Who invests in home equity to exempt wealth from bankruptcy?[1]

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Abstract: Homestead exemptions to personal bankruptcy allow households to retain their home equity up to a limit determined at the state level. Households that may experience bankruptcy thus have an incentive to bias their portfolios towards home equity. Using US household data from the Survey of Income and Program Participation for the period 1996-2006, we find that especially households with low net worth maintain a larger share of their wealth as home equity if a larger homestead exemption applies. This home equity bias is also more pronounced if the household head is in poor health, increasing the chance of bankruptcy on account of unpaid medical bills. The bias is further stronger for households with mortgage finance, shorter house tenures, and younger household heads, which taken together reflect households that face more financial uncertainty.

Key words: Homestead exemptions; Personal bankruptcy; Portfolio allocation; Home ownership

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1. Introduction

Persons who file for personal bankruptcy according to Chapter 7 of the US bankruptcy code can generally retain some assets. Specifically, at the state level there tend to be exemptions for certain asset classes up to certain thresholds. The main exemption is the homestead exemption, which enables the filer to retain home equity in his primary residence up to the exemption amount. The homestead exemption ranges from $ 0 in Maryland to an unlimited amount in 8 US states, including Florida and Texas, in 2006. Personal bankruptcy is quite common in the US, with about one million Chapter 7 filings in 2009, and homestead exemptions therefore frequently apply. With a home ownership rate of about 67 percent in the US in 2009, the homestead exemption significantly affects the financial position of households that emerge from personal bankruptcy, especially in high exemption states.[2]

The homestead exemption potentially affects household portfolio choice, as a household needs to have home equity to benefit from the wealth protection offered by the homestead bankruptcy exemption. This paper provides an empirical and a theoretical investigation of the impact of the homestead exemption on household portfolio allocation, and in particular on the share of home equity in net worth and on home ownership.

The estimation uses household level data from the Survey of Income and Program Participation (SIPP) of the US Census Bureau. This data source provides information on wealth allocation and a host of personal and household characteristics for approximately 30,000 households. The homestead exemption is found to have an economically significant effect on a

[2] Computed as owner occupied housing units as percent of total number of occupied housing units using data from the Housing Vacancy Survey of the US Census Bureau.

household's home equity share in net worth. A one standard deviation increase in the homestead exemption level of $ 354,303 starting from a level of zero is estimated to increase the share of home equity in total wealth by 22 percent, which is about half its standard deviation.

The positive relationship between the home equity share and the exemption level is estimated to be stronger for households with low net worth, as these households may face a higher bankruptcy risk. The home equity share is also relatively sensitive to the homestead exemption for households that report poor health, as this could trigger bankruptcy through income loss or major medical expenses.

Furthermore, households with mortgage finance, shorter house tenure, and a younger household head tend to have home equity shares that are more strongly affected by the homestead exemption level. This could reflect that these households also have relatively uncertain financial prospects.

A positive impact of the homestead exemption on home equity investment is confirmed by instrumental variables estimation where we use the year in which a state officially became a US state as an instrument for the state-level exemption level. This choice of instrument recognizes that, at least historically, homestead exemptions were used to attract settlers to a region, to be able to establish a homestead out of reach of previous creditors. A state's year of official US statehood is an appropriate instrument for the homestead exemption, as it proxies for the difficulty a region had in attracting a sufficient population to establish US statehood.

We also estimate a Heckman two-stage selection model, where in the first stage households decide on home ownership, and in the second stage they determine their home equity share in net worth. This approach yields a significant impact of the homestead

exemption on the home equity share, but we do not find a significant relation between the homestead exemption and home ownership. Additional probit regressions that relate home ownership to the homestead exemption also fail to find a significant impact on home ownership. This could reflect that households wishing to purchase a home on account of a high risk of personal bankruptcy are thwarted by a lack of mortgage financing necessary to complete the purchase. Households that own a home instead may have more leeway to adjust their home equity share to obtain the desired bankruptcy protection, as they can always pay down their existing mortgage.

The empirical work is motivated by a two-period model of the allocation of wealth between home equity and another asset category in the presence of a homestead exemption and major expense risk, in the form of uninsurable medical expenses. The focus on medical expenses is motivated by work by Jacoby et al. (2000) and Mathur (2006) who find that illness or injury and resulting medical bills are implicated in more than half of personal bankruptcies, although the expense risk incorporated in the model can easily be reinterpreted as any type of uninsurable household risk. The model implies that household investment in home equity increases with the level of the homestead exemption, especially for households with low net worth, as corroborated in the empirical work. Our finding that households that report poor health invest more in home equity, as protected by the homestead exemption, can also be seen as a confirmation of the model.

Personal bankruptcy, and the role of exemptions therein, have been the subject of several theoretical and empirical studies. In a world of incomplete contracting, Zame (1993) shows that contingent debt repayment, made possible by bankruptcy, can be welfare improving. The consumer will declare bankruptcy in states of nature with low income or high

expenses, providing some consumption insurance across states of nature. Such insurance comes at a cost of a more limited ability to borrow, and hence a reduced ability to smooth consumption over time. Livshits et al.(2007) calibrate a heterogeneous life-cycle model with US data to investigate whether the ability to declare personal bankruptcy, followed by a period of exclusion from new borrowing, improves welfare compared to a system where a "fresh start" is not possible. Their calculations suggest that a bankruptcy system that offers a fresh start is welfare improving for the case where expense shocks are explicitly modeled. Athreya (2002) instead finds that the possibility of consumer bankruptcy reduces welfare in a quantitative analysis of the effects of bankruptcy laws in an incomplete market exchange economy.

Homestead exemptions allow households to emerge from bankruptcy with positive net worth. The effect of these exemptions should be to further insure households against untoward income and expense shocks, and to also further limit their ability to borrow and to smooth consumption intertemporally. Li and Sarte (2006) analyze the implications of exemptions for welfare in a general equilibrium model with endogenous capital formation and labor supply. In a model calibrated with US data, they find that lowering the level of exemptions increases output and is welfare improving. Lower exemptions are found to reduce the incentive to save for borrowers, leading to higher lending rates, which reduces the amount of debt and stimulates capital formation. With higher lending rates, fewer households will opt for a Chapter 13 bankruptcy, thereby increasing the labor supply, output and welfare. Gropp, Scholz and White (1997) empirically investigate how exemptions affect aggregate credit to households. They argue that the protection offered by exemptions increases household demand for credit, while it reduces the supply of credit. They find evidence that the net impact on credit is negative for

less-well-off households, while it is positive for high-asset households. Higher exemptions are further found to explain higher interest rates on car loans.

Several studies have examined how exemptions differentially affect secured and unsecured credit to households. Berkowitz and Hynes (1999) find that homestead exemptions tend to reduce the probability of being denied secured mortgage credit. Berkowitz and White (2004), instead, find that unincorporated businesses are more likely to be denied unsecured credit or to receive less credit at higher interest rates, if they are located in states with unlimited rather than low homestead exemptions. Berger et al. (2008) construct a measure of bankruptcy protection that reflects the extent to which a business owner's home equity is covered by the homestead protection, and find that larger home equity protection leads to less and costlier credit to small businesses with unlimited liability.

Bankruptcy protection makes owning a business with unlimited liability less risky. Fan and White (2002) find that the probability that a household owns a small business is higher in states with unlimited exemption than in other states. Fay et al. (2002) further examine how bankruptcy exemptions affect the household bankruptcy decision and find that the financial gain that households can attain by filing for bankruptcy, as affected by the exemptions, is a main determinant of the bankruptcy decision.

There is also related literature on the determinants of home ownership. Li (1977) relates home ownership to household characteristics such as the age of the household head, income and family size. Using micro-level data from 14 OECD countries, Chiuri and Jappelli (2003) find that the availability of mortgage finance – as measured by down payment ratios – affects owner occupancy rates especially for young households. King and Leape (1998) jointly consider the home ownership decision and the resulting household portfolio share in a general

study of household portfolio allocation of US households and find that both home ownership and investment in owner-occupied housing respond positively to increases in wealth. Poterba and Samwick (1990) show that taxation of ordinary income and capital gains affects housing and other asset classes differentially.

Recent work on housing and portfolio composition has recognized that housing is special because it is an asset as well as a durable consumption good, and because adjustments to housing wealth imply large transactions costs. Flavin and Yamashita (2002) consider the optimal household portfolio under the assumption that the household is constrained to live in the house that is owns and show that this implies that housing introduces considerable portfolio risk, especially for younger households with low net worth. Cocco (2005) provide empirical evidence that house price risk crowds out stockholdings, and that this crowding out is stronger for households with low net worth. Using data from the SIPP survey, Chetty and Szeidl (2009) find that increases in household home equity, as explained by higher state-level house price indices, lead to a larger share of stocks in liquid wealth. Also using SIPP data, Corradin et al. (2010) estimate a model of optimal housing wealth adjustment where house price movements are predictable and there are housing adjustment costs. These authors find empirical support for the existence of a region of inaction for values of the housing share in net worth, for which the households optimally does not adjust his housing wealth up or down.

Homestead bankruptcy exemptions also set investments in home equity apart from other investments. To our knowledge, the present paper is the first to investigate the empirical impact of homestead exemptions on the home equity share in net worth and on home ownership. Homestead exemptions are found to provide bankruptcy protection especially to households that can be expected to need this, such as households that report poor health and low wealth.

This protection, however, comes at a cost of biasing household portfolios towards real estate. This distortion comes in the form of higher home equity shares in net worth for home owners, rather than a higher home ownership rate This informs the policy debate about the desirability of homestead exemptions.

The remainder of this paper is organized as follows. Section 2 discusses the role and evolution of exemptions in the US system of personal bankruptcy. Section 3 presents a simple two-period model of optimal investment in home equity in a world with bankruptcy exemption and major expense risk. Section 4 discusses the data, and section 5 presents the empirical results. Section 6 concludes.

