for the new mortgage borrowers that entered the mortgage market during month t. LTV is a dummy variable that equals one for the period after the introduction of the LTV constraint and zero otherwise. *HPgrowth* is the parish-level house price growth in the previous 36-month period, which captures the cumulative effect of housing price development. Additional controls include new borrowers' ages, credit scores and disposable income in month t when they entered the mortgage market. We cluster the standard errors at the parish level.

Table 8 presents the regression results. The positively significant coefficient for the LTV constraint indicates that the LTV limit leads to an increase of 1.68 percent in the ratio between unsecured loans and mortgage debt. This could be driven by some financially constrained new mortgage borrowers who are facing the 85 percent LTV limit and have to borrow unsecured loans in order to cover the 15 percent downpayment to purchase the home. As unsecured loans are more expensive than mortgages, the LTV limit can make the initial debt service cost higher for financially constrained new mortgage borrowers.

Zooming into the period around the introduction of the LTV limit, we find that both existing and new mortgagors have increased their unsecured loans under the tighter macroprudential regime. We can thus confirm the narrative from Finansinspektionen (2012) and van Santen (2017) that individuals try to circumvent the LTV regulation by taking on more unsecured loans.

4.5 The role of interest rates

The empirical evidence so far indicates that home equity withdrawals allow individuals to re-optimize their debt composition and lower their interest rate expense. Previous studies such as Bhutta and Keys (2016) and Bäckbom and Eklöf (2006) have shown that the interest rate is one of the main drivers of home equity withdrawals. Here, we also investigate the role of interest rates

in the equity withdrawal and debt repayment behavior. The empirical analysis and results are presented in the Appendix B.2.

We show that lower interest rates are important drivers of home equity withdrawal, consistent with the findings in Bhutta and Keys (2016) and Bäckbom and Eklöf (2006). Both the decision of home equity withdrawal and the withdrawn amount are negatively correlated with the mortgage rate and positively correlated with the spread between the unsecured loan rate and the mortgage rate. This implies that, during a housing boom period, a larger amount of home equity will be withdrawn when the mortgage is cheaper or the relative borrowing cost of unsecured loans compared to the mortgage is higher.

5 Robustness checks

5.1 Alternative definitions of home equity withdrawers

We define home equity withdrawers as mortgagors who have withdrawn home equity at least once in the sample but without purchasing new properties. Around 25 percent of the home equity withdrawers withdrew more than once in the sample period, and 5 percent of home equity withdrawers withdrew more than five times in the sample period. To rule out the possibility that our results are driven by the home equity withdrawers who withdrew more frequently in the sample period, we redefine home equity withdrawers as mortgagors who have withdrawn home equity only once in the sample but without purchasing new properties, and we repeat the analysis. Tables A4–A6 in the Appendix show that our main findings do not change under the new definition of home equity withdrawer.

Another potential concern regarding the current definition of home equity withdrawers is that this definition might include individuals who increase mortgages to change their old home to a new one within the same property type (apartment or single-family house) at the same location. These individuals should be categorized as house traders, although such cases are rare. Thus, we repeat the analysis by restricting home equity withdrawers to those who withdrew an amount between SEK 20–100 thousand during the sample period. We choose SEK 100 thousand as the threshold because this amount could be used to pay down non-mortgage debt substantially but at the same time is not enough to purchase a new property. The main results are robust with regards to the

different definitions of home equity withdrawers.

5.2 Alternative measures for cumulative house price growth

In our sample, we do not have information on the origination date of loans or the valuation of properties; therefore, we use a cumulative measure of house price growth that extends three years (36 months) back in time to make sure that a homeowner has built up equity to a certain level that is available to be withdrawn. To rule out the concern of cherry-picking the 36-month window, we test several alternative measures with different cumulative windows: 12 months, 24 months, and 48 months. As shown in Tables A7–A9 in the Appendix, the results are similar.

5.3 Discussion

Our results document that homeowners withdraw home equity in response to house price appreciation and use the proceeds to pay down comparatively more expensive non-mortgage debts. However, most of the withdrawn amount is used for other purposes, which is in line with studies for other countries that find homeowners withdraw home equity mainly for home improvement or consumption.[39] [40] We cannot verify whether homeowners use withdrawn home equity to renovate their houses or consume, but we can provide some anecdotal evidence. The 2014 Mortgage Survey states that the primary reasons why many Swedish households increase their loans are renovation or reconstruction (according to the banks), which is in line with the evidence for other countries (Finansinspektionen, 2014). Bäckbom and Eklöf (2006) provide survey evidence on the usage of equity withdrawals in Sweden for a period preceding our analysis. They directly ask equity withdrawers what the money was used for, allowing three simultaneous answers. Of their respondents, 65 percent state that they used the withdrawn money for home improvements, 42 percent for a car

[39] Many papers have studied the effect of house prices on consumption growth through the collateral channel in times of credit constraints (e.g., Hurst and Stafford, 2004; Iacoviello, 2004; Lehnert, 2004; Lustig and Van Nieuwerburgh, 2005; Ortalo-Magne and Rady, 2006; Campbell and Cocco, 2007; Cooper, 2009; Gan, 2010; Mian, Rao, and Sufi, 2013; Justiniano, Primiceri, and Tambalotti, 2015; Agarwal and Qian, 2017; Saxena and Wang, 2016).

[40] In the United States, according to surveys on mortgage refinancing activities during 1998–1999 and 2001–2002, 51 percent of cash-out refinancing is used for home improvement and consumption (33 percent for home improvement and 28 percent for consumer expenditures) while 47 percent of the withdrawn home equity money is used for repayment of other debt and real estate or business investment (Brady et al., 2000; Canner et al., 2002). Similarly, a consumer survey in the U.K. during the period 1998–2000 shows that home equity withdrawal is an important financing channel for consumption, in particular home improvements (Davey, 2001). In addition, Almaas et al. (2015) investigate home equity-based refinancing in Norway: The 2012 Survey on Living Conditions for Norwegian Residents reports that the percentage of new issued mortgages of home equity credit lines for home improvement and consumption (measured by purchasing of a car, boat or cabin) are respectively 33 percent and 32 percent.

or boat purchase, and 6.6 percent for paying off other debt. Thus, paying off debt is one of the three most frequent answers (among 14 in total, including non-durable consumption, holidays, capital investments, helping the children, etc.). However, the stated survey does not provide a breakdown of expenses by amounts that would allow us to compare the share of withdrawn money spent on the consolidation of debt with our results. Survey respondents also answered questions related to factors affecting the decision to withdraw home equity: For 51 percent of them, the increase in property price was a decision factor; for 39 percent, the consolidation of other loans; and for 57 percent, the lower interest rates. In light of this supportive evidence, our results are not surprising. Paying down more expensive non-mortgage debt is one of the important purposes for home equity withdrawal in Sweden.

A surprising finding of our study is that while equity withdrawers used parts of their withdrawal to pay back unsecured consumer debt, they do not pay back the most expensive part of their debt: credit card balances. Credit cards are used in Sweden mostly as a means of payment (Sveriges Riksbank, 2022) and not as a credit instrument, and the average outstanding balances account for only 16 percent of monthly disposable income of debtors (and 27 percent of monthly disposable income of credit card holders). In comparison, for the period of our study, a corresponding number for the U.S was 201 percent, indicating a different usage of credit cards (author's calculations based on U.S. Bureau of Economic Analysis, 2024, Karma, 2011, Traub and Ruetschlin, 2012, Gingold, 2013, CreditCards.com, 2014). In fact, according to Federal Reserve Bank of Philadelphia (2024), only around 27.5 percent of large banks' credit card account holders in the U.S. were making full balance payments. Even though credit card debt in Sweden is more expensive than unsecured loans, as shown in Figure B1 in the Appendix, when repaid during the grace period, it incurs no costs to the customers. In fact, Winstrand and Ölcer (2014) state that in Sweden, credit card balances are usually repaid at the end of the month.

One caveat that might weaken our results is that homeowners, especially home equity withdrawers, may be wealthier than renters. Though we have no data on individuals' holdings of financial assets, we indirectly control for the effect from financial wealth through disposable income in all our regression analyses. The disposable income[41] has already taken into account the net capital gain on financial investments. Though the net realized capital gain might not proportionally reflect

[41] Disposable income=labor income-tax payment+net realized capital gain (after tax).

the total financial wealth of an individual, in this study we focus on the flows rather than stocks of personal debt. Thus only the net realized capital gain of financial wealth can affect our results.

Another concern is the wealth effect: appreciation of local house prices might affect consumer behavior. In our study, we assume that the psychological effects of the increase in housing wealth on local households are homogeneous. Renters cannot benefit directly from house price increases; however, it is likely that they will increase spending due to peer pressure and behavioral reasons. Those who live in a neighborhood with a higher proportion of rich people tend to borrow more through credit card debt, which is known as the "keeping up with the Joneses" effect on consumption; see Gali (1994) and Christen and Morgan (2005). By using renters as the control group, we consider the effect of house prices on the consumption for homeowners, which allows us to focus on the housing collateral channel. Thus the wealth effect is partly absorbed by using renters as the control group. In addition, our results are driven by equity withdrawers, while the wealth effect due to the appreciated house value should have the same effect on both equity withdrawers and other homeowner types. The subgroup study suggests that the wealth effect is not the main driver of our empirical findings.

6 Conclusion

Using the credit bureau data on Swedish individuals' debt between July 2010 and July 2014, we investigate how homeowners adjust their borrowing behavior and manage their debt portfolio in response to a rapid growth in house prices. We find that homeowners demonstrate sophisticated behavior: they reduce their debt service cost by using withdrawn home equity to repay comparatively more expensive non-mortgage debt. In particular, we find that borrowers with high DTI ratios residing in high financial literacy municipalities are the main group using home equity to re-optimize their debt positions. Our results are consistent with the literature evidence that financial literate individuals are capable of making sound decisions facing credit and borrowing opportunities; see Campbell (2006) and Disney and Gathergood (2013).

Despite institutional differences, we find many similarities between our results for Sweden and evidence for other countries. Homeowners use most of the withdrawn amount for reasons other than debt consolidation. An interesting aspect of our study is the role of macroprudential measures in

shaping household indebtedness. Our results indicate that borrowers may try to circumvent tighter mortgage regulations by increasing their non-mortgage debt. This might give rise to financial stability concerns, given that borrowers face much higher interest costs on unsecured debt.

The rising house prices allow homeowners to accumulate home equity, which can be withdrawn to pay back expensive non-mortgage debt. We have shown that the spread between unsecured loan and mortgage rates is important for explaining the decision to withdraw home equity. Individuals with both mortgage and non-mortgage debts may enjoy a reduction in borrowing cost when the increase in house value allows them to use the withdrawn equity to re-optimize their debt structure. In conjunction with the macroprudential policy effects, our results imply that homeowners can "ride the housing wave" to circumvent the LTV constraint by borrowing expensive unsecured consumer loans but paying back later with withdrawn home equity, thanks to the increase of house prices in our sample period.

Our findings indicate that home equity is an important financing channel for homeowners with financial constraints. However, home equity withdrawal needs a booming house market to work and could be a fragile investment strategy. We have shown that Swedish individuals, despite their re-optimizing behavior, are still increasing their level of indebtedness, which may raise several concerns and increase systemic risk (Khandani, Lo, and Merton, 2013). If house prices were to fall unexpectedly, homeowners relying on home equity withdrawals would not be able to substitute non-mortgage debt with cheaper mortgages and could potentially face high interest payments from unsecured personal debt. Moreover, homeowners, especially those with high income risk, might need to increase their precautionary savings and reduce consumption even further.[42]

It is undoubtedly a crucial decision on how to optimally manage the mortgage and other types of debt over the life cycle phases and under heterogeneous household expectations. Therefore, it could be interesting to look at the intergenerational dynamics of the debt profile and explore how house prices affect personal debt management decisions of heterogeneous households over their life cycles. We leave this for future research.

[42] Agarwal and Qian (2017) find a significant negative consumption response to a housing policy experiment in Singapore resulting in a decrease in access to home equity. The consumption response appears to be stronger among individuals with limited access to credit market or with high precautionary saving motive.

References

Agarwal, S. and W. Qian (2017). Access to home equity and consumption: Evidence from a policy experiment. *Review of Economics and Statistics 99*(1), 40–52.

Almaas, S., L. Bystrøm, F. Carlsen, and X. Su (2015). Home Equity-Based Refinancing and Household Financial Difficulties: The Case of Norway. Working paper.

Almenberg, J., A. Lusardi, J. Säve-Söderbergh, and R. Vestman (2021). Attitudes towards Debt and Debt Behavior. *Scandinavian Journal of Economics 123*(3), 780–809.

Andersen, S., J. Y. Campbell, K. M. Nielsen, and T. Ramadorai (2020). Sources of inaction in household finance: Evidence from the Danish mortgage market. *American Economic Review 110*(10), 3184–3230.

Bäckbom, J. and M. Eklöf (2006). Mortgage Borrowing Revisited - a study of Mortgage Equity Withdrawal in Sweden 2004-2006.

Betermier, S., L. E. Calvet, and P. Sodini (2017). Who are the value and growth investors? *The Journal of Finance 72*(1), 5–46.

Bhutta, N. and B. J. Keys (2016). Interest rates and equity extraction during the housing boom. *American Economic Review 106*(7), 1742–1774.

Blom, K. and P. van Santen (2017). The indebtedness of Swedish households - Update for 2017 . *Sveriges Riksbank Economic Commentary* (6), 1–10.

Boverket (2021). Bostadsmarknadsenkäten 2021. https://www.boverket.se/sv/samhallsplanering/bostadsmarknad/bostadsmarknaden/bostadsmarknadsenkaten/. Accessed: 2022-01-18.

Brady, P. J., G. B. Canner, and D. M. Maki (2000). The effects of recent mortgage refinancing. *Fed. Res. Bull. 86*, 441.

Brown, M., S. Stein, and B. Zafar (2015). The impact of housing markets on consumer debt: Credit report evidence from 1999 to 2012. *Journal of Money, Credit and Banking 47*(S1), 175–213.

Campbell, J. Y. (2006). Household finance. *The Journal of Finance 61*(4), 1553–1604.

Campbell, J. Y. and J. F. Cocco (2003). Household risk management and optimal mortgage choice. *The Quarterly Journal of Economics 118*(4), 1449–1494.

Campbell, J. Y. and J. F. Cocco (2007). How do house prices affect consumption? Evidence from micro data. *Journal of Monetary Economics 54*(3), 591–621.

Canner, G., K. Dynan, and W. Passmore (2002). Mortgage refinancing in 2001 and early 2002. *Fed. Res. Bull. 88*, 469.

Cao, J., V. Dinger, A. Grodecka-Messi, R. Juelsrud, and X. Zhang (2021). The interaction between macroprudential and monetary policies: The cases of Norway and Sweden. *Review of International Economics 29*(1), 87–116.

Christen, M. and R. M. Morgan (2005). Keeping up with the Joneses: Analyzing the effect of income inequality on consumer borrowing. *Quantitative Marketing and Economics 3*(2), 145–173.

Comelli, M. (2021). The impact of welfare on household debt. *Sociological Spectrum 41*(2), 154–176.

Cooper, D. (2009). Impending US spending bust? The role of housing wealth as borrowing collateral. *FRB of Boston Public Policy Discussion Paper 09-9*.

CreditCards.com (2014). Credit card debt statistics. https://www.nasdaq.com/articles/credit-card-debt-statistics-2014-09-23. Accessed: 2024-03-13.

Davey, M. (2001). Mortgage equity withdrawal and consumption. *Bank of England Quarterly Bulletin, Spring*.

Disney, R. and J. Gathergood (2013). Financial literacy and consumer credit portfolios. *Journal of Banking and Finance 37*(7), 2246–2254.

Emanuelsson, R. (2015). Supply of housing in sweden. *Sveriges Riksbank Economic Review 2015:2*(2), 47–75.

Englund, P. (2011). Swedish house prices in an international perspective. In *The Riksbank's inquiry into the risks in the Swedish housing market*, pp. 23–66. Sveriges Riksbank.

