Homeownership and Liquid Wealth Accumulation

Giovanni Di Meo*

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This paper examines whether homeownership leads to greater accumulation of liquid savings through higher investments in risky assets. Using the Swiss rental and real estate market as a reference, I simulate the life-cycles of hypothetical agents who may transition from renting to homeownership once in their lifetime. I then simulate the life-cycles of a second group of homeowners, forcing them to remain tenants, thus creating a perfect counterfactual to the first group. The findings reveal substantial differences in liquid wealth between actual and counterfactual homeowners, primarily due to the down payment. Despite an increased equity component in their portfolios, some homeowners are "crowded out" of the equity market. Additional capital gains from higher relative equity holdings do not significantly contribute to the difference in liquid wealth. Ultimately, the main sources of inequality in total net wealth between homeowners and tenants are initial financial conditions and the role of real estate property as a savings commitment.

JEL: D01, D10, D15, G11, G50, G51, R21

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1. Introduction

Several studies have shown that homeownership has a positive effect on households' equity holdings at the intensive margin (Yao and Zhang, 2005; Chetty,

* Center of Economic Research, ETH Zurich, Zurich, Switzerland, gdimeo@ethz.ch. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. Declaration of interest: none. I would like to thank Antoine Bommier, Cheng Wan for their valuable feedback. All remaining errors are my own. red**PRELIMINARY DRAFT, PLEASE DO NOT CIRCULATE WITHOUT PERMISSION FROM THE AUTHOR.**

Sándor and Szeidl, 2017; Vestman, 2019; Sodini et al., 2023). This relationship stems from a combination of risk aversion and diversification mechanisms. The acquisition of real estate adds value and mortgage risk into a household's portfolio. Assuming CRRA preferences, households should increase their equity share if the total financial risk from real estate is lower than equity risk. Given two liquid portfolios of equal size, the equity premium will generate higher returns for the portfolio with the higher share of risky assets. Thus, the compounding effect of higher equity holdings may play a role in explaining the higher total net wealth of homeowners. To my knowledge, no other studies have attempted to analyze this cumulative effect over the life-cycle.

In this paper, I build on the model by Cocco, Gomes and Maenhout (2005) to show the evolution of liquid and total wealth in a stylized world where agents can purchase their dwelling. I highlight the differences in wealth accumulation patterns for three groups of agents, namely tenants, homeowners and counterfactual homeowners, with the last group consisting of homeowners who remained tenants in a counterfactual world. Among the three groups, I find that homeowners accumulate the highest total net wealth. Between homeowners and tenants, initial financial conditions are the main driver of wealth inequality. For simplicity, I do not include inheritances in my model, and initial economic disparities arise solely from differences in income levels. The initial income of agents who later become homeowners is on average 17% higher than that of lifelong tenants. Focusing on homeowners and counterfactual homeowners, I find that the latter group's liquid wealth remains consistently above that of true homeowners. This is mainly due to the required down payment, which permanently lowers homeowners' liquid wealth. In line with previous studies, I find that homeowners invest higher shares of their liquid savings in equities relative to counterfactual homeowners, and this increase is substantial (+4.2 percentage points, +26%). However, while more counterfactual homeowners start participating to the equity market after their "purchase", some true homeowners experience a crowding-out effect. Only those homeowners who were participating before the purchase, stay in the equity market and increase their equity shares. The additional capital gains from the higher equity shares do not contribute significantly to the build-up of liquid wealth. Counterfactual homeowners. The results from the simulation show that, had homeowners remained tenants instead of purchasing property, they would have had higher levels of liquid wealth throughout most of their lives. However, thanks the illiquid nature of real estate, homeowners consume away less out of their total wealth during retirement. Thus, homeowners remain the wealthiest group within the simulated population.

Homeownership is one of the main drivers of wealth inequality within populations (Kaas, Kocharkov and Preugschat, 2019; Martínez-Toledano, 2017; Fuller, Johnston and Regan, 2020; Garbinti, Goupille-Lebret and Piketty, 2021). The prevalence of homeownership differ greatly between countries and tend to be higher where the housing market offers better terms, such as lower prices, lower taxation, and an easier access to credits (Christelis, Georgarakos and Haliassos, 2013). In general, homeowners are also found to be wealthier than tenants, although this connection has been made mainly ex-post (Di, Belsky and Liu, 2007; Turner and Luea, 2009; Wainer and Zabel, 2020). However, assessing the sources of this wealth gap between (long-term) homeowners and tenants is made difficult by the endogenous nature of the decision to acquire real estate in the first place and by the subsequent portfolio choice in the second place. I contribute to this stream of literature by showing one potential source of ex-post inequality.