2. The role of exemption in US personal bankruptcy

The US bankruptcy code defines two main possibilities for personal bankruptcy. Under Chapter 13, which is not considered in this paper, the filer agrees to a payment plan with his creditors, typically over the course of three to five years, and keeps all of his assets in bankruptcy. Under Chapter 7, a debtor instead surrenders his non-exempt property to a bankruptcy trustee who then liquidates the property, and distributes the proceeds to the debtor's unsecured creditors. In exchange, the debtor is entitled to a discharge of unsecured debt.

Bankruptcy exemptions define the assets that the debtor is permitted to retain in Chapter 7 bankruptcy. Typically, every state has exemption laws that define the value of the property that can be protected from creditor collection actions within the state, while there also are federal exemptions applying in federal cases. Importantly, homestead exemptions define the

amount of housing wealth that debtors may protect from liquidation under Chapter 7 bankruptcy.[3]

In the past thirty years, the United States has had two major reforms of its personal bankruptcy laws that have substantially affected the way in which exemptions may be used in personal bankruptcy.[4] The Bankruptcy Reform Act of 1978 was a comprehensive reform that established a uniform national set of exemptions while allowing states to opt out and set their own exemption levels if desired. Every state had set its own exemptions by 1983, although up to this day many states continue to allow debtors the option of using the federal exemptions.

More recently, the Bankruptcy Abuse Prevention and Consumer Protection Act (BAPCPA) of 2005 placed three important limitations on the debtor's ability to engage in pre-bankruptcy planning to enhance the use of bankruptcy exemptions.

First, the act empowered judges to reverse any asset transfers between exemption categories made shortly before the bankruptcy filing. The objective was to prevent debtors from exchanging unprotected assets for assets protected under exemptions or transferring ownership of unprotected assets to friendly third parties at artificially low prices, only to reverse the transaction once the bankruptcy case was closed.

[3] There are also exemptions protecting other personal property from creditors. As we focus on home equity investment in this paper, we disregard these exemptions that tend to be small relative to the homestead exemption.

[4] There was one additional reform of bankruptcy legislation in the US in 1994 that did not concern bankruptcy exemptions.

Second, the reform of 2005 introduced a provision that aims to prevent households from "forum shopping", i.e. moving to states with particularly generous exemptions shortly before declaring bankruptcy.[5]

Third, the reform placed a cap on the homestead exemption in situations where the debtor has added value to the homestead during the 1215 days (about 3 years and 4 months) preceding the bankruptcy case. The pertinent provision provides that "any value in excess of $125,000" added to a homestead can not be exempted from bankruptcy. Exceptions apply if the additional value was transferred from another homestead within the same state, or if the homestead is the principal residence of a family farmer.[6]

The number of Chapter 7 filings peaked at about 1.4 million in 2005 before falling to about 400,000 in 2006, as households apparently tried to take advantage of the more favorable rules before BAPCPA was enacted. By 2009, the number of Chapter 7 filings had increased back to a level of about 1 million, which indicates that bankruptcy exemptions remain very relevant even after the reform of 2005.

Table 1 presents data on homestead exemptions for the 50 US states and DC, with the federal homestead exemption at the bottom of the table. We present data for 1996, and for each of the years 2000-2006, corresponding to your sample period of 1996-2006 in the estimation below. We coded the state exemption level to the federal exemption, if the state permits the use

[5] Under BAPCPA if a debtor has moved to another state less than 730 days before a bankruptcy case, then the exemption of the debtor's state of residence for the majority of the 180 day time period preceding the 730 days before the filing applies. If the new residency requirement renders the debtor ineligible for any state exemption, then the debtor can choose the federal exemption. See BAPCPA (2005), § 522(b)(3).

[6] Thus, the cap applies in situations where a debtor has purchased a new homestead in a different state, or where the debtor has increased the value to his homestead through a renovation or addition. See BAPCPA (2005), § 522(p).

of the federal exemption and the state exemption is lower than the federal exemption.[7] The table shows considerable cross-sectional variation in homestead exemptions, with Maryland applying an exemption of zero, and 8 states, including Florida and Texas, applying an unlimited exemption in 2006. If the exemption is unlimited, the household can retain its primary residence fully in bankruptcy regardless of its value. In the empirical work below, we code unlimited exemptions to a value of one million dollars in 2000, adjusting this amount for other years to reflect price level variation.

Comparing homestead exemptions in 1996 and 2006, we see that most states increased exemption levels to some extent to offset inflation and maintain the real value of the exemptions. Several states, however, made more significant changes in their homestead exemptions. Rhode Island, for example, increased its exemption amount from $30,000 in 1996 to $300,000 in 2006, DC moved from the federal homestead exemption to an unlimited exemption in 2006, and Delaware changed from a zero homestead exemption to an exemption of $50,000 in 2006 given that Delaware does not permit the use of the federal exemption. Thus, there is some time variation in homestead exemption levels, in addition to considerable cross-state variation.

3. A model of home equity investment with bankruptcy exemption

To motivate subsequent empirical work, this section sets out a simple two-period model of wealth allocation in the presence of major expense risk. In the first period, the representative individual allocates his wealth W between two categories. First, the individual can invest in a

[7] This applies to, for instance, Hawaii, Michigan, and New Jersey.

wealth category *H,* that is covered by a bankruptcy exemption $X > 0$ in case of a second-period bankruptcy. We will refer to *H* as housing, even though in practice other assets can be covered by an exemption as well, including clothing, furniture and pension rights. The bankruptcy exemption *X* includes any homestead exemption covering the home equity in a primary residence. The second wealth category, denoted *B*, represents all asset classes that are not potentially covered by an exemption. We will refer to *B* as bonds.

The wealth categories, *B* and *H*, differ in two respects. First, the protected wealth category, *H,* is taken to be a consumption good as well as an asset, while *B* is only an asset. The wealth category *H*, specifically, includes owner-occupied housing, which is both a consumption good and an asset. Second, we assume that asset *B* dominates asset *H* in its investment return. Assets included in *B*, specifically, provide a return of $r > 0$, while the investment return on *H* is set to zero for simplicity.

With probability π, the agent faces a major expense in the second period, denoted *M*, which can be thought of as an uninsurable medical expense. We assume that $M > W(1 + r)$ so that the medical expense will exhaust the individual's second-period wealth and trigger a personal bankruptcy, even if he previously invested only in higher yielding bonds.[8] Second-period wealth after any payment towards the medical bill is used for second-period, non-housing consumption, *C*. With probability $1 - \pi$, the agent does not face a medical bill and his

[8] We can assume that a government program will cover the part of the medical bill that the individual cannot pay. Such a government program can be thought to be financed by a first-period tax τ on an endowment *Y*, with $W = (1 - \tau)Y$ being the after-tax endowment or wealth. The government budget is then given by

$$(1+r)\tau Y = \pi[M - (B(1+r) + \max(H - X, 0))]$$

with *r* also representing the return on government surplus. The representative individual considers the tax rate τ as given.

consumption C equals $B(1 + r) + H$. With probability π, the individual, instead, consumes $\min[H, X]$, as X is the maximum wealth protection offered by the exemption. We will assume $(1-\pi)(1+r)>1$ to not exclude the possibility that the individual jointly holds bonds and housing less than the exemption.

Utility derived from non-housing and housing consumption, $U(H, C)$, is taken to be separable so that it can be written as $V(H) + Z(C)$, with the Inada conditions applying.[9] In the first period, the agent chooses B and H so as to maximize expected utility, EU, written as[10]

$$EU = V(H) + (1-\pi)Z(B(1+r) + H) + \pi Z(\min(H, X)) \quad (1)$$

subject to the wealth constraint $W = B + H$, and to $B \geq 0$ to prevent 'strategic' first-period borrowing to invest in the protected housing asset.

The marginal contributions of investments in bonds and housing to expected utility EU can be written as follows

$$\frac{dEU}{dB} = (1-\pi)(1+r)Z'(B(1+r) + H) \quad (2)$$

$$\frac{dEU}{dH} = V'(H) + (1-\pi)Z'(B(1+r) + H) + i(H, X)\pi Z'(H) \quad (3)$$

where $i(H, X)$ is an index function that equals 1 if $H < X$ and 0 if $H > X$. A marginal investment in bonds is seen to add to second-period, non-housing consumption only in the absence of the medical expense. A marginal investment in housing also adds to second-period,

[9] These are $V(0) = 0, V'(H) > 0, V''(H) < 0$, $\lim_{H\to 0} V'(H) = \infty$, and $\lim_{H\to\infty} V'(H) = 0$, with analogous conditions applying to $Z(C)$.

[10] In this specification, housing consumption can be taken to occur in either period or in both periods, with any discounting of utility from second-period consumption implicit in the subutility functions V and Z.

non-housing consumption without the medical expense, and in addition if there is a medical expense and housing is fully covered by the exemption, i.e. $H < X$.

The first order conditions (2) and (3) imply two scenarios in which the agent is at the margin indifferent between allocating his wealth to bonds and to housing.

First, the investment in housing may at the margin not be covered by the exemption so that we have $\frac{dEU}{dB} = \frac{dEU}{dH}$ with $H > X$ which implies

$$(1-\pi)(1+r)Z'(W(1+r)-rH) = V'(H) + (1-\pi)Z'(W(1+r)-rH) \qquad (4)$$

where $W - H$ has been substituted for B.