Federal Reserve Bank of Philadelphia (2024). Large Bank Consumer Credit Card Balances: Share of Accounts Making Full Balance Payment [RCCCBSHRFULL]. https://fred.stlouisfed.org/series/RCCCBSHRFULL. Retrieved from FRED, Federal Reserve Bank of St. Louis. Accessed: 2024-03-13.

Finansinspektionen (2012). The Swedish Mortgage Market. Report.

Finansinspektionen (2014). The Swedish Mortgage Market 2014. Report.

Finansinspektionen (2021). The Swedish Mortgage Market. Report.

Finocchiaro, D., C. Nilsson, D. Nyberg, and A. Soultanaeva (2011). Household indebtedness, house prices and the macroeconomy: A review of the literature. *Sveriges Riksbank Economic Review 1*, 6–28.

Gali, J. (1994). Keeping up with the Joneses: Consumption externalities, portfolio choice, and asset prices. *Journal of Money, Credit and Banking 26*(1), 1–8.

Gan, J. (2010). Housing wealth and consumption growth: Evidence from a large panel of households. *Review of Financial Studies 23*(6), 2229–2267.

Gingold, J. (2013). Americans expected to fall deeper into pit of credit card debt in 2013. https://www.gingoldbankruptcylaw.com/Articles/Americans-expected-to-fall-deeper-into-pit-of-credit-card-debt-in-2013. Accessed: 2024-03-13.

Grodecka, A. (2020). On the Effectiveness of Loan-to-Value Regulation in a Multiconstraint Framework. *Journal of Money, Credit and Banking 52*(5), 1231–1270.

Guren, A. M., A. McKay, E. Nakamura, and J. Steinsson (2021). Housing wealth effects: The long view. *The Review of Economic Studies 88*(2), 669–707.

Hurst, E. and F. P. Stafford (2004). Home is where the equity is: Mortgage refinancing and household consumption. *Journal of Money, Credit, and Banking 36*(6), 985–1014.

Iacoviello, M. (2004). Consumption, house prices, and collateral constraints: A structural econometric analysis. *Journal of Housing Economics 13*(4), 304–320.

Justiniano, A., G. E. Primiceri, and A. Tambalotti (2015). Household leveraging and deleveraging. *Review of Economic Dynamics 18*(1), 3–20.

Karma, C. (2011). Consumers lower credit card debt eight percent in 2010. https://www.creditkarma.com/about/releases/consumers-lower-credit-card-debt-eight-percent-in-2010. Accessed: 2024-03-13.

Khandani, A. E., A. W. Lo, and R. C. Merton (2013). Systemic risk and the refinancing ratchet effect. *Journal of Financial Economics 108*(1), 29–45.

Lehnert, A. (2004). Housing, consumption, and credit constraints. Working paper.

Loutskina, E. and P. E. Strahan (2015). Financial integration, housing, and economic volatility. *Journal of Financial Economics 115*(1), 25–41.

Lusardi, A. and O. S. Mitchell (2007). Baby boomer retirement security: The roles of planning, financial literacy, and housing wealth. *Journal of Monetary Economics 54*(1), 205–224.

Lusardi, A. and O. S. Mitchell (2014). The economic importance of financial literacy: Theory and evidence. *Journal of Economic Literature 52*(1), 5–44.

Lusardi, A. and P. Tufano (2015). Debt literacy, financial experiences, and overindebtedness. *Journal of Pension Economics and Finance 14*(04), 332–368.

Lustig, H. N. and S. G. Van Nieuwerburgh (2005). Housing collateral, consumption insurance, and risk premia: An empirical perspective. *The Journal of Finance 60*(3), 1167–1219.

McCully, B. A., K. M. Pence, and D. J. Vine (2019). How much are car purchases driven by home equity withdrawal? *Journal of Money, Credit and Banking 51*(5), 1403–1426.

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

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

OECD (2022). Household debt (indicator). https://doi.org/10.1787/f03b6469-en. Accessed: 2022-02-02.

Ortalo-Magne, F. and S. Rady (2006). Housing market dynamics: On the contribution of income shocks and credit constraints. *The Review of Economic Studies 73*(2), 459–485.

Palmer, C. (2015). Why did so many subprime borrowers default during the crisis: Loose credit or plummeting prices? Working paper.

Saxena, K. and P. Wang (2016). How do house price affect household consumption growth over the life cycle? Working paper.

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

Sodini, P., S. Van Nieuwerburgh, R. Vestman, and U. von Lilienfeld-Toal (2023, December). Identifying the Benefits from Homeownership: A Swedish Experiment. *American Economic Review 113*(12), 3173–3212.

Statistics Sweden (2020). Fixed interest rates on mortgages historically low. https://www.scb.se/en/finding-statistics/statistics-by-subject-area/financial-markets/financial-market-statistics/financial-market-statistics/pong/statistical-news/financial-market-statistics-december-2020/. Accessed: 2022-01-17.

Stroebel, J. and J. Vavra (2014). House prices, local demand, and retail prices. Working paper.

Sveriges Riksbank (2022). The payment behaviour of the Swedish population . https://www.riksbank.se/en-gb/statistics/statistics-on-payments-banknotes-and-coins/payment-patterns/. Accessed: 2024-03-13.

Traub, A. and C. Ruetschlin (2012). The plastic safety net: 2012 national survey on credit card debt of low-and middle-income households. www.demos.org/research/plastic-safety-net-2012-national-survey-credit-card-debt-low-and-middle-income-households. Accessed: 2024-03-13.

U.S. Bureau of Economic Analysis (2024). Disposable personal income: Per capita [A229RC0A052NBEA]. https://fred.stlouisfed.org/series/A229RC0A052NBEA. Retrieved from FRED, Federal Reserve Bank of St. Louis. Accessed: 2024-03-13.

van Rooij, M., A. Lusardi, and R. Alessie (2011). Financial literacy and stock market participation. *Journal of Financial Economics 101*(2), 449–472.

van Santen, P. (2017). Drivers and implications of the strong growth in consumption loans. *Sveriges Riksbank Staff Memo* (December), 1–16.

Vissing-Jørgensen, A. (2007). Household finance: The liability side. In *Introduction of Session Organizer at the 2007 Gerzensee European Summer Symposium.*

Winstrand, J. and D. Ölcer (2014). The indebtedness of Swedish households - Update for 2017. *Sveriges Riksbank Economic Commentary* (1), 1–18.

Table 1. Summary Statistics: Homeowners vs. Renters

	Panel A: Homeowners vs. Renters					
	N	Mean	Std. Dev.	p25	Median	p75
	Full sample					
Credit card debt	4,867,513	3.1	9.6	0	0	0.8
Unsecured loans	4,867,513	18.3	72.1	0	0	0.9
Mortgage	4,867,513	535.4	870.7	71.9	348.3	769.0
Age	4,844,322	51	14	40	50	62
Credit score	4,844,322	1.8	8.5	0.1	0.1	0.3
Disposable income	4,844,322	232.7	299.1	152.2	211.3	276.7
	Homeowner					
Credit card debt	3,932,005	2.8	9.2	0	0	0
Unsecured loans	3,932,005	15.4	72.7	0	0	0
Mortgage	3,932,005	662.7	924.2	229.2	480.4	892.5
Age	3,917,775	51	14	40	50	61
Credit score	3,917,775	1.0	6.2	0.1	0.1	0.2
Disposable income	3,917,775	237.4	228.7	157.2	216.4	283.7
	Renter					
Credit card debt	935,508	4.5	11.1	0	0	4.1
Unsecured loans	935,508	30.3	68.2	0	0	35.0
Mortgage	935,508	0	0	0	0	0
Age	926,547	53	16	41	54	66
Credit score	926,547	4.9	14.4	0.1	0.3	1.3
Disposable income	926,547	212.6	496.0	134.8	191.5	246.3

	Panel B: By Homeowner Type							
	EWs		HTs		AMs		Others	
	mean	sd	mean	sd	mean	sd	mean	sd
Credit card debt	3.1	9.6	4.1	11.0	2.7	13.0	2.2	8.0
Unsecured loans	18.0	89.8	28.5	106.4	8.5	32.4	10.0	37.1
Mortgage	804.5	1025.3	671.9	826.5	597.9	662.8	541.0	843.0
Age	49	13	49	14	51	13	53	14
Credit score	0.6	3.6	1.9	8.7	0.8	5.2	1.2	7.0
Disposable income	244.1	242.7	273.8	336.8	224.0	172.7	222.7	175.8
Obs	1,563,832		472,879		55,384		1,825,680	

Note: This table shows descriptive statistics on personal debt balances and individual characteristics. Panel A presents the summary statistics for the full sample and subsamples for homeowners and renters, respectively. Panel B presents the summary statistics for the subcategories of homeowners: equity withdrawers (EWs), active house traders (HTs), amortizers (AMs), and others. Personal debt includes mortgage and non-mortgage debt (credit card debt and unsecured loans). Individual characteristics include credit score, age and disposable income. Disposable income, credit card debt, unsecured loans, and mortgage debt are in SEK thousand. The credit score is defined by the credit bureau as the estimated probability of default for an adult individual in the next 12 months.

Table 2. Summary Statistics: By DTI Ratio or Financial Literacy Level

	Panel A: High DTI vs. Low DTI					
	N	Mean	Std. Dev.	p25	Median	p75
	High DTI					
Credit card debt	2,480,832	3.3	10.5	0	0	0.5
Unsecured loans	2,480,832	21.1	91.0	0	0	1.4
Mortgage	2,480,832	915.1	1073.1	480.3	748.0	1142.5
Age	2,480,832	47.9	13.0	38.0	46.0	57.0
Credit score	2,480,832	1.3	6.8	0.1	0.1	0.3
Disposable income	2,480,832	215.6	132.6	141.0	204.8	272.2
	Low DTI					
Credit card debt	2,381,240	2.8	8.6	0	0	0.9
Unsecured loans	2,381,240	15.4	44.3	0	0	0.4
Mortgage	2,381,240	139.0	200.7	0	78.0	226.7
Age	2,381,240	55.0	14.1	45.0	56.0	65.0
Credit score	2,381,240	2.3	10	0.1	0.1	0.3
Disposable income	2,381,240	250.4	403.3	162.3	217.6	281.0
	Panel B: High vs. Low Financial Literacy Areas					
	N	Mean	Std. Dev.	p25	Median	p75
	High Financial Literacy					
Credit card debt	3,906,384	3.2	9.9	0	0	0.9
Unsecured loans	3,906,384	17.5	73.7	0	0	0
Mortgage	3,906,384	592.7	941.3	79.7	410.5	862.5
Age	3,906,384	51.1	14.1	40	50	62.0
Credit score	3,906,384	1.7	8.2	0.1	0.1	0.3
Disposable income	3,906,384	239.9	267.4	155.5	216.2	285.1
DTI	3825107	5.3	108.1	0.6	2.0	4.0
	Low Financial Literacy					
Credit card debt	955,688	2.5	8.2	0	0	0.1
Unsecured loans	955,688	21.6	65.0	0	0	13.3
Mortgage	955,688	299.3	406.0	55.1	217.0	409.7
Age	955,688	52.3	13.8	42.0	52.0	63.0
Credit score	955,688	2.1	9.6	0.1	0.1	0.3
Disposable income	955,688	203.5	400.8	140.8	195.0	245.7
DTI	937269	2.9	61.1	0.5	1.2	2.4

Note: This table shows descriptive statistics on personal debt balances and individual characteristics. Panel A presents the summary statistics for the subsamples for borrowers with high and low DTI ratios, respectively. Panel B presents the summary statistics for the subsamples for borrowers from high and low financial literacy areas, respectively. Personal debt includes mortgage and non-mortgage debt (credit card debt and unsecured loans). Individual characteristics include credit score, age and disposable income. Disposable income, credit card debt, unsecured loans, and mortgage debt are in SEK thousand. The credit score is defined by the credit bureau as the estimated probability of default for an adult individual in the next 12 months.

Table 3. House Price Growth and Cumulative Personal Debt Changes

	ΔTotal debt	ΔMortgage	ΔTotal non-mortgage debt	ΔCredit card debt	ΔUnsecured loans
	(1)	(2)	(3)	(4)	(5)
			Panel A		
HPgrowth	92.67***	93.79***	-1.12	1.27***	-2.69
	(17.56)	(17.44)	(2.19)	(0.27)	(1.94)
Additional controls	YES	YES	YES	YES	YES
Observations	79,441	79,441	79,441	79,441	79,441
			Panel B		
HPgrowth*Homeowner	107.40***		-5.71	0.09	-7.23**
	(18.88)		(3.98)	(0.58)	(3.46)
HPgrowth	-11.49**	93.79***	4.78	1.18**	4.69
	(4.92)	(17.44)	(3.32)	(0.53)	(2.99)
Homeowner	41.34***		4.89***	0.37***	4.43***
	(4.10)		(1.10)	(0.13)	(0.98)
Additional controls	YES	YES	YES	YES	YES
Observations	98,135	79,441	98,135	98,135	98,135
			Panel C: IV House Price Volatility 1981–2005		
$\hat{HPgrowth}$	598.8***	613.0***	-14.23**	7.96***	-21.11***
	(35.69)	(34.92)	(7.15)	(0.55)	(6.64)
Additional controls	YES	YES	YES	YES	YES
Observations	79,429	79,429	79,429	79,429	79,429
F(4, 1422) = 38.41					
			Panel D: IV House Price Volatility 1981–2005		
$\hat{HPgrowth}$ *Homeowner	643.8***		-10.81	3.910***	-11.66
	(69.48)		(14.45)	(1.221)	(13.42)
$\hat{HPgrowth}$	-38.60	613.0***	-2.868	4.033***	-9.000
	(61.79)	(34.92)	(12.85)	(1.086)	(11.93)
Homeowner	-48.34***		5.519**	-0.199	4.860*
	(13.43)		(2.793)	(0.236)	(2.593)
Additional controls	YES	YES	YES	YES	YES
Observations	98,118	79,429	98,118	98,118	98,118

Note: This table reports the effect of house price growth on cumulative personal debt changes during the period July 2010–July 2014. Panel A reports the results of cross-sectional regressions

$$\Delta Debt^{j}{}_{i,c,t_2-t_1} = \beta HPGrowth_{c,t_2-t_1} + \gamma X_{i,c,t_2-t_1} + \mu_{i,c,t_2-t_1}$$

Panel B reports the results of cross-sectional regressions

$$\Delta Debt^{j}{}_{i,c,t_2-t_1} = \beta_1 HPGrowth_{c,t_2-t_1} * Homeowner_i + \beta_2 HPGrowth_{c,t_2-t_1} + \beta_3 Homeowner_i + \gamma X_{i,c,t_2-t_1} + \mu_{i,c,t_2-t_1}$$

The dependent variables are the differences in debt balances (total debt, mortgage, total non-mortgage debt, credit card debt, and unsecured loans) between July 2010 and July 2014. The units of dependent variables are SEK thousand. *HPgrowth* is the parish-level house price growth between July 2010 and July 2014. *Homeowner* is a dummy variable that equals one if individual i is a homeowner and zero otherwise. This variable is time invariant during the sample period. Additional controls include the difference in the individual's disposable income between July 2010 and July 2014, and the individual's credit score and age in July 2010. Panels C and D present corresponding regression results using the volatility of house prices between 1981 and 2005 as the instrument for house price growth. The estimated coefficient on the instrument variable in the first-stage regression is 0.00022 and significant at the 1 percent level. Columns (1)–(5) show the results of second-stage regressions, where the dependent variables are the differences in debt balances (total debt, mortgage, total non-mortgage debt, credit card debt, and unsecured consumer loans) between July 2010 and July 2014. Only homeowners are included in the regression specifications in Columns (1)–(5) of Panels A and C. In Panels B and D, both homeowners and renters are included, but the regression specification in Column (2) is only for homeowners. *HPVol81–05* is the volatility of house prices between 1981 and 2005 in the municipality where individual i is located. Standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent level, respectively.