Middle-income households that decide to acquire real estate are forced to bind a large portion of their wealth to a single asset. This decreases the propensity to start investing in the equity market (Cocco, 2005). However, since real estate is generally considered a safe asset and total wealth increases over time thanks to the steady appreciation of the property, once homeowners start to participate to the equity market, they tend to purchase larger amounts of assets (Chetty, Sándor and Szeidl, 2017). A possible explanation is that, in order to reach a similar level of portfolio diversification as tenants, the total volume of risky assets has to be higher. This result has been first highlighted by Yao and Zhang (2005), who find that the equity proportion on liquid asset tends to be higher for homeowners. This may generate a strengthening process between the appreciation of the real estate over time and the absolute volume of equities held, which in turn generate on average high nominal returns. As these returns tend to be reinvested by households (Fagereng et al., 2019), the process should become increasingly accentuated with time. Therefore, homeownership may induce not only a greater accumulation of total wealth, but also of liquid wealth. Consequently, part of the ex-post wealth inequality between homeowners and tenants may be explained by the additional volume of risky assets in the portfolios of homeowners. If this theory holds true, given two representative households with the same resources and the same life events, with one purchasing housing and the other only renting, the first one should end up with higher volumes of liquid assets. However, Kaplan, Violante and Weidner (2014) suggest that middle-class homeowners, so-called wealthy hand-to-mouth households, may have little if any liquid wealth, with real estate constituting the largest asset in their portfolio by far. Hence, it may be that that homeowners have a smaller liquid wealth, albeit with a higher equity component. On the other hand, the heavily leveraged housing purchase with long-term mortgages may allow households to keep saving liquid wealth to a level comparable to that of tenants. It remains an open question what the final result of the different forces is at the end of a person's life.

To my knowledge, no other papers have highlighted the long-term effect of homeownership on the liquid component of households' portfolios. The closest works to my paper are Vestman (2019) and Sodini et al. (2023). However, both papers investigate the optimal portfolio decision following a housing purchase, rather then the long-term consequences.

The rest of the paper is organized as follows. Section 2 outlines the real estate institutional setting in Switzerland. In Section 3 I present the stylized model and the calibration parameters. Section 4 presents and discusses the results from the simulation. Section 5 proposes an alternative scenario without the equity market. Section 6 concludes.

2. Institutional setting

The simulation is based on Switzerland as setting, which is a rather extreme example of a "country of tenants", with 61% of all households living in rented houses or apartments (Federal Statistical Office, 2022*b*). Another peculiarity of Switzerland is that most homeowners never fully repay their mortgages for fiscal reasons. Due to the federal nature of the Swiss Confederation, real estate taxation varies considerably from canton to canton. Two major aspects characterize the Swiss real estate market as a whole. The first is the "imputed rental value" tax. This tax was introduced in 1934, initially as a temporary measure to help state funding during the Great Depression. Homeowners' taxable income is increased by an amount equal to 60% to 70% of the usual rent that would be earned if the property were rented out. The second aspect is the deduction of mortgage interest and maintenance costs from taxable income. Ideally, imputed rent and deductions cancel out. In practice, whether a homeowner pays more or less income tax than a tenant depends on the specific case. These factors, combined with additional taxes on the property value and net wealth, as well as the generally high prices and rigid borrowing conditions, are at the core of Switzerland's low homeownership rate (Bourassa and Hoesli, 2010).

The purchase of property must be covered by a down payment of minimum 20% of the housing value. In order to finance the down payment, purchasers may use a part of their pension wealth from their second pillar (occupational pensions).

While this option is popular, it is by no means universal, and regulations in recent years have made withdrawals less attractive (Bütler and Stadelmann, 2020). The remaining part of the housing value may be financed through two distinct types of mortgage. The mortgage of type 1 amounts to (maximum) 2/3 of the total housing value. Purchasers do not need to pay it back, if they wish they can keep paying the annual interests forever, thus compensating for the imputed rental value tax. Whenever the mortgage of type 1 and the down payment do not cover the whole housing value, purchasers are required to take on a mortgage of type 2. This has to been repaid within 15 years, with yearly payments consisting in equal fractions of the principal plus the interests.