The relationship between W and H implicit in (4) is pictured as the 'no protection' line, labeled *NP*, in Figure 1. This schedule is upward sloping as (4) implies

$$\frac{dH}{dW} = \frac{(1-\pi)r(1+r)Z''(W(1+r)-rH)}{V''(H) + (1-\pi)r^2 Z''(W(1+r)-rH)} > 0$$

where $H \leq W$ as $B \geq 0$. We consider the case where along the *NP* schedule

$\frac{Z''(W(1+r)-rH)}{Z'(W(1+r)-rH)} > \frac{V''(H)}{V'(H)}$, which means that the marginal utility of housing consumption declines relatively fast. In this case, we have $dH/dW < 1$ so that the *NP* schedule has a slope of less than one in Figure 1, and it starts at the origin.[11]

Second, the individual can be indifferent between investing in bonds and housing for the case where housing wealth is fully exempted from bankruptcy in the bad state. From (3) and (4), we see that $\frac{dEU}{dB} = \frac{dEU}{dH}$ with $H < X$ implies

[11] The provided condition and (4) imply $dH/dW < 1$.

$$(1-\pi)(1+r)Z'(W(1+r)-rH) \;=\; V'(H)+\;(1-\pi)Z'(W(1+r)-rH)+\pi Z'(H) \qquad (5)$$

The relationship between W and H implicit in (5) is now pictured as the 'protection' line, labeled P, in Figure 1. This schedule is upward sloping as (5) implies

$$\frac{dH}{dW}=\frac{(1-\pi)r(1+r)Z''(W(1+r)-rH)}{V''(H)+\pi Z''(H)+(1-\pi)r^2Z''(W(1+r)-rH)}>0$$

where $H \leq W$ as $B \geq 0$. We further assume that along the P schedule we have

$\frac{Z''(W(1+r)-rH)}{Z'(W(1+r)-rH)} > \frac{V''(H)+\pi Z''(H)}{V'(H)+\pi Z''(H)}$ (a relatively fast decline of the marginal utility of housing consumption) to guarantee $dH/dW < 1$.[12] The P schedule thus has a slope of less than one, and it meets the 45^o line with wealth equal to W_p as implicit in $V'(W_p)=[(1-\pi)(1+r)-1]Z'(W_p)$. Note that the P schedule is situated above the NP schedule, as for given values of wealth and housing, $\frac{dEU}{dB}=\frac{dEU}{dH}$ with $H > X$ implies $\frac{dEU}{dB}<\frac{dEU}{dH}$ with $H < X$ from (4) and (5). This implies $W_p > 0$.

Next, we consider how the optimal investment in housing H varies with the individual's wealth, W. With the Inada conditions applying, the agent allocates his entire wealth to 'housing' to guarantee some second-period, non-housing consumption at very low levels of wealth.[13] At a certain higher level of wealth, the individual start to invest jointly in bonds and in housing.

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[12] This condition and (5) imply $dH/dW < 1$.

[13] Note that the wealth insurance offered by the exemption is valuable to the individual as without it he obtains a subutility Z of zero with probability π. However, this insurance comes at a cost of biasing consumption towards housing if a housing allocation is chosen above the NP schedule. The optimal level of the exemption X in this model is not considered.

We can now distinguish two possible overall relationships between wealth and housing, depending on the size of the exemption, *X*, relative to the wealth levels at which the individual starts to invest in bonds with the housing investment protected, denoted W_p.

Case A: $X > W_p$ (weak preference for housing consumption)

This is a case of a weak relative preference for housing consumption, as the individual starts to invest jointly in bonds and housing at a level of wealth W_p below the exemption X.

The overall relationship between wealth and housing is now pictured in Figure 2, Panel A. For wealth levels up to W_p, the individual just holds housing. At that point, the investor starts to invest jointly in both bonds and housing, along the *P* schedule. Housing continues to rise with wealth until housing equals the exemption level, i.e. $H = X$. At that point, the marginal contribution of higher housing to expected utility (i.e., $\frac{dEU}{dH}$ for *H* rising) drops, as any further investment in housing no longer adds to second-period, non-housing consumption in the bad state. Therefore, the individual starts to invest at the margin only in bonds until the *NP* schedule is reached at a wealth level $\hat{W}$.[14] At that wealth level, the individual starts to invest jointly in bonds and housing again, along the *NP* schedule. For wealth levels below $\hat{W}$ in the figure, the individual is seen to hold additional wealth in the form of housing on account of the housing exemption, while for lower and higher wealth levels housing investment is not affected by the exemption.

[14] Using (4) we can find $\hat{W}$ implicitly from $(1-\pi)rZ'(\hat{W}(1+r)-X) = V'(X)$.

Case B: $W_p \geq X$ (strong preference for housing consumption)

This is a case of strong preference for housing consumption, as the individual starts to invest jointly in bonds and housing at a wealth level equal to the exemption.

The relationship between wealth and housing is now presented in Figure 2, Panel B. For wealth levels up to *X* the investor just holds housing. At that point, any further investment in housing ceases to add to second-period, non-housing consumption in the bad state. Therefore, the investor only invests in bonds at the margin as wealth increases until the *NP* schedule is reached at a wealth level $\hat{W}$. For higher wealth levels, the investor invests jointly in bonds and housing, along the *NP* schedule. For wealth below $\hat{W}$, the individual is now seen to maintain a higher housing investment on account of the exemption.

In both panels of Figure 2, the marginal investment in housing, *dH/dW*, is higher at the lowest levels of wealth than it is at very high levels of wealth. In addition, there is a range of wealth levels where the marginal investment in housing is zero.

To conclude the discussion of the model, we consider the impact of a change in the exemption level *X* on the wealth allocation for individuals with different wealth levels. Specifically, let us consider a (small) rise in the exemption *X* from X_1 to X_2. Graphically, the increase in *X* will affect the position of the horizontal line segment, at housing level *H* equal to *X*, in Panels A and B of Figure 2. To illustrate, in Figure 3 we picture the horizontal line segments at housing levels X_1 and X_2 for case B as depicted in Panel B of Figure 2. In the figure, we see that the increase in the exemption only affects the wealth allocation between housing and bonds for individuals with wealth levels between X_1 and $\hat{W}_2$. For these individuals, the higher exemption is seen to lead to a greater allocation of wealth towards the

protected housing category. For individuals with either lower or higher wealth, the wealth allocation between bonds and housing, however, is not affected by the increase in the exemption level *X*.

The empirical work below tests some key aspects of the model. Specifically, the share of household wealth that is allocated to home equity is expected to increase with the level of the homestead exemption, especially for households with low net worth. The positive relationship between the homestead exemption and home equity investments is predicated on the existence of some bankruptcy risk. Poor health poses a major risk, as it can lead to income loss or catastrophic medical bills as modeled in this section. Therefore, we also investigate whether the positive impact of the homestead exemption on home equity investment is stronger if the household head is in poor health.

4. The data

We use household data from the Survey of Income and Program Participation from the US Census Bureau that at each moment tracks about 30,000 households. Our sample period is from 1996 to 2006. During this period, information was collected from three consecutive groups of households or panels that were interviewed during the years 1996-2000, 2001-2003, and 2004-2006, respectively. During its active period, each panel is interviewed many times with intervals of several months, while panels of households do not overlap across periods. During a calendar year, the households in a panel are typically asked to answer different questions at different times, with for our purposes no repetition of the same relevant question within a calendar year. This enables us to organize the data by calendar year, yielding at least 2

usable years of data per panel and with some households moving between states and thus subject to different state homestead exemptions in our sample.

The SIPP collects information on home ownership, home value and mortgage debt, as well as on a wide range of other real and financial assets and liabilities. The SIPP thus is well suited to study household portfolio allocation, and in particular the share of a household's net worth that is held in the form of home equity in the household's primary residence. As we know whether a household owns its home, the underlying home ownership decision can be examined as well. The SIPP, in addition, contains other information on household composition and characteristics that can be considered to affect the home equity investment decision.

A first variable used in this study is Own, which is a dummy variable that takes on a value of 1 if the household owns its residence, and it is zero otherwise (see the Appendix for variable definitions and data sources). The mean ownership rate in our sample is 67.3 percent as seen in Table 2, which provides summary statistics on main variables. The mean Home equity, computed as house value minus mortgage debt, is seen to be $ 63,745. Total average household net worth amounts o $ 155,671. Home equity share is the ratio of home equity to net worth, and it is computed only for households with positive net worth. The mean home equity share amounts to 0.58.

A key household characteristic is the variable Age, which is the age of the household head. A household's home equity can be expected to increase with age, as mortgage debt tends to be paid down over time. Health also potentially increases a household's investment in exempted home equity. Our Health variable stands for the health status of the household head, and it ranges from value of 1 for poor health to 5 for excellent health, with an average health rating of 3.6 (between good and very good). Members is the number of individual household

members, with a mean value of 2.6. A larger family is expected to own a larger and more expensive residence. Married is a dummy variable that takes on a value of one if the household head is married, and zero otherwise. Marriage may signal household stability promoting home ownership.

Moved state is an indicator for whether the household moved to another state during the previous year. Households that move state typically are subject to different state homestead exemption regimes during the years that they are included in the sample. Exemption is the dollar amount of the homestead exemption. The level is set to 1 millions dollars in case the exemption is unlimited in 2000, adjusting this amount in other years for inflation. With this adjustment, we get an average exemption level of $ 208,066. Log exemption is the natural logarithm of the value of the exemption plus one. Appreciation is the state-level annual rate of appreciation of the deflated house price index constructed by the Office of Federal Housing Enterprise Oversight. The mean rate of real house price appreciation is 3.8 percent in our sample.

Statehood is the year in which a state officially became a US state. The year of statehood is an index of how difficult it was to settle a part of the US, either because of unfavorable natural circumstances or distance from the original colonies. As documented by Goodman (1993), homestead exemptions were used to attract indebted settlers to mainly uninhabited areas, as these exemptions allowed people to acquire a new home out of reach of previous creditors. The regions that were more difficult to settle required higher homestead exemptions to be attractive to potential settlers. The difficulty to settle a region, as proxied by a state's year of official US statehood, thus can be seen as one of the historical determinants of homestead exemption levels. Hynes, Malani and Posner (2004) document that state-level

exemption levels have been quite persistent, which suggests that current exemption levels still reflect the determinants of historical exemption levels. The mean year of US statehood for our sample is 1827.