Table 4. House Price Growth and Cumulative Personal Debt Changes by Homeowner Type

	ΔTotal debt	ΔMortgage	ΔTotal non-mortgage debt	ΔCredit card debt	ΔUnsecured loans
	(1)	(2)	(3)	(4)	(5)
			Panel A		
Equity withdrawer	149.10***	157.80***	-8.67*	1.21***	-10.58**
	(33.91)	(34.09)	(4.63)	(0.39)	(4.22)
House trader	339.10***	320.70***	18.39*	2.05***	14.05
	(78.85)	(77.48)	(9.74)	(0.77)	(8.69)
Amortizer	-105.70*	-124.70**	19.05	2.75	21.64
	(57.29)	(52.84)	(20.14)	(2.20)	(19.79)
Renter	5.53*		5.53*	1.20**	5.25*
	(3.28)		(3.28)	(0.53)	(2.94)
			Panel B		
Equity withdrawer	169.40***	157.80***	-11.78**	-0.00	-13.54***
	(35.49)	(34.09)	(5.01)	(0.63)	(4.38)
House trader	362.50***	320.70***	13.95	0.87	9.56
	(79.92)	(77.48)	(10.65)	(0.88)	(9.28)
Amortizer	-111.40*	-124.70**	15.30	1.63	17.34
	(57.47)	(52.84)	(21.81)	(2.25)	(21.25)
			Panel C: IV House Price Volatility 1981–2005		
Equity withdrawer	1239.4***	1295.1***	-55.63***	9.072***	-59.53***
	(73.66)	(71.85)	(15.64)	(0.981)	(14.81)
House trader	1855.2***	1814.2***	41.00	14.31***	22.74
	(184.7)	(183.9)	(26.32)	(2.376)	(24.72)
Amortizer	-609.2***	-576.9***	-32.26	7.430*	-19.73
	(139.6)	(136.1)	(28.93)	(4.425)	(25.57)
Renter			-1.359	4.069***	-7.932
			(8.337)	(1.187)	(7.650)
			Panel D: IV House Price Volatility 1981–2005		
Equity withdrawer	1278.0***	1295.1***	-47.50**	4.875***	-45.20**
	(90.23)	(71.85)	(20.21)	(1.520)	(19.08)
House trader	1963.8***	1814.2***	46.47**	10.17***	33.61*
	(124.3)	(183.9)	(21.90)	(2.465)	(20.39)
Amortizer	-606.9***	-576.9***	-16.58	3.273	-2.476
	(47.65)	(136.1)	(34.31)	(4.899)	(31.43)

Note: This table reports the effect of house price growth on cumulative personal debt changes during the period July 2010–July 2014 using subsamples of homeowner types. Panel A reports the estimates of the coefficient on house price growth in cross-sectional regressions

$$\Delta Debt^{j}{}_{i,c,t_2-t_1} = \beta HPGrowth_{c,t_2-t_1} + \gamma X_{i,c,t_2-t_1} + \mu_{i,c,t_2-t_1}$$

Panel B reports the estimates of the coefficient on the interaction term between house price growth and homeowner in cross-sectional regressions

$$\Delta Debt^{j}{}_{i,c,t_2-t_1} = \beta_1 HPGrowth_{c,t_2-t_1} * Homeowner_i + \beta_2 HPGrowth_{c,t_2-t_1} + \beta_3 Homeowner_i + \gamma X_{i,c,t_2-t_1} + \mu_{i,c,t_2-t_1}$$

In Panel A, only one type of homeowner or renters are included in a regression analysis. In Panel B, each regression analysis includes one type of homeowner and renters as the control group, while the regression specification in Column (2) in Panel B is only for the corresponding type of homeowner. Panels C and D present corresponding regression results using the volatility of house prices between 1981 and 2005 as the instrument for house price growth. The dependent variables are the differences in debt balances (total debt, mortgage, total non-mortgage debt, credit card debt, and unsecured loans) between July 2010 and July 2014. Debt balances are measured in SEK thousand. House price growth is the parish-level house price growth between July 2010 and July 2014. Controls in Columns (1)–(5) in all panels also include other individual characteristics: the individual's credit score and age in July 2010, and the difference in the individual's disposable income between July 2010 and July 2014. Standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent level, respectively.

Table 5. Home Equity Withdrawal and Non-Mortgage Debt Repayment

	ΔCredit card debt		ΔUnsecured loans		Δ Total non-mortgage debt	
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: Full Sample					
EW dummy	-0.0733***		-9.6240***		-9.6980***	
	(0.0240)		(0.8430)		(0.8400)	
EW size		-0.0000		-0.0298***		-0.0298***
		(0.0000)		(0.0070)		(0.0070)
Homeowner	0.0022	0.0002	0.3130***	0.2520***	0.3150***	0.2530***
	(0.0025)	(0.0024)	(0.0325)	(0.0560)	(0.0325)	(0.0562)
Additional controls	YES	YES	YES	YES	YES	YES
Parish-Month FE	YES	YES	YES	YES	YES	YES
Observations	2,439,785	2,439,785	2,439,785	2,439,785	2,439,785	2,439,785
	Panel B: EW with Unsecured Loan Repayment					
EW dummy	-0.0902		-55.04***		-55.13***	
	(0.0595)		(4.611)		(4.618)	
EW size		-0.000173		-0.177***		-0.177***
		(0.000177)		(0.0109)		(0.0110)
Homeowner	0.0455***	0.0446***	-7.349***	-7.190***	-7.303***	-7.145***
	(0.00796)	(0.00789)	(0.321)	(0.314)	(0.319)	(0.312)
Additional controls	YES	YES	YES	YES	YES	YES
Parish-Month FE	YES	YES	YES	YES	YES	YES
Observations	1,181,233	1,181,233	1,181,233	1,181,233	1,181,233	1,181,233

Note: This table reports the results of panel data regressions

$$\Delta Debt^{j}_{i,c,t+1} = \beta_1 EquityWithdrawal_{i,t} + \beta_2 Homeowner_i + \gamma X_{i,t} + \theta_{c,t} + \mu_{i,c,t}$$

Only home equity withdrawers and renters are included in the analysis. Panel A presents results for all withdrawers and renters. Panel B presents results for withdrawers who repaid at least part of their unsecured loans in the month after the withdrawal. The dependent variables are the differences in debt balances (credit card debt, unsecured loans, and total non-mortgage debt) between month t and month $t+1$, measured in SEK thousand. We use two equity withdrawal measures: (1) *EW dummy*; and (2) *EW size*. *EW dummy* is a dummy variable that equals one if an individual withdrew home equity of at least SEK 20,000 in month t. *EW size* is the withdrawn amount in terms of SEK thousand if *EW dummy* equals one. *Homeowner* is a dummy variable that equals one if individual i is a homeowner and zero if they are a renter. Additional controls include the disposable income of individual i in month t, and the individual's credit score and age in July 2010. Standard errors are in parentheses and clustered at the parish level. *, **, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent level, respectively.

Table 6. Home Equity Withdrawal, Non-Mortgage Debt Repayment, DTI, and Financial Literacy

	ΔCredit card debt		ΔUnsecured loans		Δ Total non-mortgage debt	
	(1)	(2)	(3)	(4)	(5)	(6)
HighDTI	-0.00512	-0.00694	-0.347***	-0.347***	-0.352***	-0.354***
	(0.00519)	(0.00523)	(0.0805)	(0.0894)	(0.0807)	(0.0895)
HighLit	0.00707	0.00718	0.187	0.189	0.194*	0.196*
	(0.0169)	(0.0169)	(0.115)	(0.116)	(0.112)	(0.113)
HighDTI ∗ HighLit	0.000673	0.000305	0.168**	0.0697	0.168**	0.0700
	(0.00588)	(0.00590)	(0.0840)	(0.116)	(0.0842)	(0.117)
EW dummy	-0.119**		-0.0725		-0.192	
	(0.0495)		(0.212)		(0.212)	
EW dummy ∗ HighDTI	0.0267		-2.239***		-2.212***	
	(0.0729)		(0.755)		(0.760)	
EW dummy ∗ HighLit	0.0787		-0.171		-0.0925	
	(0.0663)		(0.242)		(0.245)	
EW dummy ∗ HighDTI ∗ HighLit	-0.0532		-9.913***		-9.966***	
	(0.0902)		(1.310)		(1.309)	
EW size		-0.00138**		0.00105		-0.000334
		(0.000694)		(0.00335)		(0.00330)
EW size ∗ HighDTI		0.00124*		-0.0121**		-0.0108*
		(0.000697)		(0.00583)		(0.00582)
EW size ∗ HighLit		0.00114		-0.000133		0.00100
		(0.000866)		(0.00365)		(0.00366)
EW size ∗ HighDTI ∗ HighLit		-0.000978		-0.0203**		-0.0213**
		(0.000871)		(0.00988)		(0.00986)
Additional controls	YES	YES	YES	YES	YES	YES
Parish FE	YES	YES	YES	YES	YES	YES
Year-Month FE	YES	YES	YES	YES	YES	YES
Observations	2,439,372	2,439,372	2,439,372	2,439,372	2,439,372	2,439,372

Note: This table reports the results of panel data regressions

$$\Delta Debt^{j}_{i,c,t+1} = \beta_1 EquityWithdrawal_{i,t} + \beta_2 HighDTI_{i,t} + \beta_3 EquityWithdrawal_{i,t} * HighDTI_{i,t}$$
$$+\beta_4 HighLit_{c,t} + \beta_5 EquityWithdrawal_{i,t} * HighLit_{c,t} + \beta_6 HighDTI_{i,t} * HighLit_{c,t}$$
$$+\beta_7 EquityWithdrawal_{i,t} * HighDTI_{i,t} * HighLit_{c,t} + \gamma_1 X_{i,t} + \gamma_2 Homeowner_i + \theta_c + t + \mu_{i,c,t}$$

Only home equity withdrawers and renters are included in the analysis. $HighDTI_{i,t}$ is a dummy variable that equals one if individual i's DTI ratio is higher than the median of DTI ratios for all borrowers in month t and zero otherwise. $HighLit_{c,t}$ is a dummy variable that equals one if municipality c's share of inhabitants with post-high school education is above the national median in the corresponding year, and zero otherwise. The dependent variables are the differences in debt balances (credit card debt, unsecured loans, and total non-mortgage debt) between month t and month $t+1$, measured in SEK thousand. We use two equity withdrawal measures: (1) *EW dummy*; and (2) *EW size*. *EW dummy* is a dummy variable that equals one if an individual withdrew home equity of at least SEK 20,000 in month t. *EW size* is the withdrawn amount in terms of SEK thousand if *EW dummy* equals one. *Homeowner* is a dummy variable that equals one if individual i is a homeowner and zero if they are a renter. Additional controls include the disposable income of individual i in month t, and the individual's credit score and age in July 2010. Standard errors are in parentheses and clustered at the parish level. *, **, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent level, respectively.

Table 7. House Price Growth and Cumulative Personal Debt Changes: The Effect of the LTV Constraint

	ΔTotal debt	ΔMortgage	ΔTotal non-mortgage debt	ΔCredit card debt	ΔUnsecured loans
	(1)	(2)	(3)	(4)	(5)
	Panel A: 3 Months before the LTV Constraint				
HPgrowth	7.932	8.234	-0.302	0.000969	-0.605
	(5.952)	(5.481)	(1.952)	(0.142)	(1.901)
Additional controls	YES	YES	YES	YES	YES
Observations	88,067	88,067	88,067	88,067	88,067
	Panel B: 3 Months after the LTV Constraint				
HPgrowth	15.24**	10.28*	4.956***	0.608***	3.811**
	(6.044)	(5.486)	(1.694)	(0.170)	(1.590)
Additional controls	YES	YES	YES	YES	YES
Observations	87,972	87,972	87,972	87,972	87,972
	Panel C: 3 Months before and after the Introduction of the LTV Constraint				
HPgrowth	7.782	8.095	-0.313	0.00481	-0.613
	(5.946)	(5.474)	(1.953)	(0.142)	(1.902)
LTV	-0.112	-0.111	-0.00122	0.292***	-0.0550
	(1.168)	(1.079)	(0.326)	(0.0341)	(0.303)
HPgrowth × LTV	7.650	2.348	5.302**	0.597**	4.453*
	(9.219)	(8.405)	(2.527)	(0.236)	(2.359)
Additional controls	YES	YES	YES	YES	YES
Observations	176,039	176,039	176,039	176,039	176,039

Note: This table reports the results for the analysis of the role of the LTV constraint in the effect of house price growth on cumulative personal debt changes. We use a six-month event window of the period July 2010–December 2010 in this analysis. Panels A and B report the results of cross-sectional regressions for the two three-month subsamples before and after the introduction of LTV cap

$$\Delta Debt^{j}{}_{i,c,t_2-t_1} = \beta HPGrowth_{c,t_2-36,t_2} + \gamma X_{i,c,t_2-t_1} + \mu_{i,c,t_2-t_1}$$

Panel C reports the results of the following regression specification, where we combine the two cross-sectional subsamples and add an interaction term between the house price growth and the dummy indicator for the LTV-constrained subsample

$$\Delta Debt^{j}{}_{i,c,t_2-t_1} = \beta_1 HPGrowth_{c,t_2-36,t_2} + \beta_2 LTV + \beta_3 HPGrowth_{c,t_2-36,t_2} * LTV + \gamma X_{i,c,t_2-t_1} + \mu_{i,c,t_2-t_1}$$

The dependent variables are the cumulative differences in debt balances (total debt, mortgage, total non-mortgage debt, credit card debt, and unsecured loans) during the subsample period. The units of dependent variables are SEK thousand. *HPgrowth* is the parish-level house price growth in the previous 36-month period before t_2, which captures the cumulative effect of housing price development. *LTV* is a dummy variable that equals one for the period after the introduction of the LTV constraint and zero otherwise. Controls for individual characteristics include credit score, age and disposable income. Only homeowners are included in the regression specifications. Standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent level, respectively.

Table 8. First-Time Mortgage Borrowers' Debt Ratio and the LTV Constraint

	(1)
	Unsecured loans / Mortgage
LTV-constraint	0.0168*
	(0.00867)
HPgrowth	-0.142***
	(0.0546)
Additional controls	YES
Observations	1,342

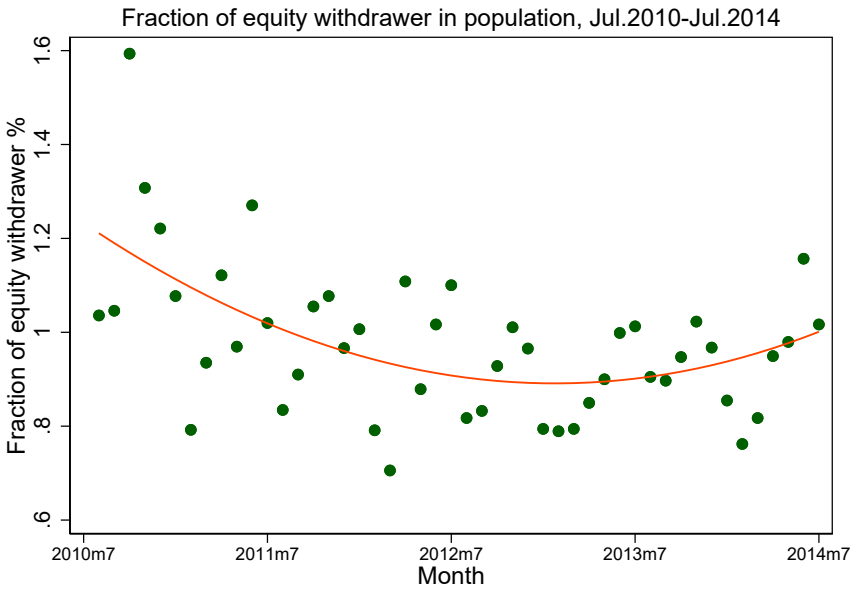
Note: This table reports the effect of the LTV constraint on the first-time mortgage borrowers' debt composition. We use a six-month event window of the period July 2010–December 2010 in this analysis.

$$\frac{Unsecuredloans_{i,t}}{Mortgage_{i,t}} = \beta_1 LTV + \beta_2 HPGrowth_{c,t-36,t} + \gamma X_{i,t} + \mu_{i,t}$$

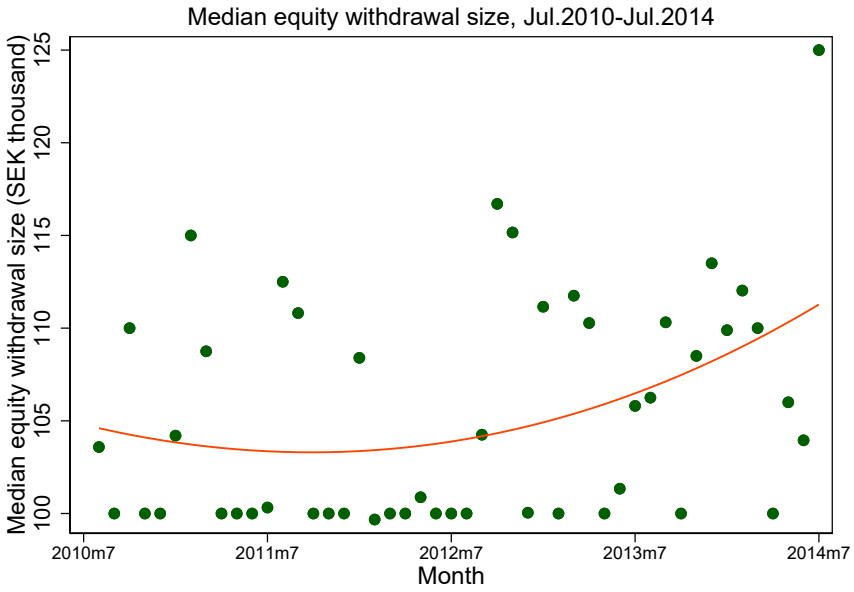
The dependent variable is the initial debt ratio between the unsecured loans and the mortgage debt for the new mortgage borrowers that entered the mortgage market during month t. LTV is a dummy variable that equals one for the period after the introduction of the LTV constraint and zero otherwise. *HPgrowth* is the parish-level house price growth in the previous 36-month period, which captures the cumulative effect of housing price development. Additional controls include new borrowers' age, credit score and disposable income in month t when they entered the mortgage market. The average ratio between the unsecured loans and the mortgage debt is 0.025 before the introduction of the LTV constraint, and 0.070 after the introduction of the LTV constraint. Standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent level, respectively.

Figure 1. Equity Withdrawal Dynamics, July 2010–July 2014

(a)



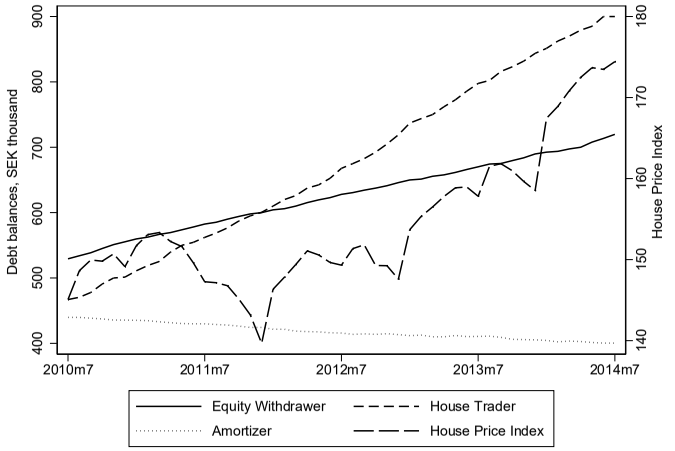
(b)



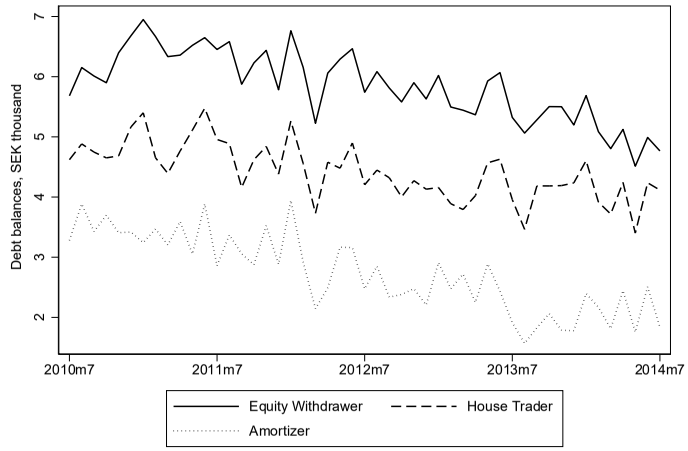
Note: Figure (a) presents the portion of home equity withdrawers in the full sample during the period July 2010–July 2014. Figure (b) presents the median equity withdrawal size in terms of SEK thousand for the full sample during the period July 2010–July 2014.

Figure 2. Mortgage and Non-Mortgage Debt Balances by Homeowner Type, July 2010–July 2014

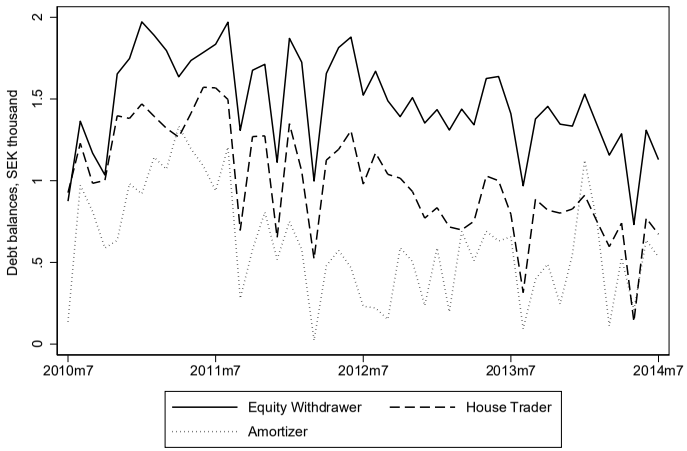
(a) Mortgage



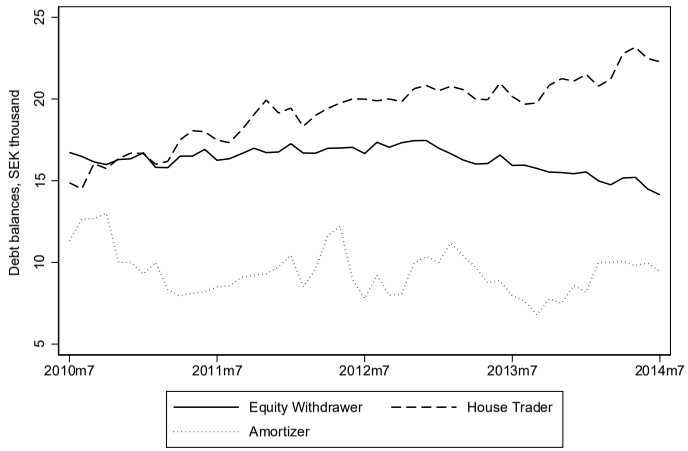
(b) Non-mortgage



(c) Credit card debt



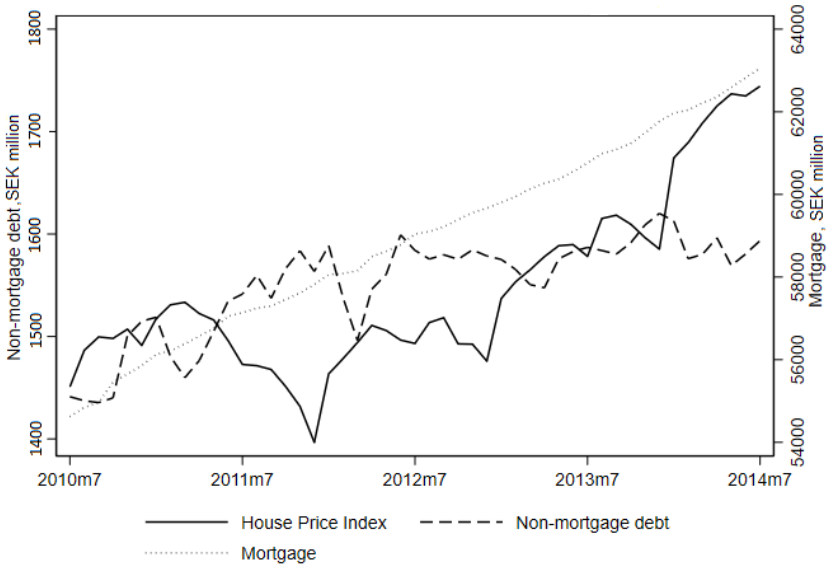
(d) Unsecured loans



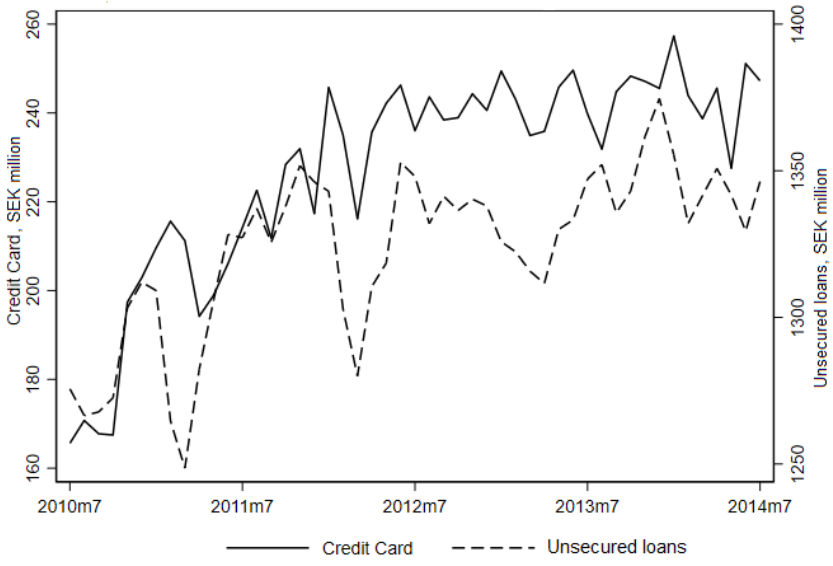
Note: This figure presents the median size debt balances for both mortgage and non-mortgage debt by homeowner type and debt type for the full sample during the period July 2010–July 2014.

Figure 3. Aggregate Debt Balances for Homeowners, July 2010–July 2014

(a) Mortgage and non-mortgage debt balances



(b) Credit card and unsecured loan balances



Note: Figure (a) presents aggregate mortgage and non-mortgage debt of homeowners in the full sample during the period July 2010–July 2014. Figure (b) presents aggregate credit card debt and unsecured loans of homeowners in the full sample during the period July 2010–July 2014.

Appendix

"Riding the Housing Wave: Home Equity Withdrawal and Consumer Debt Composition"

Part A: Additional tables and figures

Table A1. Variable definitions

Variable Name	Definition
Debt variables	
Total debt	The total debt outstanding of individual i in month t, in thousand SEK.
Mortgage	The total mortgage outstanding of individual i in month t, in thousand SEK.
Total non-mortgage debt	The total non-mortgage debt outstanding of individual i in month t, in thousand SEK.
Credit card debt	The outstanding credit card balances of individual i in month t, in thousand SEK.
Unsecured (consumer) loans	The outstanding unsecured consumer loan balances of individual i in month t, in thousand SEK.
Mortgage rate$_t$	Average mortgage lending rate of the eight biggest Swedish banks in month t, in percent.
Unsecured loan spread$_t$	The difference between unsecured loan rate and mortgage rate in month t. The unsecured loan rate is the average unsecured loan lending rate of the eight biggest Swedish banks in month t, in percent.
Credit card spread$_t$	The difference between credit card rate and mortgage rate in month t. The credit card rate is the average credit card lending rate of the eight biggest Swedish banks in month t, in percent.
Household characteristics	
Age	The age of individual i.
Credit score	The credit score of individual i in month t, which is the estimated probability of default for the individual within the next 12 months.
Disposable income	The disposable income (labor income-tax payment+ net realized capital gain after tax) of individual i in month t, in thousand SEK.
Homeowner	A dummy variable that equals one if individual i is a homeowner and zero otherwise. This variable is time invariant during the sample period.
Equity withdrawer	A dummy variable that equals one if individual i has withdrawn home equity at least once for non-housing purchase purposes during the period July 2010–July 2014 and zero otherwise. This variable is time invariant during the sample period.
House trader	A dummy variable that equals one if individual i has refinanced mortgage for purchasing properties during the period July 2010–July 2014 and zero otherwise. This variable is time invariant during the sample period.
Amortizer	A dummy variable that equals one if individual i is an amortizer (who actively reduced mortgage at least three times with more than 150 SEK, but never increased mortgage) during the period July 2010–July 2014 and zero otherwise. This variable is time invariant during the sample period.
Renter	A dummy variable that equals one if individual i is a renter during the period July 2010–July 2014 and zero otherwise. This variable is time invariant during the sample period.

Table A1. Variable definitions

Variable Name	Definition
HighDTI	A dummy variable that equals 1 if individual i's DTI ratio is higher than the median of DTI ratios for all borrowers in month t and zero otherwise.
HighLit	A dummy variable that equals 1 if municipality c's share of inhabitants with a post-high school education is above the national median in the corresponding year, and zero otherwise.
Equity withdrawal	
EW dummy	A dummy variable that equals one if individual i has withdrawn home equity in month t.
EW size	The amount of equity withdrawal if individual i has withdrawn home equity in month t, in thousand SEK.
House price controls	
$\text{HPGrowth}_{t_2-t_1}$	The house price growth between t_1 and t_2 in the parish where individual i is located. In most regressions, the period is July 2010–July 2014
$\text{HPGrowth}_{c,t-36,t}$	The cumulative three years' house price growth between month $t-36$ and month t in the parish c where individual is located.
HPVol81–05	The volatility of house prices between 1981 and 2005 in the municipality where individual i is located.
Buildingfriendly	The fraction of appealed building permissions (which are approved by the municipality but get appealed to the county) in the municipality where individual i is located, which are overruled by the county that the municipality belongs to. The measurement is created based on the planning and building survey published by Sweden's National Board of Housing, Building and Planning in 2013.

Table A2. House price growth and cumulative personal debt changes: Regulation on housing supply as IV for house price growth

	HPgrowth	ΔTotal debt	ΔMortgage	ΔTotal non-mortgage debt	ΔCredit card debt	ΔUnsecured loans
	(1)	(2)	(3)	(4)	(5)	(6)
			Panel A			
Buildingfriendly	-0.113***					
	(0.0195)					
$\hat{HPgrowth}$		325.8***	327.4***	-1.62	4.43***	-6.86
		(67.85)	(66.35)	(13.67)	(1.06)	(12.70)
Additional controls	YES	YES	YES	YES	YES	YES
Observations	98,118	79,429	79,429	79,429	79,429	79,429
F(4,1422) = 25.01						
			Panel B			
$\hat{HPgrowth}$ *Homeowner		373.5***		2.317	1.843	7.436
		(140.1)		(29.34)	(2.470)	(27.23)
$\hat{HPgrowth}$		-35.96	327.4***	-3.500	2.587	-14.00
		(126.7)	(66.35)	(26.52)	(2.233)	(24.62)
Homeowner		-3.402		3.325	0.113	1.582
		(26.08)		(5.460)	(0.460)	(5.069)
Additional controls		YES	YES	YES	YES	YES
Observations		98,118	79,429	98,118	98,118	98,118

Notes: Panel A of this table reports the results of cross-sectional regressions

$$\Delta Debt^{j}{}_{i,c,t_2-t_1} = \beta HPGrowth_{c,t_2-t_1} + \gamma X_{i,c,t_2-t_1} + \mu_{i,c,t_2-t_1}$$

using *Buildingfriendly* as the instrument for the house price growth. Only homeowners are included in the regression specifications in Column (2)-(6) of panel A. Panel B of this table reports the results of cross-sectional regressions

$$\Delta Debt^{j}{}_{i,c,t_2-t_1} = \beta_1 HPGrowth_{c,t_2-t_1} * Homeowner_i + \beta_2 HPGrowth_{c,t_2-t_1} + \beta_3 Homeowner_i + \gamma X_{i,c,t_2-t_1} + \mu_{i,c,t_2-t_1}$$

using *Buildingfriendly* as the instrument for the house price growth. In panel B, both homeowners and renters are included, but the regression specification in Column (3) is only for homeowners. *Buildingfriendly* is measured by the fraction of appealed building permissions (which are approved by the municipality but get appealed to the county) overruled by the county. Column (1) shows the result of the first stage regression. Columns (2)–(6) show the results of second stage regressions, where the dependent variables are the differences in debt balances (total debt, mortgage, total non-mortgage debt, credit card debt, and unsecured loans) between July 2010 and July 2014.*Homeowner* is a dummy variable that equals one if individual i is a homeowner and zero otherwise. $\hat{HPgrowth}$ is the estimated municipal-level house price growth between July 2010 and July 2014. Additional controls contain the individual's credit score and age in July 2010, and the difference in the individual's disposable income between July 2010 and July 2014. Debt balances and disposable income are measured in thousand SEK. Standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent level, respectively.