5. Empirical results

We examine whether homestead exemptions affect household portfolio allocation, and in particular the ratio of home equity to total household net worth. We first estimate a regression model with the ratio of home equity to total household net worth as dependent variable and a host of household and state-level characteristics, including applicable homestead exemption levels, as explanatory variables. The regressions of the home equity share reported in Table 3 all include state and year fixed effects and errors are clustered at the household level. In regression 1, the Log exemption variable obtains a coefficient of 0.017 that is significant at the 1 percent level. To interpret this coefficient, we can consider a one standard deviation increase in Exemption of $ 354,303, starting from a level of zero. This will increase the home equity share by 0.22, which amounts to about half its standard deviation of 0.462 (from Table 2). Thus, the impact of the actual variation of homestead exemption levels, as reflected in Table 1, on the home equity share is estimated to be economically significant.

In regression 1, the home equity share is further positively and significantly related to home price appreciation. The Age variable also enters with a positive and significant coefficient which can reflect that older households benefited from longer periods of house price appreciation, or that they have had more time to pay down their mortgages. The Health variable obtains a negative and significant coefficient. Households with healthier household heads could invest less in home equity partly because they are less in need of any exemption from

bankruptcy. The Members variable obtains a positive and significant coefficient, reflecting that larger families are more likely to own more expensive homes.

Next, we restrict the sample to households that own their home because we do not observe home equity for households without a home. In regression 2, the Log exemption variable now obtains a slightly higher coefficient of 0.018 that remains significant at the 1 percent level. Starting from regression 2, we include the Log net worth in regression 3 as an additional control variable, as a household's home equity share may vary with household wealth due to the operation of the housing finance market (in particular, the need to make a down payment out of own funds when purchasing a home) and due to preferences. In regression 3, the Log exemption variable now obtains a slightly higher coefficient of 0.025 that is significant at the 1 percent level. The Log net worth variable obtains a negative coefficient of -0.156 that is significant at the 1 percent level, which may reflect preferences of richer households to maintain a lower share of their wealth in the form of home equity. In addition, regression 4 includes the square of the Log net worth variable. The estimated coefficient for the Log exemption variable is virtually unchanged, while the linear and quadratic Log net worth variables now obtain positive and negative coefficients, respectively, that are both significant at the 1 percent level. Apparently, the home equity share first rises and then declines with the Log net worth variable.

Regression 5 in addition includes an interaction variable of Log exemption and Log net worth. Now the Log exemption variable obtains a larger coefficient of 0.068 that is significant at the 1 percent level, while the interaction variable obtains a negative coefficient of -0.004 that is also significant at the 1 percent level. Thus, the positive impact of the homestead exemption on the home equity share declines with net worth. The estimated coefficients on the Log

exemption variable and its interaction with Log net worth suggest that the impact of a higher exemption on the home equity share could turn negative in principle for households with a Log net worth above 17 (or net worth above $ 21.5 million). In the sample of regression 5, however, there is only a negligibly small number of observations with household wealth above this level. We therefore conclude that the impact of the homestead exemption on the home equity share is positive and decreasing in net worth.

This could reflect that the wealth protection offered by the homestead exemption biases investment portfolios of wealthy households less towards home equity, as these households face a lower probability of bankruptcy. Alternatively, wealthier households have to bias their home equity share less towards home equity to obtain the same level increase in home equity as protected by the homestead exemption. To differentiate between these alternative explanations, in regressions 6 and 7 of Table 3 we split the sample between high-wealth households, defined as households with net wealth in excess of US$500,000 of 2000 US dollars, and non-high-wealth households. For high-wealth households, exemption levels are more likely to be binding the amount of wealth insurance that they can obtain, which would suggest we should find that home equity shares are more sensitive to exemption levels for the wealthy. On the other hand, if wealthy households face a lower risk of bankruptcy, then the sensitivity with respect to exemption levels should be lower for wealthy households. We find that exemption levels only affect home equity shares for non-wealthy households. This suggests that the sensitivity of the home equity share to the homestead exemption declines in net worth because wealthy households face a lower risk of bankruptcy.

Next, we consider whether the sensitivity of a household's home equity share to the exemption level depends on the household head's age and health. First, in regression 1 of Table

4 we include an interaction variable of Log exemption and Log age, starting from regression 5 of Table 3. Now the Log exemption obtains a higher coefficient of 0.087 that remains significant at 1 percent, while the interaction variable obtains a negative coefficient of -0.006 that is significant at 1 percent. Thus, the positive impact of the homestead exemption on the home equity share is smaller for older households. Potential reasons are that older households move less frequently and thus have fewer opportunities to adjust the value of their home to their optimal home equity share, and that they are more likely to have paid down their initial mortgage.[15]

Next, regression 2, instead, includes an interaction variable of the Log exemption variable and the Health variable. Good health is expected to reduce the demand for home equity in household portfolios, as healthy households are less likely to be hit by catastrophic health care bills that can trigger personal bankruptcy. In line with this, the interaction variable obtains a negative coefficient of -0.001, but it is statistically insignificant. Regression 3 alternatively includes two interaction variables of Log exemption with both Log age and Health. Both of these interaction variables now obtain negative coefficients that are significant at the 1 percent and 5 percent levels, respectively. This suggests that the insignificance of the Health interaction variable in regression 2 is due to a positive left-our-variable bias of the estimated coefficient, given that the Health and Log age variables are negatively correlated. Overall, we find evidence that healthier households bias their investment portfolios less towards home equity with a view to obtain wealth insurance against bankruptcy through the homestead exemption.

[15] It may also be the case that older households have more difficulty in obtaining home equity loans as a means to fine tune their home equity share.

Households that do not have a mortgage cannot adjust the balance of their mortgage to reach a target home equity share. Therefore, the home equity share is potentially less sensitive to the homestead exemption for households that do not have a mortgage. In regression 1 of Table 5, we restrict the sample to households without a mortgage yielding estimated coefficients for the Log exemption variable and its interaction with Log net worth of 0.042 and -0.003 that are both significant at the 5 percent level, and somewhat smaller in absolute value than the corresponding estimates of 0.068 and -0.004 in regression 5 of Table 3. Thus, the impact of the exemption on the home equity share of households without a mortgage is relatively small at low levels of net worth, and it declines less with wealth.

Regression 2 instead is only estimated for households with a mortgage, with estimated coefficients for the Log exemption variable and its interaction with Log net worth of 0.081 and -0.004 that are significant at 1 percent, with the former estimate larger than the benchmark estimate of 0.068.

At the time of home purchase, households can use both the house value and the mortgage amount to approach their optimal home equity share, and hence the home equity share of households that bought their home more recently may be relatively sensitive to the home equity share. To test this, regression 3 limits the sample to households that have acquired their home less than 10 years previously. In this regression, the estimated coefficient of 0.083 for the Log exemption variable is significant at 1 percent and larger than the benchmark value of 0.068, while its interaction with Log net worth obtains a coefficient of -0.004 that is significant at the 1 percent level as in the benchmark case.

The home equity share of younger households may be relatively responsive to the homestead exemption because of a combination of shorter house tenures and easier access to

mortgage finance, for instance in the form of home equity loans. Regression 4 is estimated only for households with a household head younger than 55 years, yielding a relatively large estimated coefficient for the Log exemption variable of 0.077, even if the estimated coefficient for the interaction of the Log exemption and Log net worth variables is relatively small at -0.003, with both coefficients significant at the 1 percent level. Thus, the home equity share of younger households is relatively sensitive to the exemption at low levels of net worth, and this sensitivity declines relatively little with net worth.

The state-level exemption level is possibly endogenous to the home equity share, say on account of political pressures from home owners. Rising home equity shares could possibly lead to additional political demands from home owners for bankruptcy protection, giving rise to higher homestead exemptions. Hynes, Malani and Posner (2004) have considered several explanatory variables for the state-level homestead exemption on political grounds (including the individual bankruptcy rate, the number of banks per 100,000 population, and government transfers per capita), failing to find any statistically significant relation. These authors conclude that the best explanation for the current homestead exemption is the past exemption level, which is testimony to a high persistence of state-level homestead exemption policies.

This also suggests that to understand current state-level variation in homestead exemptions we have to go back to the historical reasons for their introduction. As documented by Goodman (1993), a main reason for the introduction of homestead exemptions in 19th century America was to enable a state (or territory) to attract indebted settlers from other regions with the prospect of being able to establish a homestead out of reach of creditors. Texas introduced the first homestead law in 1839 to attract southern agriculturalists heavily burdened by debts following the depression of the late 1830s. Other Southern states soon retaliated with

their own homestead exemption laws, starting with Georgia and Mississippi in 1841 (see Goodman (1993), Table 1). Historical homestead exemption levels thus can be seen as an equilibrium outcome of a game where states use exemption policies to attract additional settlers. In this equilibrium, relatively unattractive states need to institute relatively high homestead exemptions to be competitive to potential settlers.

Regions that were relatively unattractive to settlers required more time to acquire sufficient populations to officially become a US state. Thus, a state's year of statehood is a useful index of a state's attractiveness, and it should be positively correlated with the state exemption level. The correlation between Log statehood and Log exemption with data for 2000 is calculated to be 0.36. In this calculation, we exclude the DC, as according to the US constitution this is not a US state. Figure 4 provides a scatter plot of Log exemption against Log statehood again without DC, confirming a positive relation between these two variables. Among the early states, Delaware and Maryland have an Exemption of zero (and also a Log exemption of zero) in 2000. For states with unlimited exemption (Arkansas, Florida, Iowa, Kansas, Oklahoma, South Dakota, Tennessee, and Texas), we set exemption levels to 1 million US dollars and calculate Log exemption as ln(1,000,000) = 13.8 in 2000.

In an instrumental variables regression, we use the log of the year of official statehood, denoted Log statehood, as an instrument for the homestead exemption level, with the results reported as regression 1 of Table 6. In this regression (as in all regressions), we exclude households located in DC. The IV regression includes year fixed effects, but no state fixed effects as the year of statehood is time-invariant. The Log exemption variable and its interaction with Log net worth obtain coefficient of 0.062 and -0.007, respectively, that are both

significant at 1 percent. The *F*-test of excluded instruments is rejected at the 1 percent level, which suggests that Log statehood is an appropriate instrument for Log exemption.