Table A3. House price growth and cumulative personal debt changes by homeowner: type Regulation on housing supply as IV for house price growth

	ΔTotal debt	ΔMortgage	ΔTotal non-mortgage debt	ΔCredit card debt	ΔUnsecured loans
	(1)	(2)	(3)	(4)	(5)
			Panel A		
Equity withdrawer	464.3***	511.2***	-46.96	3.329*	-66.45**
	(140.2)	(136.4)	(30.41)	(1.896)	(28.82)
House trader	1302.2***	1199.3***	102.9**	13.38***	67.35*
	(297.3)	(295.7)	(43.32)	(3.887)	(40.59)
Amortizer	-311.1	-412.7	101.6	-13.23	91.07
	(426.0)	(420.0)	(91.78)	(14.27)	(81.07)
Renter			22.67	5.506**	18.33
			(16.65)	(2.372)	(15.26)
			Panel B		
Equity withdrawer	472.5***	511.2***	-64.20	-2.236	-79.50**
	(174.8)	(136.4)	(39.98)	(2.997)	(37.76)
House trader	1405.5***	1199.3***	84.08	7.922*	52.19
	(387.6)	(370.4)	(56.42)	(4.470)	(52.00)
Amortizer	-350.2	-412.7	67.56	-19.45	63.79
	(412.1)	(391.4)	(104.1)	(21.86)	(88.57)

Notes: This table reports the effect of house price growth on cumulative personal debt changes during the period July 2010–July 2014 for various homeowner type, but using *Buildingfriendly* as the instrument for the house price growth. *Buildingfriendly* is measured by the fraction of appealed building permissions (which are approved by the municipality but get appealed to the county) overruled by the county. Panel A reports the estimates of the coefficient on house price growth in cross-sectional regressions

$$\Delta Debt^{j}{}_{i,c,t_2-t_1} = \beta HPGrowth_{c,t_2-t_1} + \gamma X_{i,c,t_2-t_1} + \mu_{i,c,t_2-t_1}.$$

Panel B reports the estimates of the coefficient on the interaction term between house price growth and homeowner in cross-sectional regressions

$$\Delta Debt^{j}{}_{i,c,t_2-t_1} = \beta_1 HPGrowth_{c,t_2-t_1} * Homeowner_i + \beta_2 HPGrowth_{c,t_2-t_1} + \beta_3 Homeowner_i + \gamma X_{i,c,t_2-t_1} + \mu_{i,c,t_2-t_1}.$$

In Panel A, only one type of homeowner or renters are included in a regression analysis. In Panel B, each regression analysis includes one type of homeowner and renters as the control group, while the regression specification in Column (2) in Panel B is only for the corresponding type of homeowner. The dependent variables are the differences in debt balances (total debt, mortgage, total non-mortgage debt, credit card debt, and unsecured loans) between July 2010 and July 2014. *Homeowner* is a dummy variable that equals one if individual i is a homeowner and zero otherwise. House price growth is the estimated municipal-level house price growth between July 2010 and July 2014 using the instrument. Controls in Columns (1)–(5) in both Panel A and Panel B also include other individual characteristics: the individual's credit score and age in July 2010, and the difference in the individual's disposable income between July 2010 and July 2014. Debt balances and disposable income are measured in thousand SEK. Standard errors are in the parentheses. *, **, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent level, respectively.

Table A4. House price growth and cumulative personal debt changes by homeowner type: Alternative definitions of EWs

	ΔTotal debt	ΔMortgage	ΔTotal non-mortgage debt	ΔCredit card debt	ΔUnsecured loans
	(1)	(2)	(3)	(4)	(5)
		Panel A			
Equity withdrawer	113.5***	120.2***	-6.633*	0.919**	-7.527**
only once	(18.32)	(17.68)	(4.017)	(0.425)	(3.550)
Equity withdrawer	137.8***	147.5***	-9.622	1.178***	-11.62**
between 20–100 thousand SEK	(28.18)	(27.44)	(6.085)	(0.383)	(5.781)
		Panel B			
Equity withdrawer	124.9***	120.2***	-11.79**	-0.290	-12.49***
only once	(19.60)	(17.68)	(5.336)	(0.643)	(4.776)
Equity withdrawer	157.7***	147.5***	-12.85	-0.0409	-14.69*
between 20–100 thousand SEK	(35.58)	(27.44)	(8.127)	(0.615)	(7.689)

Notes: This table reports the effect of house price growth on cumulative personal debt changes during the period July 2010–July 2014 for home equity withdrawers, using alternative definitions of EWs. Panel A reports the estimates of the coefficient on house price growth in cross-sectional regressions

$$\Delta Debt^{j}{}_{i,c,t_2-t_1} = \beta HPGrowth_{c,t_2-t_1} + \gamma X_{i,c,t_2-t_1} + \mu_{i,c,t_2-t_1}.$$

Panel B reports the estimates of the coefficient on the interaction term between house price growth and homeowner in cross-sectional regressions

$$\Delta Debt^{j}{}_{i,c,t_2-t_1} = \beta_1 HPGrowth_{c,t_2-t_1} * Homeowner_i + \beta_2 HPGrowth_{c,t_2-t_1} + \beta_3 Homeowner_i + \gamma X_{i,c,t_2-t_1} + \mu_{i,c,t_2-t_1}.$$

In Panel A, only home equity withdrawers are included in a regression analysis. In Panel B, each regression analysis includes home equity withdrawers and renters as the control group, while the regression specification in Column (2) in Panel B is only for home equity withdrawers. "Equity withdrawer only once" represents the definition of home equity withdrawers who withdrew only once during the sample period. "Equity withdrawer between 20–100 thousand SEK" represents the definition of home equity withdrawers who withdrew between 20–100 thousand SEK. The dependent variables are the differences in debt balances (total debt, mortgage, total non-mortgage debt, credit card debt, and unsecured loans) between July 2010 and July 2014. House price growth is the parish-level house price growth between July 2010 and July 2014. Controls in Columns (1)–(5) in both Panel A and Panel B also include other individual characteristics: the individual's credit score and age in July 2010, and the difference in the individual's disposable income between July 2010 and July 2014. Debt balances and disposable income are measured in thousand SEK. Standard errors are in the parentheses. *, **, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent level, respectively.

Table A5. House price growth and time series dynamics of personal debt composition: Alternative definitions of EWs

	Total debt	Mortgage	Total non-mortgage debt	Credit card debt	Unsecured loans
	(1)	(2)	(3)	(4)	(5)
	Panel A: EWs withdrew only once in the sample period				
$HPGrowth * Homeowner$	778.1***	808.3***	-30.15***	-0.613	-27.11***
	(104.2)	(105.2)	(6.176)	(0.796)	(5.397)
	Panel B: EWs withdrew between 20–100 thousand SEK				
$HPGrowth * Homeowner$	818.6***	849.3***	-30.73***	-0.290	-26.17***
	(122.1)	(122.3)	(5.784)	(0.758)	(5.188)

Notes: This table reports the estimates of the coefficent on the interaction term of $HPGrowth * Homeowner$ in the following regression, similar analysis as in Table 5 but using alternative definitions of EWs and a subsample that includes home equity withdrawers and renters. We run panel data regressions

$$Debt^{j}_{i,c,t+1} = \beta_1 HPGrowth_{c,t-36} * Homeowner_i + \beta_2 Homeowner_i + \gamma X_{i,c,t} + \theta_{c,t} + \mu_{i,c,t}.$$

Panel A reports the results by restricting EWs to those who withdrew only once during the sample period. Panel B reports the results by restricting EWs to those who withdrew between 20–100 thousand SEK. The dependent variables are debt balances (total debt, mortgage, total non-mortgage debt, credit card debt, and unsecured loans) in month $t + 1$. House price growth is the cumulative three years' house price growth until month t at the parish level. *Homeowner* is a dummy variable that equals one if individual i is a homeowner and zero if individual i is a renter. This variable is time invariant during the sample period. Controls in Columns (1)–(5) in both Panel A and Panel B also include other individual characteristics: the individual's credit score and age in July 2010, and the individual's disposable income of individual i in month t. Debt balances and disposable income are measured in thousand SEK. All regression specifications have parish-month fixed effects. Standard errors are in parentheses and clustered at the parish level. *, **, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent level, respectively.

Table A6. Home equity withdrawal and non-mortgage debt repayment
Alternative definitions of EWs

	ΔCredit card debt		ΔUnsecured loans		Δ Total non-mortgage debt	
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: EWs withdrew only once in the sample period					
EW dummy	-0.0558*		-10.68***		-11.004***	
	(0.0337)		(1.126)		(1.127)	
EW size		-0.00001		-0.0420***		-0.0425***
		(0.00010)		(0.0055)		(0.00547)
Homeowner	0.0452**	0.0441*	-0.113	-0.108	-0.0897	-0.0891
	(0.0226)	(0.0226)	(0.265)	(0.209)	(0.211)	(0.155)
Additional controls	YES	YES	YES	YES	YES	YES
Parish-Month FE	YES	YES	YES	YES	YES	YES
Observations	1,114,874	1,114,874	1,114,874	1,114,874	1,114,874	1,114,874
	Panel B: EWs withdrew between 20–100 thousand SEK					
EW dummy	-0.0727***		-9.589***		-9.870***	
	(0.0259)		(0.832)		(0.829)	
EW size		-0.00006		-0.0297***		-0.0303***
		(0.00008)		(0.00659)		(0.00669)
Homeowner	0.0615***	0.0598***	0.228	0.137	0.262	0.166
	(0.0116)	(0.0117)	(0.212)	(0.168)	(0.216)	(0.171)
Additional controls	YES	YES	YES	YES	YES	YES
Parish-Month FE	YES	YES	YES	YES	YES	YES
Observations	1,637,940	1,637,940	1,637,940	1,637,940	1,637,940	1,637,940

Notes: This table reports the results of the following panel data regression specification, the same analysis as in Table 6 Panel A but using alternative definitions of EWs.

$$\Delta Debt^{j}_{i,c,t+1} = \beta_1 EquityWithdrawal_{i,t} + \beta_2 Homeowner_i + \gamma X_{i,t} + \theta_{c,t} + \mu_{i,t}.$$

Panel A reports the results by restricting EWs to those who withdrew only once during the sample period. Panel B reports the results by restricting EWs to those who withdrew between 20–100 thousand SEK. Only EWs and renters are included in the regression analysis. The dependent variables are the differences in debt balances (credit card debt, unsecured loans, and total non-mortgage debt) between month t and month $t+1$, measured in thousand SEK. *EW dummy* is a dummy variable that equals one if an individual withdrew home equity of at least 20,000 SEK in month t. *EW size* is the withdrawn size in terms of thousand SEK if *EW dummy* equals one. *Homeowner* is a dummy variable that equals one if individual i is a homeowner and zero if individual i is a renter. Additional controls contain the individual's credit score and age in July 2010, and the difference in the individual's disposable income between July 2010 and July 2014. Standard errors are in parentheses and clustered at the parish level. *, **, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent level, respectively.

Table A7. 12-Month House price growth and time series dynamics of personal debt composition

	Total debt	Mortgage	Total non-mortgage debt	Credit card debt	Unsecured loans
	(1)	(2)	(3)	(4)	(5)
HPgrowth*Homeowner	708.8***	726.4***	-17.63***	0.328	-16.28***
	(88.88)	(88.39)	(5.107)	(0.733)	(4.614)
Homeowner	581.8***	597.4***	-15.56***	-1.505***	-13.98***
	(13.75)	(13.72)	(0.679)	(0.0816)	(0.617)
Credit score	-0.0170	-0.460*	0.443***	0.0753***	0.389***
	(0.271)	(0.265)	(0.0306)	(0.00415)	(0.0274)
Disposable income	0.234***	0.221***	0.0136**	0.00141***	0.0108**
	(0.0800)	(0.0759)	(0.00548)	(0.000481)	(0.00491)
Age	-8.458***	-7.821***	-0.637***	-0.0290***	-0.545***
	(0.286)	(0.288)	(0.0155)	(0.00176)	(0.0142)
Additional controls	YES	YES	YES	YES	YES
Parish-Month FE	YES	YES	YES	YES	YES
Observations	4,744,934	4,744,934	4,744,934	4,744,934	4,744,934

Notes: This table reports the results of panel data regressions

$$Debt^{j}_{i,c,t+1} = \beta_1 HPGrowth_{c,t-12,t} * Homeowner_i + \beta_2 Homeowner_i + \gamma X_{i,c,t} + \theta_{c,t} + \mu_{i,c,t}.$$

Both homeowners and renters are included in the analysis. The dependent variables are the debt balances (total debt, mortgage, total non-mortgage debt, credit card debt, and unsecured loans) in month t+1. $HPgrowth_{c,t-12,t}$ measures the cumulative one years' house price growth until month t at the parish level. *Homeowner* is a dummy variable that equals one if individual i is a homeowner and zero if individual i is a renter. This variable is time invariant during the sample period. Additional controls include the disposable income of individual i in month t, and the individual's credit score and age in July 2010. All regression specifications have parish-month fixed effects. Standard errors, which are in parentheses, are clustered at the parish level. *,**, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent level, respectively.

Table A8. 24-Month House price growth and time series dynamics of personal debt composition

	Total debt	Mortgage	Total non-mortgage debt	Credit card debt	Unsecured loans
	(1)	(2)	(3)	(4)	(5)
HPgrowth*Homeowner	655.1***	680.1***	-25.06***	-0.866	-21.33***
	(77.27)	(76.93)	(3.984)	(0.560)	(3.618)
Homeowner	555.9***	570.2***	-14.22***	-1.424***	-12.88***
	(12.98)	(12.94)	(0.739)	(0.0871)	(0.670)
Credit score	-0.0217	-0.465*	0.443***	0.0753***	0.389***
	(0.270)	(0.264)	(0.0307)	(0.00415)	(0.0274)
Disposable income	0.234***	0.220***	0.0136**	0.00141***	0.0108**
	(0.0800)	(0.0759)	(0.00548)	(0.000481)	(0.00491)
Age	-8.462***	-7.825***	-0.637***	-0.0290***	-0.544***
	(0.286)	(0.288)	(0.0155)	(0.00176)	(0.0142)
Additional controls	YES	YES	YES	YES	YES
Parish-Month FE	YES	YES	YES	YES	YES
Observations	4,744,934	4,744,934	4,744,934	4,744,934	4,744,934

Notes: This table reports the results of panel data regressions

$$Debt^{j}_{i,c,t+1} = \beta_1 HPGrowth_{c,t-24,t} * Homeowner_i + \beta_2 Homeowner_i + \gamma X_{i,c,t} + \theta_{c,t} + \mu_{i,c,t}.$$

Both homeowners and renters are included in the analysis. The dependent variables are the debt balances (total debt, mortgage, total non-mortgage debt, credit card debt, and unsecured loans) in month $t+1$. *HPgrowth* measures the cumulative two years' house price growth until month t at the parish level. *Homeowner* is a dummy variable that equals one if individual i is a homeowner and zero if individual i is a renter. This variable is time invariant during the sample period. Additional controls include the disposable income of individual i in month t, and the individual's credit score and age in July 2010. All regression specifications have parish-month fixed effects. Standard errors, which are in parentheses, are clustered at the parish level. *,**, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent level, respectively.