The homestead exemption potentially affects the home equity share of home owners as well as the earlier home ownership decision. To control for the potential impact of the homestead exemption on the selection of home owners, we estimate a Heckman two-stage selection model where the first stage concerns the selection of home owners, and the second stage the home equity share of home owners. The selection variable is the household head's marital status, reflected in the Married variable, as marriage can imply household stability and promote home ownership, even if married couples may not purchase different homes or finance them differently. In column 2, the exemption variable and its interaction with net worth obtain coefficients of 0.068 and -0.004 that are significant at the 1 percent level, and equal to the coefficients in the benchmark regression 5 of Table 3. This suggests that the selection issue does not bias regression coefficients for the exemption related variables in the benchmark regression.

The corresponding selection regression is a probit regression with as a dependent variable the Own variable. The results of this first-stage regression are reported as column 3. The Married variable obtains a coefficient of 0.382 that is significant at the 1 percent level, to suggest that marriage increase home ownership. In the selection equation, the Log exemption variable and its interaction with Log net worth obtain coefficients of 0.023 and -0.001, respectively, that are both statistically insignificant. This is consistent with the finding that not controlling for the selection of households into home owners (as in the benchmark regression 5 of Table 3) does not bias the estimated impact of the homestead exemption on the home equity share.

To conclude the empirical section, Table 7 reports several additional probit regressions with the Own variable as the dependent variable. Regression 1 reports a regression similar to column 3 of Table 6, but it excludes the interaction of the Log exemption and Log net worth variables as well as the Log net worth, sq variable. The Log exemption variable continues to obtain a coefficient that is statistically insignificant.

Regression 1 includes state fixed effects, which means that the Log exemption variable can affect the home ownership decision through time variation in the value of the exemption, and through variation in the homestead exemption that comes about as households move between states. If we exclude the state fixed effects, the homestead exemption in addition potentially affects home ownership on account of cross-state variation in this variable, even if such a regression fails to control for any time-invariant state-level factors that may be relevant for the home ownership decision. After we exclude state fixed effects in regression 2, however, the homestead exemption fails to have a statistically significant impact on home ownership.

The homestead exemption has a potentially more discernible impact on the home ownership decision of households that move between states, as these households tend to face rather different homestead exemption regimes during the years that they are included in the sample. To check this, we re-estimate regression 1 only for the sample of households that move between states, with the results reported as regression 3. The homestead exemption again fails to have a statistically significant impact on home ownership. Finally, we exclude state fixed effects from regression 3, and report the results as regression 4. Now the Log exemption variable obtains a coefficient of 0.018 that is significant at the 10 percent level. Thus, there is some limited evidence that the homestead exemption affects the home ownership decision.

At first glance, it is somewhat surprising that there is only limited evidence that the homestead exemption affects the home ownership decision. After all, one expects the demand for wealth insurance against personal bankruptcy that is found to be a significant determinant of the home equity share to also affect the demand for owning a home, as home ownership is a prerequisite for benefiting from the homestead bankruptcy exemption.[16]

A household, however, can unilaterally decide to alter its home equity share by repaying part or all of its mortgage (which is to say that the supply of mortgage credit to households is fully elastic in a downward way once a mortgage has been provided). Home ownership, instead, reflects the demand for generally mortgage-financed homes by households as well as the supply of mortgage finance. The exemption may have little impact on home ownership, because households that wish to purchase a home to protect against personal bankruptcy are the same households that face difficulty in financing a home purchase.[17]

6. Conclusions

For many households, the home is the single most important asset. Thus, the share of household net worth that is allocated to home equity is a key aspect of household portfolio choice. Recent contributions on the determination of housing in household portfolios have focused on the joint home ownership and housing consumption decision, and on high

[16] In the model of section 3, households always invest a positive share of their wealth in asset *H*, which can be taken to mean that they always purchase a home. While this clearly is a simplification, it implies that the level of the exemption, if positive, does not affect the home ownership decision.

[17] The homestead exemption could affect home ownership through its impact on home purchases as well as through its impact on home retention for households that experience financial distress. Li and White (2009) and Li, White and Zhu (2009) argue that bankruptcy reform introduced in 2005 that limited the bankruptcy shield offered by homestead exemptions increased foreclosure rates.

transaction costs that make the home investment decision special. Home equity investment is also special in that home equity tends to benefit from a favorable treatment in US personal bankruptcy law in the form of homestead exemptions. This paper is the first to examine how homestead exemptions affect the home equity share in net worth using detailed US household data from the Survey of Income and Participation over the 1996-2006 period.

A one standard deviation increase in the homestead exemption level of $ 354,303 starting from a level of zero is estimated to increase the share of home equity in total wealth for the average household by 22 percent, which is economically significant (equals about half its standard deviation). The positive relationship between the home equity share and the exemption level is more pronounced for households with low net worth, which potentially reflects that such households face a higher risk of bankruptcy. Similarly, the home equity share is more sensitive to the homestead exemption for households that report poor health, as these households may face a higher probability of high medical bills that can trigger personal bankruptcy. Furthermore, households with mortgage finance, with shorter house tenures, and with a younger household head tend to have home equity shares that are relatively sensitive to the homestead exemption level. These households may equally face higher probabilities of financial distress, but they may also have wider opportunities to adjust their home equity share either through a home purchase or change in the amount of mortgage debt.

The results of a two-stage model of the home equity share (where the first stage concerns the home ownership decision) suggest that households that own their home adjust their home equity share to the homestead exemption level in a significant way, while there is no statistically significant relationship between home ownership and the homestead exemption.

Only if we consider the sample of households that moved between states do we find some evidence that the homestead exemption positively affects the home ownership rate.

The bias in household portfolios towards home equity induced by its special bankruptcy protection suggests that these portfolios are not efficient as they expose the household to too much real estate risk in no-bankruptcy states. Wealth protection against personal bankruptcy may be desirable (as suggested, for instance, by Li and Sarte (2006) on the basis of a simulation model), but its provision through an exemption for home equity appears to be unnecessarily distorting household portfolio choice.

An exemption for home equity could be rationalized if it were to influence home ownership, and if in addition home ownership produced positive externalities on neighborhood stability, as claimed by a substantial literature.[18] However, we do not find robust evidence that homestead exemptions affect home ownership. Thus, the costs of homestead exemptions in biasing household portfolios towards home equity are clear, while there are no obvious counterbalancing benefits of singling out home equity for special bankruptcy protection.

This paper only documents the microeconomic cost of homestead exemptions in that household portfolios tend to be biased towards home equity. At the macroeconomic level, homestead exemptions potentially lead to biases as well. Any macroeconomic distortions depend on how increased demand for home equity at the micro level is accommodated at the macro level. Potential macroeconomic responses to higher homestead exemptions are higher average house prices and reduced aggregate mortgage financing demand in the short run, and

[18] Glaeser and Sacerdote (1999), for instance, find a negative relation between home ownership and crime.

increased housing construction in the long run. The macroeconomic implications of homestead exemption, however, are beyond the scope of the present paper.

Our results imply that homestead exemptions distort household asset portfolio without bringing about clear benefits in terms of increased home ownership. The paper therefore contributes to the policy debate about the desirability of homestead exemptions.

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Table 1. Homestead exemptions by state in 1996 and 2000-2006

State	1996	2000	2001	2002	2003	2004	2005	2006
Alabama	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Alaska	54,000	62,000	64,800	64,800	64,800	67,500	67,500	67,500
Arizona	100,000	100,000	100,000	100,000	100,000	100,000	150,000	150,000
Arkansas	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited
California	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
Colorado	60,000	60,000	60,000	90,000	90,000	90,000	90,000	90,000
Connecticut	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
DC	30,000	32,300	34,850	34,850	34,850	36,900	36,900	Unlimited
Delaware	0	0	0	0	0	0	0	50,000
Florida	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited
Georgia	10,000	10,000	10,000	20,000	20,000	20,000	20,000	20,000
Hawaii	30,000	32,300	34,850	34,850	34,850	36,900	36,900	40,400
Idaho	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Illinois	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
Indiana	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
Iowa	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited
Kansas	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited
Kentucky	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Louisiana	15,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
Maine	25,000	25,000	25,000	50,000	12,300	70,000	70,000	70,000
Maryland	0	0	0	0	0	0	0	0
Massachusetts	100,000	100,000	100,000	300,000	300,000	500,000	500,000	500,000
Michigan	30,000	32,300	34,850	34,850	34,850	36,900	36,900	40,400
Minnesota	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Mississippi	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Missouri	8,000	8,000	8,000	8,000	8,000	15,000	15,000	15,000
Montana	80,000	120,000	120,000	120,000	120,000	200,000	200,000	200,000
Nebraska	10,000	12,500	12,500	12,500	12,500	12,500	12,500	12,500
Nevada	125,000	125,000	125,000	125,000	125,000	200,000	200,000	350,000
New Hampshire	60,000	60,000	60,000	100,000	100,000	200,000	200,000	200,000
New Jersey	30,000	32,300	34,850	34,850	34,850	36,900	36,900	40,400
New Mexico	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
New York	20,000	20,000	20,000	20,000	20,000	20,000	20,000	100,000
North Carolina	20,000	20,000	20,000	20,000	20,000	20,000	20,000	37,000
North Dakota	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000
Ohio	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Oklahoma	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited
Oregon	33,000	33,000	33,000	33,000	33,000	33,000	33,000	30,000
Pennsylvania	30,000	32,300	34,850	34,850	34,850	36,900	36,900	40,400
Rhode Island	30,000	32,300	34,850	150,000	150,000	150,000	200,000	300,000
South Carolina	30,000	32300	34,850	34,850	34,850	36,900	36,900	40,400
South Dakota	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited
Tennessee	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500

Texas	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited
Utah	10,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
Vermont	60,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Virginia	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Washington	30,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
West Virginia	30,000	30,000	30,000	50,000	50,000	50,000	50,000	50,000
Wisconsin	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
Wyoming	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Federal exemption	30,000	32,300	34,850	34,850	34,850	36,900	36,900	40,400

Table 2. Summary statistics of main variables

This table reports summary statistics on the main regression variables. Own is a dummy variable that takes a value of one if the household owns a home, and zero otherwise. Home equity is household home equity in US dollars. Net worth is total household net worth in US dollars. Log net worth is the natural logarithm of net worth. Home equity share is the ratio of home equity and net worth and is computed only for households with positive net worth. Age is the age of the household head. Log age is the natural logarithm of age. Health is a variable indicating the health status of the household head and ranges from a low health of 1 to a high health of 5. Members is the number of individuals in the household. Married is a dummy variable that takes a value of one if the household head is married, and zero otherwise. Moved state is an indicator that takes a value of one if a household physically moved to another state during the last year, and zero otherwise. Exemption is the state-level homestead exemption in US dollars. We set unlimited exemption levels equal to 1 million US dollars in 2000, and adjust this amount for inflation in other years. Log exemption is the natural logarithm of exemption plus one. Statehood is the year that a state officially became a US state. Log statehood is the natural logarithm of statehood. Appreciation is the annual percentage change in the deflated state-level OFHEO house price index.