Table A9. 48-Month House price growth and time series dynamics of personal debt composition

	Total debt	Mortgage	Total non-mortgage debt	Credit card debt	Unsecured loans
	(1)	(2)	(3)	(4)	(5)
HPgrowth*Homeowner	477.7***	500.6***	-22.91***	-0.817	-19.35***
	(73.59)	(73.59)	(3.499)	(0.526)	(3.179)
Homeowner	533.1***	545.8***	-12.62***	-1.365***	-11.54***
	(14.41)	(14.39)	(0.880)	(0.104)	(0.801)
Credit score	-0.0197	-0.462*	0.443***	0.0753***	0.389***
	(0.271)	(0.264)	(0.0307)	(0.00415)	(0.0274)
Disposable income	0.234***	0.220***	0.0136**	0.00141***	0.0108**
	(0.0800)	(0.0759)	(0.00548)	(0.000481)	(0.00491)
Age	-8.465***	-7.829***	-0.636***	-0.0289***	-0.544***
	(0.286)	(0.288)	(0.0155)	(0.00176)	(0.0142)
Additional controls	YES	YES	YES	YES	YES
Parish-Month FE	YES	YES	YES	YES	YES
Observations	4,744,934	4,744,934	4,744,934	4,744,934	4,744,934

Notes: This table reports the results of panel data regressions

$$Debt^{j}_{i,c,t+1} = \beta_1 HPGrowth_{c,t-48,t} * Homeowner_i + \beta_2 Homeowner_i + \gamma X_{i,c,t} + \theta_{c,t} + \mu_{i,c,t}.$$

Both homeowners and renters are included in the analysis. The dependent variables are the debt balances (total debt, mortgage, total non-mortgage debt, credit card debt, and unsecured loans) in month $t+1$. *HPgrowth* measures the cumulative four years' house price growth until month t at the parish level. *Homeowner* is a dummy variable that equals one if individual i is a homeowner and zero if individual i is a renter. This variable is time invariant during the sample period. Additional controls include the disposable income of individual i in month t, and the individual's credit score and age in July 2010. All regression specifications have parish-month fixed effects. Standard errors, which are in parentheses, are clustered at the parish level. *,**, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent level, respectively.

Table A10. Home equity withdrawal, non-mortgage debt repayment, and DTI

	ΔCredit card debt		ΔUnsecured loans		Δ Total non-mortgage debt	
	(1)	(2)	(3)	(4)	(5)	(6)
EW dummy	-0.0645*		-0.195*		-0.260**	
	(0.0342)		(0.114)		(0.117)	
HighDTI	-0.00462*	-0.00669**	-0.197***	-0.280***	-0.202***	-0.287***
	(0.00269)	(0.00271)	(0.0671)	(0.0872)	(0.0673)	(0.0878)
EW dummy ∗ HighDTI	-0.00566		-10.86***		-10.86***	
	(0.0433)		(0.952)		(0.949)	
EW size		-0.000361		0.000931		0.000570
		(0.000497)		(0.00166)		(0.00177)
EW size ∗ HighDTI		0.000357		-0.0308***		-0.0305***
		(0.000501)		(0.00715)		(0.00715)
Additional controls	YES	YES	YES	YES	YES	YES
Parish-Month FE	YES	YES	YES	YES	YES	YES
Observations	2,439,372	2,439,372	2,439,372	2,439,372	2,439,372	2,439,372

Notes: This table reports the results of panel data regressions

$$\Delta Debt^{j}_{i,c,t+1} = \beta_1 EquityWithdrawal_{i,t} + \beta_2 HighDTI_{i,t} + \beta_3 EquityWithdrawal_{i,t} * HighDTI_{i,t} + \beta_4 Homeowner_i + \gamma X_{i,t} + \theta_{c,t} + \mu_{i,t}.$$

Only home equity withdrawers and renters are included in the analysis. $HighDTI_{i,t}$ is a dummy variable that equals 1 if individual i's DTI ratio is higher than the median of DTI ratios for all borrowers in month t and zero otherwise. The dependent variables are the differences in debt balances (credit card debt, unsecured loans, and total non-mortgage debt) between month t and month $t+1$, measured in thousand SEK. We use two equity withdrawal measures: (1) *EW dummy*; (2) *EW size*. *EW dummy* is a dummy variable that equals one if an individual withdrew home equity of at least 20,000 SEK in month t. *EW size* is the withdrawn amount in terms of thousand SEK if *EW dummy* equals one. *Homeowner* is a dummy variable that equals one if individual i is a homeowner and zero if individual i is a renter. Additional controls include the disposable income of individual i in month t, and the individual's credit score and age in July 2010. Standard errors are in parentheses and clustered at the parish level. *,**, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent level, respectively.

Table A11. Home equity withdrawal, non-mortgage debt repayment, and financial literacy

	ΔCredit card debt		ΔUnsecured loans		Δ Total non-mortgage debt	
	(1)	(2)	(3)	(4)	(5)	(6)
EW dummy	-0.102***		-1.673***		-1.775***	
	(0.0394)		(0.497)		(0.499)	
HighLit	0.00736	0.00747	0.284**	0.228*	0.292**	0.235**
	(0.0169)	(0.0169)	(0.116)	(0.120)	(0.113)	(0.117)
EW dummy ∗ HighLit	0.0381		-9.037***		-8.999***	
	(0.0472)		(1.048)		(1.045)	
EW size		-0.000177**		-0.0109**		-0.0111**
		(0.0000785)		(0.00462)		(0.00463)
EW size ∗ HighLit		0.000180*		-0.0201**		-0.0199**
		(0.0000923)		(0.00884)		(0.00884)
Additional controls	YES	YES	YES	YES	YES	YES
Parish FE	YES	YES	YES	YES	YES	YES
Year-Month FE	YES	YES	YES	YES	YES	YES
Observations	2,439,372	2,439,372	2,439,372	2,439,372	2,439,372	2,439,372

Notes: This table reports the results of panel data regressions

$$\Delta Debt^{j}_{i,c,t+1} = \beta_1 EquityWithdrawal_{i,t} + \beta_2 HighLit_{c,t} + \beta_3 EquityWithdrawal_{i,t} * HighLit_{c,t} + \beta_4 Homeowner_i + \gamma X_{i,t} + \theta_c + t + \mu_{i,t}.$$

Only home equity withdrawers and renters are included in the analysis. $HighLit_{c,t}$ is a dummy variable that equals 1 if municipality c's share of inhabitants with a post-high school education is above the national median in the corresponding year, and zero otherwise. The dependent variables are the differences in debt balances (credit card debt, unsecured loans, and total non-mortgage debt) between month t and month $t+1$, measured in thousand SEK. We use two equity withdrawal measures: (1) *EW dummy*; (2) *EW size*. *EW dummy* is a dummy variable that equals one if an individual withdrew home equity of at least 20,000 SEK in month t. *EW size* is the withdrawn amount in terms of thousand SEK if *EW dummy* equals one. *Homeowner* is a dummy variable that equals one if individual i is a homeowner and zero if individual i is a renter. Additional controls include the disposable income of individual i in month t, and the individual's credit score and age in July 2010. Standard errors are in parentheses and clustered at the parish level. *,**, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent level, respectively.

Table A12. Home equity withdrawal and non-mortgage debt repayment: the effect of LTV constraint

	ΔCredit card debt		ΔUnsecured loans		Δ Total non-mortgage debt	
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: 3 months before the LTV constraint					
EW dummy	-0.0620		-6.197***		-6.259***	
	(0.0806)		(1.600)		(1.600)	
EW size		-0.000278*		-0.0243***		-0.0246***
		(0.000159)		(0.00926)		(0.00928)
Homeowner	-0.0360**	-0.0359**	-0.0333	-0.0419	-0.0693	-0.0777
	(0.0157)	(0.0156)	(0.132)	(0.136)	(0.133)	(0.137)
Additional controls	YES	YES	YES	YES	YES	YES
Parish-Month FE	YES	YES	YES	YES	YES	YES
Observations	152,765	152,765	152,765	152,765	152,765	152,765
	Panel B: 3 months after the LTV constraint					
EW dummy	-0.109		-3.569***		-3.678***	
	(0.0727)		(0.807)		(0.804)	
EW size		-0.0000126		-0.00843		-0.00844
		(0.000239)		(0.00595)		(0.00593)
Homeowner	0.0206	0.0161	0.325**	0.259*	0.346**	0.275*
	(0.0176)	(0.0177)	(0.152)	(0.157)	(0.153)	(0.157)
Additional controls	YES	YES	YES	YES	YES	YES
Parish-Month FE	YES	YES	YES	YES	YES	YES
Observations	152,774	152,774	152,774	152,774	152,774	152,774
	Panel C: 3 months before and after the LTV constraint					
EW dummy	-0.0703		-6.268***		-6.338***	
	(0.0806)		(1.592)		(1.593)	
EW dummy ∗ LTV	-0.0299		2.773		2.743	
	(0.108)		(1.742)		(1.744)	
EW size		-0.000286*		-0.0243***		-0.0246***
		(0.000160)		(0.00925)		(0.00927)
EW size ∗ LTV		0.000284		0.0159		0.0162
		(0.000282)		(0.0111)		(0.0111)
Homeowner	-0.00771	-0.00985	0.145	0.108	0.137	0.0985
	(0.0107)	(0.0108)	(0.0959)	(0.0958)	(0.0956)	(0.0955)
Additional controls	YES	YES	YES	YES	YES	YES
Parish-Month FE	YES	YES	YES	YES	YES	YES
Observations	305,539	305,539	305539	305,539	305,539	305,539

Notes: This table reports the results for the analysis on the role of LTV constraint in non-mortgage debt repayment after home equity withdrawal. We use a six-month event window of the period July 2010-December 2010 in this analysis. Panel A and B report the results of cross-sectional regressions for the two three-month subsamples before and after the introduction of LTV cap

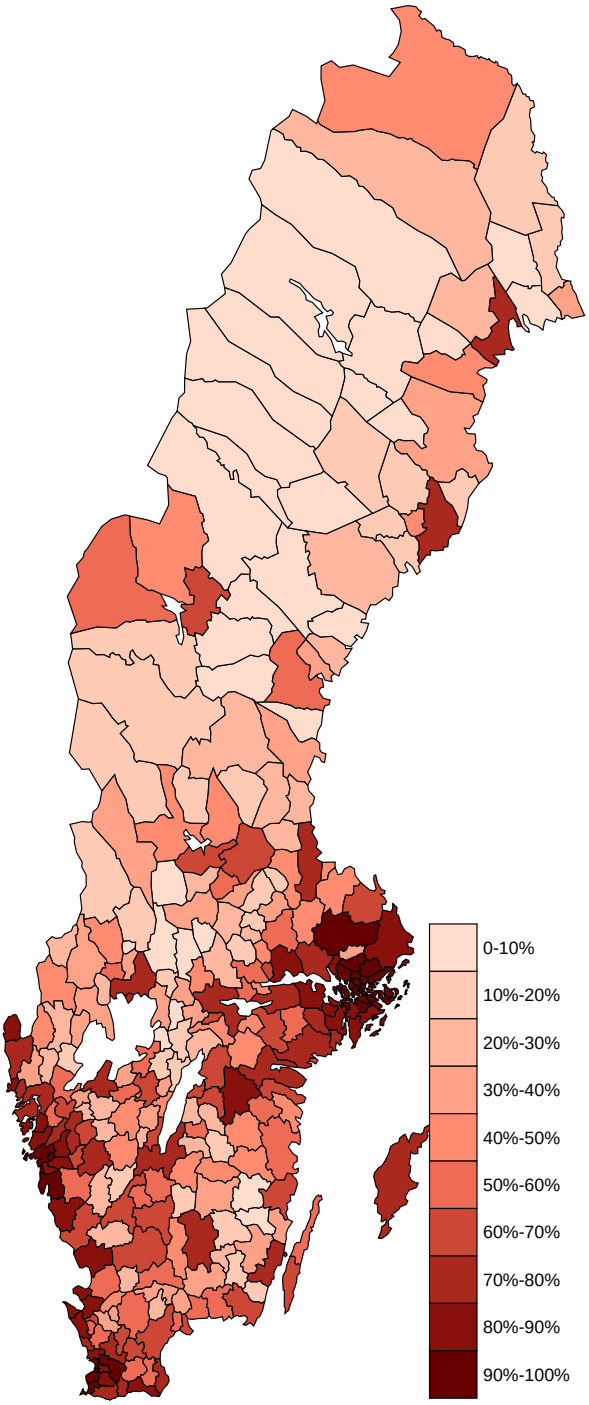
$$\Delta Debt^{j}_{i,c,t+1} = \beta_1 EquityWithdrawal_{i,t} + \beta_2 Homeowner_i + \gamma X_{i,t} + \theta_{c,t} + \mu_{i,t}.$$

Panel C reports the results of the following regression specification, where we combine the two cross-sectional subsamples and add an interaction term between the house price growth and the dummy indicator for the LTV-constrained subsample

$$\Delta Debt^{j}_{i,c,t+1} = \beta_1 EquityWithdrawal_{i,t} + \beta_2 LTV_t + \beta_3 EquityWithdrawal_{i,t} * LTV_t + \beta_4 Homeowner_i + \gamma X_{i,t} + \theta_{c,t} + \mu_{i,t}$$

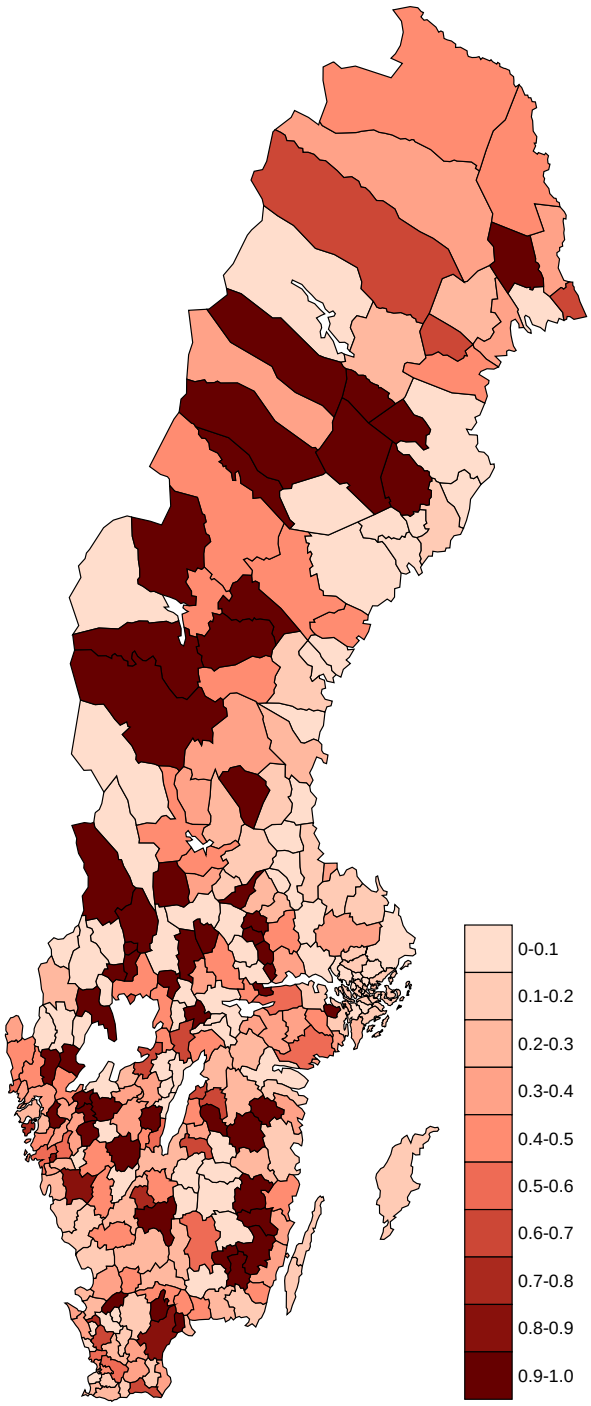
Only home equity withdrawers and renters are included in the analysis. The dependent variables are the differences in debt balances (credit card debt, unsecured loans, and total non-mortgage debt) between month t and month $t+1$, measured in thousand SEK. We use two equity withdrawal measures: (1) *EW dummy*; (2) *EW size*. *EW dummy* is a dummy variable that equals one if an individual withdrew home equity of at least 20,000 SEK in month t. *EW size* is the withdrawn amount in terms of thousand SEK if *EW dummy* equals one. *Homeowner* is a dummy variable that equals one if individual i is a homeowner and zero if individual i is a renter. *LTV* is a dummy variable that equals 1 for the period after the introduction of the LTV constraint and zero otherwise. Additional controls include the disposable income of individual i in month t, and the individual's credit score and age in July 2010. Standard errors are in parentheses and clustered at the parish level. *,**, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent level, respectively.