Variable	Obs	Mean	Std.dev.	Min	Max
Own	276,791	0.673	0.469	0	1
Home equity	276,791	63,745	98,311	-299,624	813,619
Net worth	276,791	155,671	1,009,251	-10,700,000	212,000,000
Log net worth	231,501	10.885	1.955	-0.158	19.172
Home equity share	231,501	0.517	0.462	0	2.469
Age	276,791	49.881	17.004	15	88
Log age	276,791	3.849	0.356	2.708	4.477
Health	276,791	3.557	1.137	1	5
Log age	276,791	3.849	0.356	2.708	4.477
Members	276,791	2.592	1.492	1	17
Married	276,791	0.529	0.499	0	1
Moved state	168,673	0.065	0.247	0	1
Exemption	276,791	208,066	354,303	0	1,097,514
Log exemption	271,018	10.726	1.200	8.765	13.030
Appreciation	276,791	0.038	0.040	-0.089	0.224
Statehood	276,791	1,827.331	36.344	1787	1,959
Log of statehood	276,791	7.510	0.020	7.488	7.580

Table 3. Homestead exemptions and investments in home equity

Dependent variable is the home equity share which is the ratio of home equity and net worth and is computed only for households with positive net worth. Log exemption is the natural logarithm of exemption plus one where exemption is the state-level homestead exemption l in US dollars. We set unlimited exemption levels equal to 1 million US dollars in 2000, and adjust this amount for inflation in other years. Appreciation is the annual percentage change in the deflated state-level OFHEO house price index. Log age is the natural logarithm of the age of the household head. Health is a variable indicating the health status of the household head and ranges from a low health of 1 to a high health of 5. Members is the number of individuals in the household. Log net worth is the natural logarithm of net worth. Log net worth, sq is the square of the natural logarithm of net worth. Regression 6 reports results only for households with wealth more than US$500,000. Regression 7 reports results only for households with wealth less than US$500,000.All regressions exclude observations from DC. Regressions in columns 2 to 7 also exclude households that do not own a house. Regressions include state and year fixed effects. Robust standard errors in parentheses, corrected for clustering at the household level. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

Variables	(1)	(2)	(3)	(4)	(5)	(6) Wealth > 500,000	(7) Wealth < 500,000
Log exemption	0.017***	0.018***	0.025***	0.026***	0.068***	0.006	0.029***
	(0.006)	(0.006)	(0.005)	(0.005)	(0.011)	(0.009)	(0.006)
Appreciation	0.267***	0.329***	0.481***	0.489***	0.490***	0.422***	0.477***
	(0.042)	(0.043)	(0.037)	(0.037)	(0.037)	(0.059)	(0.040)
Log age	0.206***	-0.121***	0.138***	0.141***	0.140***	0.105***	0.142***
	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.010)	(0.005)
Health	-0.008***	-0.055***	-0.014***	-0.013***	-0.013***	0.003	-0.014***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
Members	0.041***	0.004***	0.014***	0.014***	0.014***	0.008***	0.014***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
Log net worth			-0.156***	0.052***	0.090***	-1.284***	0.053***
			(0.001)	(0.015)	(0.017)	(0.047)	(0.020)
Log net worth, sq				-0.009***	-0.009***	0.039***	-0.009***
				(0.001)	(0.001)	(0.002)	(0.001)
Log exemption *Log net worth					-0.004***		
					(0.001)		
State fixed effects	Y	Y	Y	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y	Y	Y	Y
Observations	226,600	172,680	172,680	172,680	172,680	18,032	154,648
R-squared	0.039	0.029	0.235	0.240	0.241	0.305	0.173

Table 4. Homestead exemptions and investments in home equity: interactions

Dependent variable is the home equity share which is the ratio of home equity and net worth and is computed only for households with positive net worth. Log exemption is the natural logarithm of exemption plus one where exemption is the state-level homestead exemption in US dollars. We set unlimited exemption levels equal to 1 million US dollars in 2000, and adjust this amount for inflation in other years. Appreciation is the annual percentage change in the deflated state-level OFHEO house price index. Log age is the natural logarithm of the age of the household head. Health is a variable indicating the health status of the household head and ranges from a low health of 1 to a high health of 5. Members is the number of individuals in the household. Log net worth is the natural logarithm of net worth. Log net worth, sq is the square of the natural logarithm of net worth. Regressions include state and year fixed effects. Regressions exclude households that do not own a house and observations from DC. Regressions include state and year fixed effects. Robust standard errors in parentheses, corrected for clustering at the household level. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

Variables	(1)	(2)	(3)
Log exemption	0.087***	0.070***	0.100***
	(0.013)	(0.011)	(0.014)
Appreciation	0.490***	0.490***	0.489***
	(0.037)	(0.037)	(0.037)
Log age	0.206***	0.141***	0.234***
	(0.026)	(0.005)	(0.028)
Health	-0.013***	-0.006	0.005
	(0.001)	(0.006)	(0.007)
Members	0.014***	0.014***	0.014***
	(0.001)	(0.001)	(0.001)
Log net worth	0.086***	0.090***	0.083***
	(0.018)	(0.017)	(0.018)
Log net worth, sq	-0.009***	-0.009***	-0.009***
	(0.001)	(0.001)	(0.001)
Log exemption*Log net worth	-0.003***	-0.004***	-0.003***
	(0.001)	(0.001)	(0.001)
Log exemption*Log age	-0.006***		-0.009***
	(0.002)		(0.003)
Log Exemption*Health		-0.001	-0.002**
		(0.001)	(0.001)
State fixed effects	Y	Y	Y
Year fixed effects	Y	Y	Y
Observations	172,680	172,680	172,680
R-squared	0.241	0.241	0.241

Table 5. Homestead exemptions and investments in home equity: subsamples

Dependent variable is the home equity share which is the ratio of home equity and net worth and is computed only for households with positive net worth. Log exemption is the natural logarithm of exemption plus one where exemption is the state-level homestead exemption in US dollars. We set unlimited exemption levels equal to 1 million US dollars in 2000, and adjust this amount for inflation in other years. Appreciation is the annual percentage change in the deflated state-level OFHEO house price index. Log age is the natural logarithm of the age of the household head. Health is a variable indicating the health status of the household head and ranges from a low health of 1 to a high health of 5. Members is the number of individuals in the household. Log net worth is the natural logarithm of net worth. Log net worth, sq is the square of the natural logarithm of net worth. Regression 1 reports results only for households that own a house but have no mortgage. Regression 2 reports results only for households that own a house but have a mortgage. Regression 3 reports results only for households that own a house but with home tenure less than 10 years. Regression 4 reports results only for households that own a house but with age less than 55. Regressions exclude observations from DC. Regressions include state and year fixed effects. Robust standard errors in parentheses, corrected for clustering at the household level. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

Variables	(1) No mortgage	(2) With mortgage	(3) Home tenure<10 years	(4) Age less than 55
Log exemption	0.042**	0.081***	0.083***	0.077***
	(0.016)	(0.015)	(0.017)	(0.015)
Appreciation	0.086	0.781***	0.883***	0.695***
	(0.052)	(0.047)	(0.056)	(0.053)
Log age	0.067***	0.119***	0.068***	0.116***
	(0.007)	(0.006)	(0.007)	(0.008)
Health	-0.013***	-0.008***	-0.016***	-0.013***
	(0.001)	(0.001)	(0.002)	(0.002)
Members	0.020***	0.014***	0.010***	0.014***
	(0.001)	(0.001)	(0.001)	(0.001)
Log net worth	0.404***	-0.127***	-0.212***	0.000
	(0.028)	(0.024)	(0.030)	(0.024)
Log net worth, sq	-0.022***	-0.001	0.004***	-0.006***
	(0.001)	(0.001)	(0.001)	(0.001)
Log exemption*Log net worth	-0.003**	-0.004***	-0.004***	-0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
State fixed effects	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y
Observations	68,473	104,207	71,939	96,982
R-squared	0.259	0.262	0.261	0.204

Table 6. Homestead exemptions and investments in home equity: endogeneity and selection