Figure A1. Volatility of house prices 1981–2005 for different municipalities in Sweden



Notes: This figure displays the normalized volatility of house prices 1981–2005 for different municipalities in Sweden. The cut-off points are the decile values according to the normalized volatility of house prices during the period 1981–2005.

Figure A2. Fraction of municipal appeals overruled by the county for different municipalities in Sweden, 2013



Notes: This figure displays the fraction of municipal appeals which were overruled by the county that the municipality belongs to in 2013. The cut-off points are the original fraction values.

Part B: Supplementary analysis

B.1 Time series dynamics of personal debt composition

The analysis in section 4.1.1 in the main paper focuses on variations in the starting and ending debt levels of the samples for households residing in areas with heterogeneous house price development. The heterogeneity of the cross-sectional house price dynamics is then the main source of variation in the econometric model. Here, we explore differences from the time series dimension, which helps us understand the shift in the household debt portfolio over time. The regression specification is defined as follows:

$$Debt^{j}_{i,c,t+1} = \beta_1 HPGrowth_{c,t-36,t} * Homeowner_i + \beta_2 Homeowner_i + \gamma X_{i,c,t} + \theta_{c,t} + \mu_{i,c,t}, \quad \text{(B1)}$$

where $Debt^{j}{}_{i,c,t+1}$ is the debt balance for type j of individual i who is located in parish c in month $t+1$. $HPGrowth_{c,t-36,t}$ measures the cumulative house price growth over three years until month t.[43] Here, the house price growth is calculated using the weighted average of single-family house and apartment price growth in the same parish as provided by Valueguard. $Homeowner_i$ is a dummy variable that equals one if individual i owns a home during the whole sample period and zero otherwise. $X_{i,c,t}$ stands for personal characteristics of individual i in parish c in month t, including credit score, disposable income and age. $\theta_{c,t}$ represents parish-month fixed effects. $\mu_{i,c,t}$ is an idiosyncratic error. To control for local common factors, we employ the DiD approach by interacting the house price growth variable with the homeowner dummy. The $HPGrowth_{c,t-36,t}$ term is absorbed by the parish-month fixed effects. Standard errors are clustered at the parish level.

Table B1 reports estimates obtained with the recursive regression in Equation (B1), which explores the time series dimension of personal debt changes in response to house price growth. The β_1 (the coefficient on the interaction term between house price growth and homeowner dummy) point estimates for total debt and mortgage are positively significant at the 1 percent level, while

[43] The house price index data from Valueguard covers years before and during our sample period July 2010–July2014. As a result, we can use the full sample of household panel data in the regression. We also checked the regression results using 12-month, 24-month, and 48-month time window to accumulate the housing price growth. The results are reported in the Appendix and qualitatively similar.

the estimates for total non-mortgage debt and unsecured consumer loans are negatively significant at the 1 percent level, which is consistent with the results of Panel B in Table 3 in the main paper. Meanwhile, the β_1 estimate for credit card debt is also negative but only significant at the 10 percent level. These findings confirm the substitution effect between mortgage and non-mortgage debt in response to house price changes. Since we have controlled for parish-month fixed effects, we should have accounted for local common factors that drive both house price changes and personal debt.

It is worth pointing out that the estimates of coefficients on personal characteristics also present meaningful results. The β_2 point estimates suggest, in line with the summary statistics in Table 1 in the main paper, that homeowners have higher total debt but lower non-mortgage debt compared to renters. More creditworthy borrowers tend to have a higher level of mortgage debt and lower level of non-mortgage debt. Positive and significant coefficients on disposable income (for all debt types) reflect the fact that income is an important factor in deciding an individual's debt capacity. Similarly, our regressions indicate that younger borrowers have higher levels of debt, which is in line with U.S. findings in Mian and Sufi (2011), Brown et al. (2015), and Bhutta and Keys (2016) and the survey results of Almenberg et al. (2021) for Sweden.

B.2 The role of interest rates

The empirical evidence in our paper "Riding the Housing Wave: Home Equity Withdrawal and Consumer Debt Composition" indicates that house price movements can explain a significant portion of household debt changes in Sweden. In particular, we show that home equity withdrawals allow individuals to re-optimize their debt composition and lower their interest rate expense. It is well-documented that the interest rate is one of the main drivers of home equity withdrawals; see for instance Bhutta and Keys (2016) for U.S. households. In Sweden, anecdotal evidence from survey responses shows that lower interest rates are one of the main reasons to withdraw home equity (Bäckbom and Eklöf, 2006). Therefore, we investigate the role of interest rates in the equity withdrawal and debt repayment behavior.

We examine the effect of a number of interest rates: the central bank policy rate (the repo rate), the average mortgage debt interest rate, and the interest rate spreads (the average interest rate difference between unsecured consumer loans and mortgages, and the average interest rate

Table B1. House Price Growth and Time Series Dynamics of Personal Debt Composition

	Total debt	Mortgage	Total non-mortgage debt	Credit card debt	Unsecured loans
	(1)	(2)	(3)	(4)	(5)
HPgrowth*Homeowner	718.7***	747.6***	-28.94***	-1.146*	-24.63***
	(101.7)	(101.5)	(4.551)	(0.672)	(4.101)
Homeowner	533.0***	546.2***	-13.19***	-1.373***	-12.01***
	(13.12)	(13.05)	(0.824)	(0.0960)	(0.749)
Credit score	-0.0174	-0.460*	0.443***	0.0753***	0.389***
	(0.270)	(0.264)	(0.0307)	(0.00415)	(0.0274)
Disposable income	0.234***	0.220***	0.0136**	0.00141***	0.0108**
	(0.0800)	(0.0758)	(0.00548)	(0.000481)	(0.00491)
Age	-8.467***	-7.831***	-0.636***	-0.0289***	-0.544***
	(0.286)	(0.288)	(0.0155)	(0.00176)	(0.0142)
Additional controls	YES	YES	YES	YES	YES
Parish-Month FE	YES	YES	YES	YES	YES
Observations	4,744,934	4,744,934	4,744,934	4,744,934	4,744,934

Note: This table reports the results of panel data regressions

$$Debt^{j}_{i,c,t+1} = \beta_1 HPGrowth_{c,t-36,t} * Homeowner_i + \beta_2 Homeowner_i + \gamma X_{i,c,t} + \theta_{c,t} + \mu_{i,c,t}$$

Both homeowners and renters are included in the analysis. The dependent variables are the debt balances (total debt, mortgage, total non-mortgage debt, credit card debt, and unsecured loans) in month $t+1$. *HPgrowth* measures the cumulative three years of house price growth until month t at the parish level. *Homeowner* is a dummy variable that equals one if individual i is a homeowner and zero if they are a renter. This variable is time invariant during the sample period. Additional controls include the disposable income of individual i in month t, and the individual's credit score and age in July 2010. All regression specifications have parish-month fixed effects. Standard errors, which are in parentheses, are clustered at the parish level. *, **, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent level, respectively.

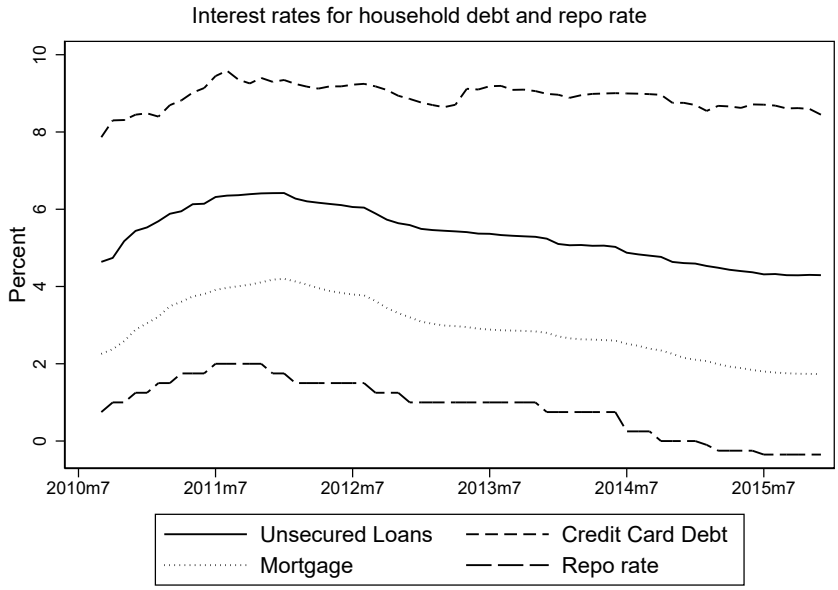
difference between credit card debt and mortgages). These time series are plotted in Figure B1. The interest rate spreads appear to move in the opposite direction of the repo rate, and the turning point of the credit spread is different from the monetary policy regime switch point.

Firstly, we follow the same regression specification as in previous sections, but focus on analyzing the effects of housing prices on debt composition with two subsamples: monetary policy tightening (November 2010–November 2011) and monetary policy easing (December 2011–December 2012).[44] We test whether the changes in the monetary policy regime, i.e., when the central bank reversed its policy rate hikes and turned into a monetary policy easing regime, affect the relationship between house prices and personal debt balances. We find that the main empirical results are similar in both subsample periods. Results are available upon request.

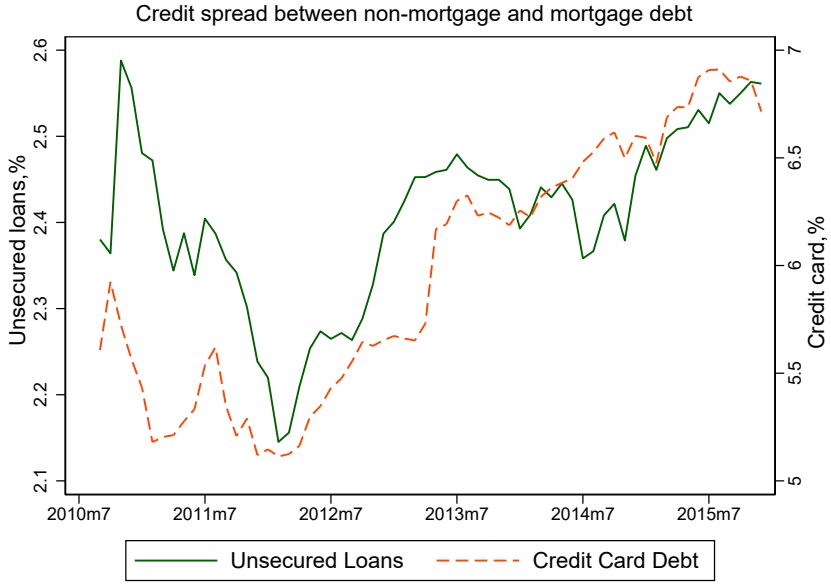
[44]We restrict the sample to the months after the introduction of the LTV restriction to ensure that the macroprudential policy is not driving uncovered differences.

Figure B1. Interest Rates for Different Types of Household Debt in Sweden

(a)



(b)



Note: Figure (a) presents the average interest rates for mortgages, unsecured loans, credit card debt, and the monetary policy rates (repo rates). Figure (b) presents the credit spread between unsecured loan rates and mortgage rates and the spread between credit card interest rates and mortgage rates. All interest rates are in percent.

Secondly, we analyze the relationship between the home equity withdrawal decisions and the mortgage rate as well as the relationship between the withdrawal decisions and the spread between the unsecured loan rate and the mortgage rate. The regression specification is as follows:

$$EW_{i,c,t+1} = \beta_1 InterestRate_{t-3} + \beta_2 HPGrowth_{c,t-36,t} + \beta_3 Homeowner_i + \gamma X_{i,t} + \theta_c + \mu_{i,c,t}. \quad \text{(B2)}$$

$InterestRate_{t-3}$ represents the lagged mortgage rate or the spread between the lagged unsecured loan rate and the lagged mortgage rate. We use lagged interest rates or spreads of up to three months because it takes some time for borrowers to plan and withdraw their home equity, and the decision of equity withdrawal is unlikely to be a response to simultaneous movements in interest rates or spreads.

Additionally, we introduce another regression by adding an interaction term between the lagged interest rates or spreads and the house price growth in Equation B2. The specification becomes

$$EW_{i,c,t+1} = \beta_1 InterestRate_{t-3} * HPGrowth_{c,t-36,t} + \beta_2 InterestRate_{t-3} + \beta_3 HPGrowth_{c,t-36,t} + \beta_4 Homeowner_i + \gamma X_{i,t} + \theta_c + \mu_{i,c,t}. \quad \text{(B3)}$$

The underlying hypothesis for this additional analysis is that the equity withdrawal decision is driven by both interest rate differences and the amount of home equity accumulated. Table B2 presents the results of the regressions. The decision to withdraw equity is negatively correlated with the mortgage rate and positively correlated with the spread between the unsecured loan rate and the mortgage rate. A similar pattern holds for the withdrawn amount. We find that a 100-basis points increase in the interest rate spread leads to a 66 percent increase in the withdrawn home equity. Importantly, the effect is stronger for the spread between the unsecured loan and mortgage rates, which indicates that the relative borrowing cost is an important factor for the home equity withdrawal decision. Results in Columns (5)–(6) are consistent with that in Columns (3)–(4). However, the magnitude of the estimated coefficients on the interaction terms is much larger than that on the stand-alone mortgage rate and unsecured loan spread variables. This implies that, during a housing boom period, a larger amount of home equity will be withdrawn when the mortgage is cheaper or the relative borrowing cost of unsecured loans compared to the

mortgage is higher.

We further investigate the effect of the spread between the credit card (unsecured loan) and mortgage rates on the changes in outstanding balances for credit card debt (unsecured loans).

$$\Delta Debt^{j}_{i,c,t+1} = \beta_1 InterestSpread_{t-3} * HPGrowth_{c,t-36,t} + \beta_2 InterestSpread_{t-3} + \beta_3 HPGrowth_{c,t-36,t} + \beta_4 Homeowner_i + \gamma X_{i,t} + \theta_c + \mu_{i,c,t}. \quad \text{(B4)}$$

The regression specification is shown in Equation B4. The key variables of interest are the spread between the non-mortgage and mortgage rates, the house price growth, and the interaction term. As shown in Table B3, house price growth is positively correlated with changes in non-mortgage debt balances. However, the interaction terms between house price growth and the interest rate spreads are negative, which means that the non-mortgage debt decreases when the interest rate spread is higher and the house price increases. The non-mortgage debt balances are reduced when the benefit of reduction in borrowing cost is stronger and the accumulated home equity increases due to larger house price growth.

These regression results are consistent with the findings in Bhutta and Keys (2016) that interest rates are important drivers of home equity withdrawal. In the Swedish data, we find supporting evidence that individuals rebalance their debt portfolio when the house price growth allows them to accumulate home equity and the interest rate expenses are lower due to the interest rate differences.