Log exemption is the natural logarithm of exemption where exemption is the state-level homestead exemption in US dollars. We set unlimited exemption levels equal to 1 million US dollars in 2000, and adjust this amount for inflation in other years. Appreciation is the annual percentage change in the deflated state-level OFHEO house price index. Log age is the natural logarithm of the age of the household head. Health is a variable indicating the health status of the household head and ranges from a low health of 1 to a high health of 5. Members is the number of individuals in the household. Log net worth is the natural logarithm of net worth. Log net worth, sq is the square of the natural logarithm of net worth. Married is a dummy variable that takes a value of one if the individual is married, and zero otherwise. Lambda is Heckman's lambda. Regression in column 1 is an IV regression with log of statehood as instrument for log exemption, and the interaction between log of statehood and log of net worth as instrument for log exemption and log net worth. Dependent variable is the home equity share which is the ratio of home equity and net worth and is computed only for households with positive net worth. Column 2 reports the two-stage regression results of a Heckman selection model with home equity share as dependent variable and with Married as selection variable. Column 3 reports the corresponding first-stage regression results of the Heckman selection model with Married as selection variable and home ownership dummy variable as dependent variable. Robust standard errors in parentheses, corrected for clustering at the household level (except in Heckman model). Regressions exclude observations from DC. Regressions 2 and 3 include state effects, and regressions 2-3 include state effects. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

Variables	(1) IV, Statehood	(2) Heckman	(3) Own, Selection
Log exemption	0.062***	0.068***	0.023
	(0.019)	(0.007)	(0.026)
Appreciation	1.132***	0.499***	-0.466***
	(0.030)	(0.033)	(0.138)
Log age	0.140***	0.122***	0.480***
	(0.005)	(0.004)	(0.012)
Health	-0.012***	-0.012***	-0.023***
	(0.001)	(0.001)	(0.004)
Members	0.015***	0.008***	0.088***
	(0.001)	(0.001)	(0.003)
Log net worth	0.115***	-0.029**	0.839***
	(0.023)	(0.013)	(0.026)
Log net worth, sq	-0.008***	-0.005***	-0.015***
	(0.001)	(0.000)	(0.001)
Log exemption*Log net worth	-0.007***	-0.004***	-0.001
	(0.002)	(0.000)	(0.002)
Married			0.382***
			(0.009)
Lambda		-0.126***	
		(0.011)	
State fixed effects	N	Y	Y
Year fixed effects	Y	Y	Y
Instruments	Log statehood, Log statehood*Log net worth		

F-test of excluded instruments (p-value)	0.000***		
Observations	172,680	226,600	226,600
Censored observations		53,920	53,920
Uncensored observations		172,680	172,680
R-squared	0.224		

Table 7. Homestead exemptions and home ownership

Dependent variable is home ownership dummy variable. Log exemption is the natural logarithm of exemption plus one where exemption is the state-level homestead exemption in US dollars. We set unlimited exemption levels equal to 1 million US dollars in 2000, and adjust this amount for inflation in other years. Appreciation is the annual percentage change in the deflated state-level OFHEO house price index. Log age is the natural logarithm of the age of the household head. Health is a variable indicating the health status of the household head and ranges from a low health of 1 to a high health of 5. Members is the number of individuals in the household. Log net worth is the natural logarithm of net worth. Results based on probit regressions. Sample in regressions 3 and 4 only includes households that moved states. Regressions exclude observations from DC. Regressions 1 and 3 include state effects, and all regressions include year effects. Robust standard errors in parentheses, corrected for clustering at the household level. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

	(1)	(2)	(3)	(4)
Variables			Moved state	Moved state
Log exemption	0.006	0.002	-0.132	0.018*
	(0.024)	(0.003)	(0.092)	(0.011)
Appreciation	-0.493***	-3.649***	-0.224	-3.101***
	(0.168)	(0.131)	(0.713)	(0.518)
Log age	0.462***	0.448***	0.477***	0.459***
	(0.017)	(0.017)	(0.055)	(0.053)
Health	-0.024***	-0.036***	-0.049***	-0.060***
	(0.005)	(0.004)	(0.017)	(0.017)
Members	0.088***	0.080***	0.079***	0.070***
	(0.004)	(0.004)	(0.013)	(0.013)
Log net worth	0.536***	0.519***	0.474***	0.459***
	(0.004)	(0.004)	(0.013)	(0.013)
Married	0.378***	0.387***	0.295***	0.308***
	(0.012)	(0.012)	(0.0392)	(0.0386)
State fixed effects	Y	N	Y	N
Year fixed effects	Y	Y	Y	Y
Observations	226,600	226,600	8,056	8,058

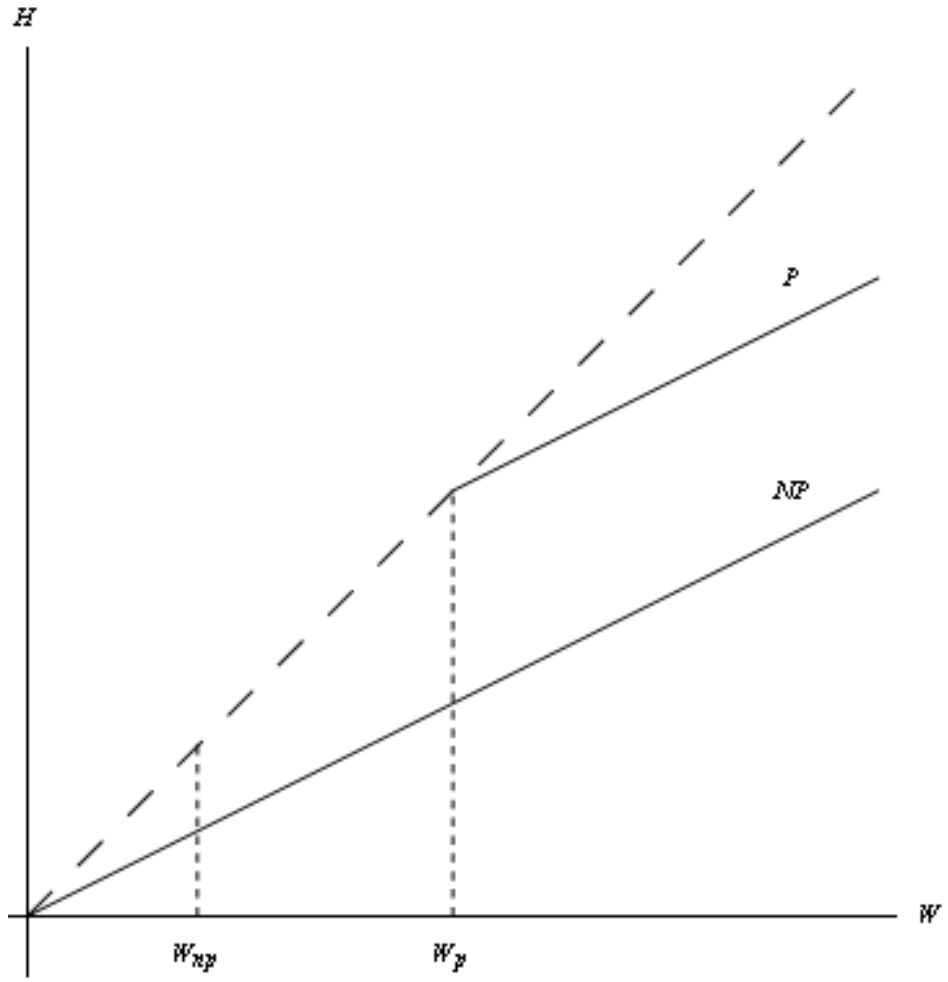


Figure 1. Housing with and without bankruptcy protection

This figure plots housing investment, *H*, against wealth, *W*. The *P* and *NP* schedules represent points where marginal investment in housing is protected and not protected by the homestead exemption in case of a medical expense, respectively.

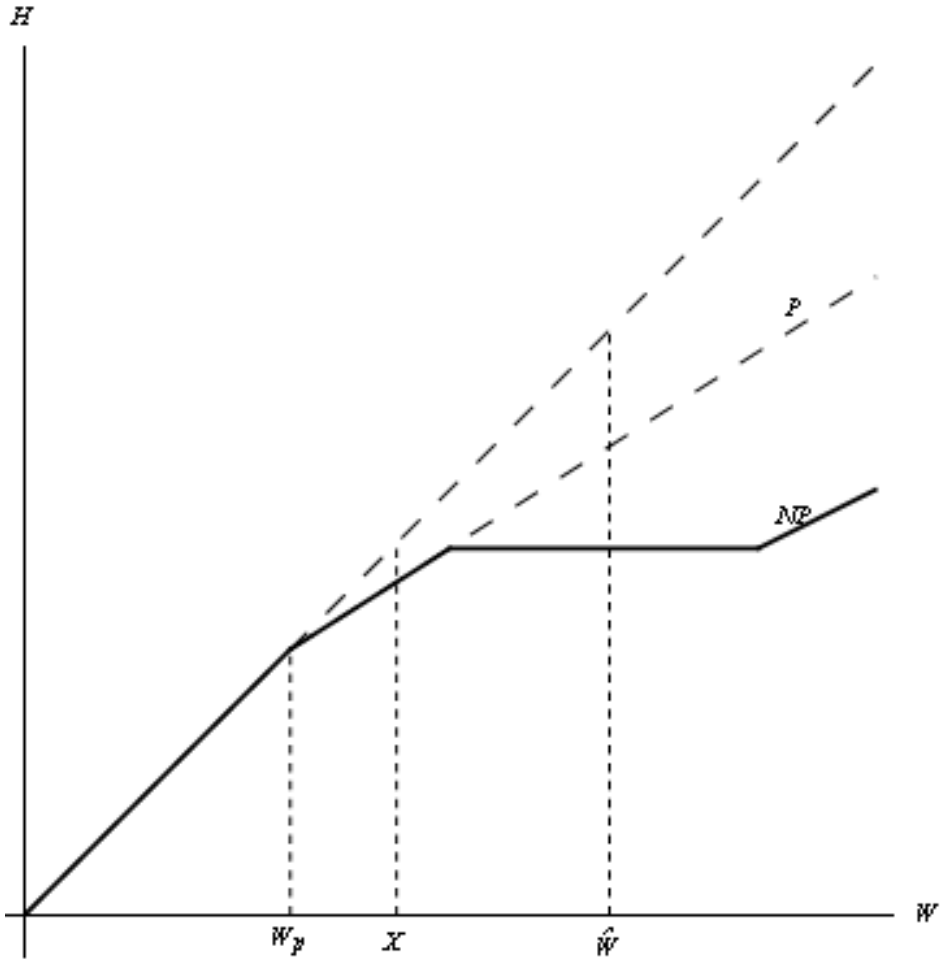
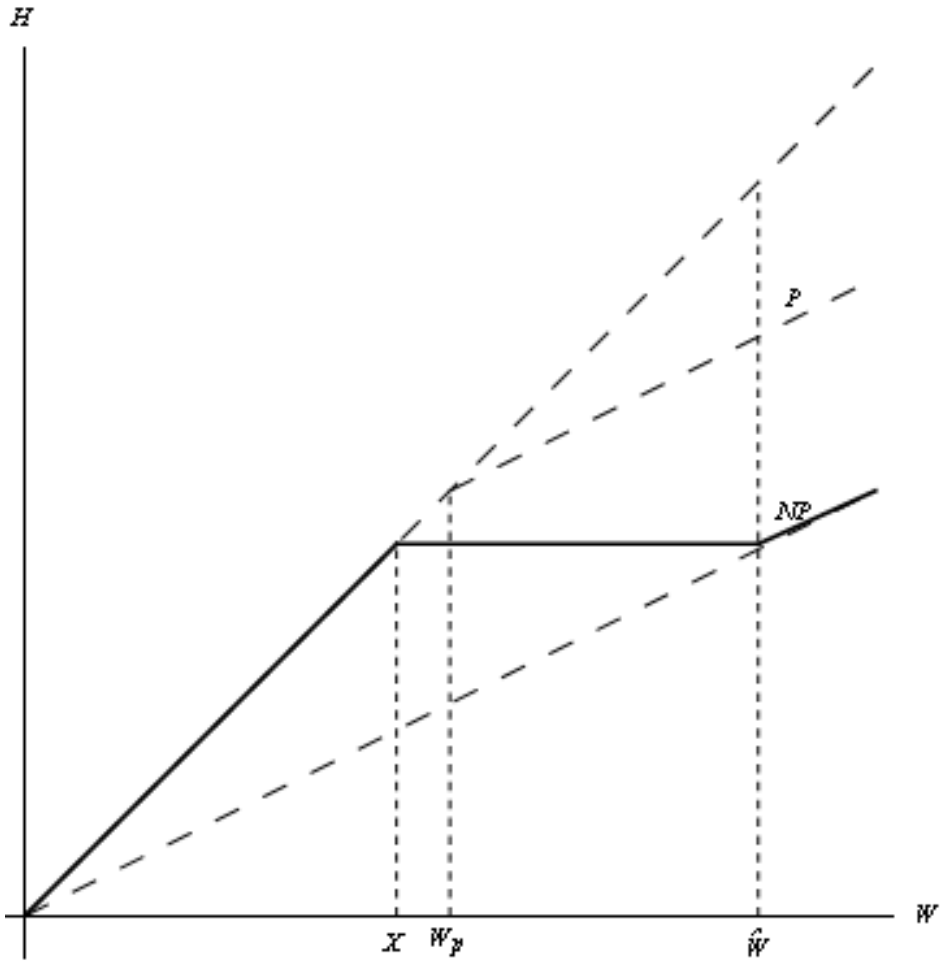


Figure 2. The relation between housing and wealth

Panel A. Weak preferences for housing consumption



Panel B. Strong preferences for housing consumption

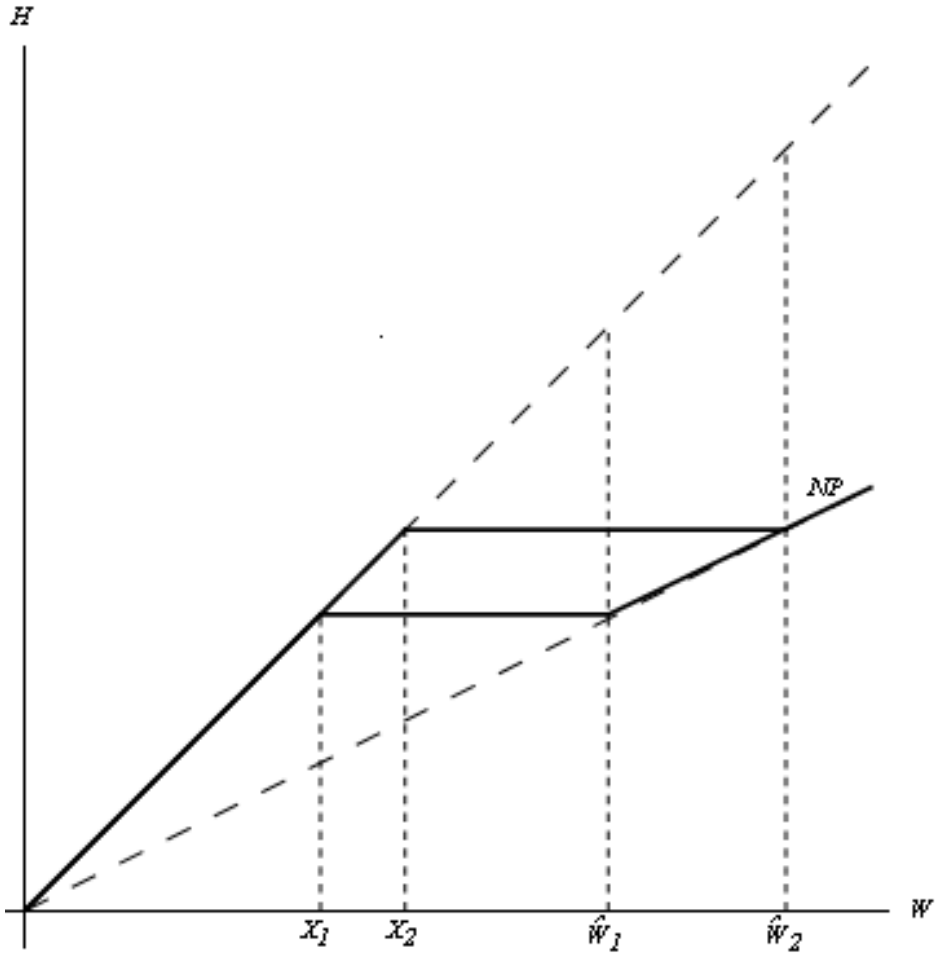
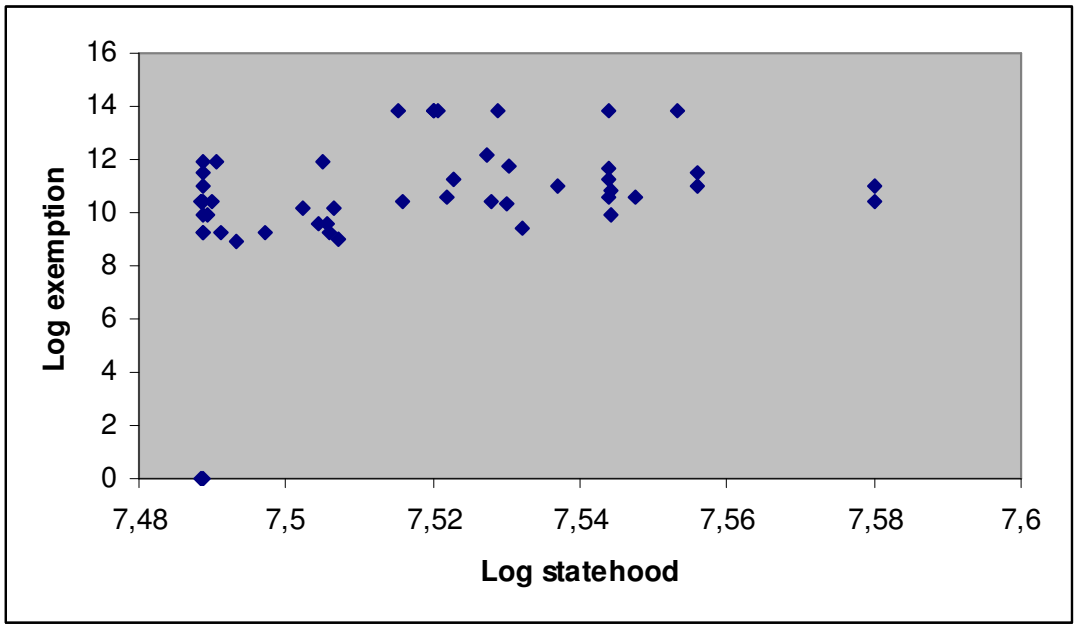


Figure 3. An increase in the exemption

Figure 4. Plot of natural logarithms of exemption and year of statehood for 2000



Appendix A. Variable definitions and data sources

Variable	Description	Sources
Own	Dummy variable that takes a value of one if the household owns a home, and zero otherwise.	SIPP
Home equity	Household home equity in US dollars	SIPP
Net worth	Total household net worth in US dollars	SIPP
Home equity share	Ratio of home equity and net worth and computed only for households with positive net worth	SIPP
Age	Age of household head	SIPP
Health	Variable indicating the health status of the household head ranging from a low health of 1 to a high health of 5	SIPP
Members	Number of individuals in the household	SIPP
Married	Dummy variable that takes a value of one if the individual is married, and zero otherwise.	SIPP
Moved state	Indicator for whether the household physically moved to another state during the last year	SIPP
Exemption	State-level homestead exemption level in US dollars. We set unlimited exemption levels equal to 1 million US dollars in 2000 and adjust this amount for inflation in other years	Elias, Renauer and Leonard, various years
Appreciation	Annual percentage change in the deflated state-level house price index.	Office of Federal Housing Enterprise Oversight
Statehood	Year in which a state officially became a US state	Wikipedia[19]

[19] See http://webcache.googleusercontent.com/search?q=cache:m8BkF2zdiAsJ:en.wikipedia.org/wiki/List_of_U.S._states_by_date_of_statehood+list+of+U.S.+states+by+date+of+statehood&cd=1&hl=nl&ct=clnk&gl=nl