Table B2. Interest Rates and Home Equity Withdrawal Decision

	EW (0 or 1)		EW size (SEK thousand)		EW size (SEK thousand)	
	(1)	(2)	(3)	(4)	(5)	(6)
Mortgage rate$_{t-3}$	-0.000403*		-0.573***		0.0342	
	(0.000235)		(0.161)		(0.168)	
Unsecured loan spread$_{t-3}$		0.00230*		1.651***		-1.139
		(0.00123)		(0.633)		(0.873)
Mortgage rate$_{t-3}$*HPgrowth					-5.274***	
					(1.121)	
Unsecured loan spread$_{t-3}$*HPgrowth						28.76***
						(6.157)
HPgrowth	0.00716***	0.00718***	0.191	0.591	17.17***	-68.08***
	(0.00209)	(0.00207)	(0.934)	(0.901)	(3.655)	(14.75)
Homeowner	0.0292***	0.0292***	7.525***	7.529***	7.525***	7.529***
	(0.000198)	(0.000198)	(0.239)	(0.239)	(0.239)	(0.239)
Additional controls	YES	YES	YES	YES	YES	YES
Parish FE	YES	YES	YES	YES	YES	YES
Observations	2,184,840	2,184,840	2,184,840	2,184,840	2,184,840	2,184,840

Note: Columns (1)–(4) in this table report the results of panel data regressions

$$EW_{i,c,t+1} = \beta_1 InterestRate_{t-3} + \beta_2 HPGrowth_{c,t-36,t} + \beta_3 Homeowner_i + \gamma X_{i,t} + \theta_c + \mu_{i,c,t}$$

Columns (5)–(6) in this table report the results of panel data regressions

$$EW_{i,c,t+1} = \beta_1 InterestRate_{t-3} * HPGrowth_{c,t-36,t} + \beta_2 InterestRate_{t-3} + \beta_3 HPGrowth_{c,t-36,t} + \beta_4 Homeowner_i + \gamma X_{i,t} + \theta_c + \mu_{i,c,t}$$

Home equity withdrawers and renters are included in the analysis. In Columns (1)-–(2), the dependent variables are the dummy variable for the equity withdrawal events, *EW dummy*, which equals one if an individual withdrew home equity of at least SEK 20,000 in month t. In Columns (3)–(6),the dependent variables are *EW size*, and the withdrawn amount in terms of SEK thousand if *EW dummy* equals one. $InterestRate_t$ represents interest rate measures for personal debt: (1) mortgage rate; and (2) unsecured loan spread between the unsecured loan rate and mortgage rate. *HPgrowth* measures the cumulative three years of house price growth until month t at the parish level. *Homeowner* is a dummy variable that equals one if individual i is a homeowner and zero if they are a renter. Additional controls include the disposable income of individual i in month t, and the individual's credit score and age in July 2010. Standard errors are in parentheses and clustered at the parish level. *, **, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent level, respectively.

Table B3. Interest Spread, Home Equity Withdrawal and Non-Mortgage Debt Repayment

	ΔCredit card debt	ΔUnsecured loans
	(1)	(2)
Credit card spread$_{t-3}$	0.00660	
	(0.00787)	
Credit card spread$_{t-3}$*HPgrowth	-0.128**	
	(0.0517)	
Unsecured loan spread$_{t-3}$		0.376
		(0.379)
Unsecured loan spread$_{t-3}$*HPgrowth		-6.549**
		(3.255)
HPgrowth	0.732**	15.93**
	(0.301)	(7.974)
Homeowner	0.00125	-16.58***
	(0.0196)	(0.873)
Additional controls	YES	YES
Parish FE	YES	YES
Observations	839,702	839,702

Note: This table reports the results of panel data regressions

$$\Delta Debt^{j}_{i,c,t+1} = \beta_1 InterestSpread_{t-3} * HPGrowth_{c,t-36,t} + \beta_2 InterestSpread_{t-3} + \beta_3 HPGrowth_{c,t-36,t} + \beta_4 Homeowner_i + \gamma X_{i,t} + \theta_c + \mu_{i,c,t}$$

Only home equity withdrawers who repaid at least part of outstanding unsecured loans and renters are included in the analysis. The dependent variables are the differences in debt balances (credit card debt, and unsecured loans) between month t and month $t+1$. $InterestSpread_t$ represents the spread between the unsecured loan rate and mortgage rate, or the spread between the credit card interest rate and mortgage rate. *HPgrowth* measures the cumulative three years of house price growth until month t at the parish level. *Homeowner* is a dummy variable that equals one if individual i is a homeowner and zero if they are a renter. Additional controls include the disposable income of individual i in month t, and the individual's credit score and age in July 2010. Standard errors are in parentheses and clustered at the parish level. *, **, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent level, respectively.

Recent Working Papers:

For a complete list of Working Papers published by Sveriges Riksbank, see www.riksbank.se

The Macroeconomic Effects of Trade Tariffs: Revisiting the Lerner Symmetry Result *by Jesper Lindé and Andrea Pescatori*	2019:363
Biased Forecasts to Affect Voting Decisions? The Brexit Case *by Davide Cipullo and André Reslow*	2019:364
The Interaction Between Fiscal and Monetary Policies: Evidence from Sweden *by Sebastian Ankargren and Hovick Shahnazarian*	2019:365
Designing a Simple Loss Function for Central Banks: Does a Dual Mandate Make Sense? *by Davide Debortoli, Jinill Kim and Jesper Lindé*	2019:366
Gains from Wage Flexibility and the Zero Lower Bound *by Roberto M. Billi and Jordi Galí*	2019:367
Fixed Wage Contracts and Monetary Non-Neutrality *by Maria Björklund, Mikael Carlsson and Oskar Nordström Skans*	2019:368
The Consequences of Uncertainty: Climate Sensitivity and Economic Sensitivity to the Climate *by John Hassler, Per Krusell and Conny Olovsson*	2019:369
Does Inflation Targeting Reduce the Dispersion of Price Setters' Inflation Expectations? *by Charlotte Paulie*	2019:370
Subsampling Sequential Monte Carlo for Static Bayesian Models *by David Gunawan, Khue-Dung Dang, Matias Quiroz, Robert Kohn and Minh-Ngoc Tran*	2019:371
Hamiltonian Monte Carlo with Energy Conserving Subsampling *by Khue-Dung Dang, Matias Quiroz, Robert Kohn, Minh-Ngoc Tran and Mattias Villani*	2019:372
Institutional Investors and Corporate Investment *by Cristina Cella*	2019:373
The Impact of Local Taxes and Public Services on Property Values *by Anna Grodecka and Isaiah Hull*	2019:374
Directed technical change as a response to natural-resource scarcity *by John Hassler, Per Krusell and Conny Olovsson*	2019:375
A Tale of Two Countries: Cash Demand in Canada and Sweden *by Walter Engert, Ben Fung and Björn Segendorf*	2019:376
Tax and spending shocks in the open economy: are the deficits twins? *by Mathias Klein and Ludger Linnemann*	2019:377
Mind the gap! Stylized dynamic facts and structural models *by Fabio Canova and Filippo Ferroni*	2019:378
Financial Buffers, Unemployment Duration and Replacement Labor Income *by Mats Levander*	2019:379
Inefficient Use of Competitors' Forecasts? *by André Reslow*	2019:380
How Much Information Do Monetary Policy Committees Disclose? Evidence from the FOMC's Minutes and Transcripts *by Mikael Apel, Marianna Blix Grimaldi and Isaiah Hull*	2019:381
Risk endogeneity at the lender/investor-of-last-resort *by Diego Caballero, André Lucas, Bernd Schwaab and Xin Zhang*	2019:382
Heterogeneity in Households' Expectations of Housing Prices – Evidence from Micro Data *by Erik Hjalmarsson and Pär Österholm*	2019:383
Big Broad Banks: How Does Cross-Selling A Affect Lending? *by Yingjie Qi*	2020:384
Unemployment Fluctuations and Nominal GDP Targeting *by Roberto Billi*	2020:385
FAQ: How do I extract the output gap? *by Fabio Canova*	2020:386

Drivers of consumer prices and exchange rates in small open economies *by Vesna Corbo and Paola Di Casola*	2020:387
TFP news, stock market booms and the business cycle: Revisiting the evidence with VEC models *by Paola Di Casola and Spyridon Sichlimiris*	2020:388
The costs of macroprudential deleveraging in a liquidity trap *by Jiaqian Chen, Daria Finocchiaro, Jesper Lindé and Karl Walentin*	2020:389
The Role of Money in Monetary Policy at the Lower Bound *by Roberto M. Billi, Ulf Söderström and Carl E. Walsh*	2020:390
MAJA: A two-region DSGE model for Sweden and its main trading partners *by Vesna Corbo and Ingvar Strid*	2020:391
The interaction between macroprudential and monetary policies: The cases of Norway and Sweden *by Jin Cao, Valeriya Dinger, Anna Grodecka-Messi, Ragnar Juelsrud and Xin Zhang*	2020:392
Withering Cash: Is Sweden ahead of the curve or just special? *by Hanna Armelius, Carl Andreas Claussen and André Reslow*	2020:393
Labor shortages and wage growth *by Erik Frohm*	2020:394
Macro Uncertainty and Unemployment Risk *by Joonseok Oh and Anna Rogantini Picco*	2020:395
Monetary Policy Surprises, Central Bank Information Shocks, and Economic Activity in a Small Open Economy *by Stefan Laséen*	2020:396
Econometric issues with Laubach and Williams' estimates of the natural rate of interest *by Daniel Buncic*	2020:397
Quantum Technology for Economists *by Isaiah Hull, Or Sattath, Eleni Diamanti and Göran Wendin*	2020:398
Modeling extreme events: time-varying extreme tail shape *by Bernd Schwaab, Xin Zhang and André Lucas*	2020:399
The Effects of Government Spending in the Eurozone *by Ricardo Duque Gabriel, Mathias Klein and Ana Sofia Pessoa*	2020:400
Narrative Fragmentation and the Business Cycle *by Christoph Bertsch, Isaiah Hull and Xin Zhang*	2021:401
The Liquidity of the Government Bond Market – What Impact Does Quantitative Easing Have? Evidence from Sweden *by Marianna Blix Grimaldi, Alberto Crosta and Dong Zhang*	2021:402
Five Facts about the Distributional Income Effects of Monetary Policy *by Niklas Amberg, Thomas Jansson, Mathias Klein and Anna Rogantini Picco*	2021:403
When domestic and foreign QE overlap: evidence from Sweden *by Paola Di Casola and Pär Stockhammar*	2021:404
Dynamic Macroeconomic Implications of Immigration *by Conny Olovsson, Karl Walentin, and Andreas Westermark*	2021:405
Revisiting the Properties of Money *by Isaiah Hull and Or Sattath*	2021:406
The cost of disinflation in a small open economy vis-à-vis a closed economy *by Oleksandr Faryna, Magnus Jonsson and Nadiia Shapovalenko*	2021:407
On the Performance of Cryptocurrency Funds *by Daniele Bianchi and Mykola Babiak*	2021:408
The low-carbon transition, climate commitments and firm credit risk *by Sante Carbone, Margherita Giuzio, Sujit Kapadia, Johannes Sebastian Krämer, Ken Nyholm and Katia Vozian*	2022:409
Seemingly Irresponsible but Welfare Improving Fiscal Policy at the Lower Bound *by Roberto M. Billi and Carl E. Walsh*	2022:410
Pension Reform and Wealth Inequality: Evidence from Denmark *by Torben M. Andersen, Joydeep Bhattacharya, Anna Grodecka-Messi and Katja Mann*	2022:411

Inflation Targeting or Fiscal Activism? *by Roberto M. Billi*	2022:412
Trading volume and liquidity provision in cryptocurrency markets *by Daniele Bianchi, Mykola Babiak and Alexander Dickerson*	2022:413
DISPERSION OVER THE BUSINESS CYCLE: PASSTHROUGH, PRODUCTIVITY, AND DEMAND *by Mikael Carlsson, Alex Clymo and Knut-Eric Joslin*	2022:414
Electoral Cycles in Macroeconomic Forecasts *by Davide Cipullo and André Reslow*	2022:415
The Curious Incidence of Monetary Policy Across the Income Distribution *by Tobias Broer, John Kramer and Kurt Mitman*	2022:416
Central Bank Mandates and Monetary Policy Stances: through the Lens of Federal Reserve Speeches *by Christoph Bertsch, Isaiah Hull, Robin L. Lumsdaine, and Xin Zhang*	2022:417
The Political Costs of Austerity *by Ricardo Duque Gabriel, Mathias Klein and Ana Sofia Pessoa*	2022:418
Central bank asset purchases: Insights from quantitative easing auctions of government bonds *by Stefan Laséen*	2023:419
Greenflation? *by Conny Olovsson and David Vestin*	2023:420
Effects of foreign and domestic central bank government bond purchases in a small open economy DSGE model: Evidence from Sweden before and during the coronavirus pandemic *by Yildiz Akkaya, Carl-Johan Belfrage, Paola Di Casola and Ingvar Strid*	2023:421
Dynamic Credit Constraints: Theory and Evidence from Credit Lines* *by Niklas Amberg, Tor Jacobson, Vincenzo Quadrini and Anna Rogantini Picco*	2023:422
Stablecoins: Adoption and Fragility *by Christoph Bertsch*	2023:423
CBDC: Lesson from a Historical Experience *by Anna Grodecka-Messi and Xin Zhang*	2023:424
Do Credit Lines Provide Reliable Liquidity Insurance? Evidence from Commercial-Paper Backup Lines *by Niklas Amberg*	2023:425
Price Pass-Through Along the Supply Chain: Evidence from PPI and CPI Microdata *by Edvin Ahlander, Mikael Carlsson and Mathias Klein*	2023:426
Cash for Transactions or Store-of-Value? A comparative study on Sweden and peer countries *by Carl Andreas Claussen, Björn Segendorf and Franz Seitz*	2023:427
Fed QE and bank lending behaviour: a heterogeneity analysis of asset purchases *by Marianna Blix Grimaldi and Supriya Kapoor*	2023:428
Monetary policy in Sweden after the end of Bretton Woods *by Emma Bylund, Jens Iversen and Anders Vredin*	2023:429
Banking Without Branches *by Niklas Amberg and Bo Becker*	2024:430
Climate impact assessment of retail payment services *by Niklas Arvidsson, Fumi Harahap, Frauke Urban and Anissa Nurdiawati*	2024:431
Four Facts about International Central Bank Communication b*y Christoph Bertsch, Isaiah Hull, Robin L. Lumsdaine, and Xin Zhang*	2024:432
Optimal Monetary Policy with r* < 0 *by Roberto Billi, Jordi Galí, and Anton Nakov*	2024:433
Quantitative Easing, Bond Risk Premia and the Exchange Rate in a Small Open Economy *by Jens H. E. Christensen and Xin Zhang*	2024:434
Supply-Chain Finance: An Empirical Evaluation of Supplier Outcomes *by Niklas Amberg, Tor Jacobson and Yingjie Qi*	2024:435
Optimal Contracts and Inflation Targets Revisited *by Torsten Persson and Guido Tabellini*	2024:436
Potential Climate Impact of Retail CBDC Models *by Niklas Arvidsson, Fumi Harahap, Frauke Urban and Anissa Nurdiawati*	2024:437

Do we need firm data to understand macroeconomic dynamics? *by Michele Lenza and Ettore Savoia*	2024:438
Inflation-Dependent Exchange Rate Pass-Through in Sweden: Insights from a Logistic Smooth Transition VAR Model *by Gabriella Linderoth and Malte Meuller*	2024:439
Quantitative Easing and the Supply of Safe Assets: Evidence from International Bond Safety Premia *by Jens H. E. Christensen, Nikola N. Mirkov and Xin Zhang*	2024:440
Bank fragility and the incentives to manage risk *by Toni Ahnert, Christoph Bertsch, Agnese Leonello and Robert Marquez*	2024:441
A Traffic-Jam Theory of Growth *by Daria Finocchiaro and Philippe Weil*	2024:442
Intertemporal MPC and Shock Size *by Tullio Jappelli, Ettore Savoia and Alessandro Sciacchetano*	2024:443
Plundered or profitably pumped-up? The effects of private equity takeover *by Anders Kärnä and Samantha Myers*	2024:444
Measuring Riksbank Monetary Policy: Shocks and Macroeconomic Transmission *by Jakob Almerud, Dominika Krygier, Henrik Lundvall and Mambuna Njie*	2024:445
Joint extreme Value-at-Risk and Expected Shortfall dynamics with a single integrated tail shape parameter *by Enzo D'Innocenzo, André Lucas, Bernd Schwaab and Xin Zhang*	2025:446
The Inflationary Effects of Quantitative Easing *by Mathias Klein and Xin Zhang*	2025:447
Shadow banks or just not banks? Growth of the Swedish non-bank sector *by Jieying Li and Samantha Myers*	2025:448
Sveriges Riksbank´s Foreign Exchange Reserve, 1823–2023 *by Gustav Ingman*	2025:449
Unconventional Monetary Policies in Small Open Economies *by Marcin Kolasa, Stefan Laséen and Jesper Lindé*	2025:450
Long-Lag VARs *by Ferre De Graeve and Andreas Westermark*	2025:451

Sveriges Riksbank
Visiting address: Brunkebergs torg 11
Mail address: se-103 37 Stockholm

Website: www.riksbank.se
Telephone: +46 8 787 00 00, Fax: +46 8 21 05 31
E-mail: registratorn@riksbank.se