3. Model

Consider fictitious agents working from $t = 1$ until N and living at most until T, such that $T > N$. They face in each period a probability π_t to survive and pass to the next period, with $\pi_T = 0$. Agents derive utility according to a CRRA function with non-durable consumption $C_t > 0$ and housing consumption $h_t > 0$, expressed in square meters. Agents also care about future consumption and bequest (total net wealth) W_T. Thus, preferences can be expressed by

$$U = E\left[\sum_{t=1}^{T} \beta^{t-1}\left(\frac{(C_t^{1-\omega} h_t^{\omega})^{1-\gamma}}{1-\gamma}\right) + \theta \frac{W_T^{1-\gamma}}{1-\gamma}\right], \tag{1}$$

where β is the time and θ the bequest discount factor, ω gives the relative preference for housing consumption to non-durable consumption, and γ simulates the coefficient of relative risk aversion.

I adopt a simplified version of the Swiss real estate market. Home purchases are once-in-a-lifetime events, are intended only for one's own home and must occur before retirement. Simulating market imperfections, it is not possible to purchase a home of less than 30 square meters. This also reflects that the purchase of fractions of properties is not common in Switzerland. Agents cannot resell the property or repay their mortgage in full. In every period, they pay a fraction of the original property value, reflecting mortgage payments. The property value net of the mortgage enters the agents' problem as net property wealth. I do not simulate the Swiss pension system and therefore do not allow for the possibility of using the pension wealth from the second pillar to finance the down payment. The simulation of this financing instrument would be difficult due to the fact that in reality only some individuals use it, to various degrees, thus representing an additional choice dimension. As for the rental market, I assume for simplicity that rental prices vary freely in each period following the real estate market. This allows me to use the same housing prices for both tenants and homeowners.

Thus, agents maximize their utility by solving different recursive problems, depending on their property status. If they are tenants, they choose in each period both non-durable and housing consumption. Once in a lifetime, tenants may purchase housing, thus becoming homeowners. This second group can only choose non-durable consumption, while housing consumption remains fix. One challenge arising from fixing the level of housing for homeowners is that they may default. By making the simulated agents extremely averse against this possibility, the chances of a default remain small. Agents also face different housing costs depending on their housing situation. Specifically, tenants pay rent equal to a fraction ψ_r of the total house value ($P_t h_t$, with P_t representing the square meter price). Home buyers pay the down payment on the property ($\delta P_t h_t$), together with the annual mortgage payment ($\psi_o(1-\delta)P_t h_t$). In the years after the purchase, homeowners pay only the annual mortgage payments. Thus, total housing costs can be summarized as follows:

$$H_t = \begin{cases} \psi_r P_t h_t & D_t = 0 \\ [\delta + \psi_o(1-\delta)]P_t h_t & D_t = 1,\ D_{t-1} = 0,\ t \leq N,\ h_t, \geq 30, \\ \psi_o(P_t - M_t)\overline{h} & D_t = 1,\ D_{t-1} = 1, \end{cases} \tag{2}$$

where the first case is that of tenants, the second case for home buyers and the third case for homeowners, with D_t giving the current ownership state and M_t the current net price of the real estate. i.e. current price minus outstanding mortgage. I also account for a small probability that $M_t < 0$, i.e. the property value is below the outstanding mortgage.

Non-durable and housing consumption are financed by income and liquid savings. The income process is given by

$$\tilde{Y}_t = \begin{cases} Y_{t-1} + \tilde{\eta} & t < N \\ zY_{N-1} & t \geq N \end{cases} \tag{3}$$

where $\tilde{\eta}$ is a random temporary income shock. During retirement, income is no longer unsure and equal to a fraction z of the last income during working life. Since I do not replicate the Swiss pension system, the calculation of retirement income is much simplified compared to the real world case, and I simply assume a fixed value for z, equal for all individuals.

Savings are allocated among a risk free asset and equities, if an individual participates to the equity market. Participation can start in every period, provided that individuals meet certain conditions, which make sure that participation is not universal. Individuals have to invest a non-zero amount of money after paying entry fees, as well as a per-period participation fee (as in Fagereng, Gottlieb and Guiso, 2017). The usage of this per-period fee contributes to creating a more realistic life-cycle profile of portfolios, with declining risky shares through life.

Thus, the cash-on-hand equality in every period is given by

$$Y_t + L_t = Y_t + S_{t-1}R_f + \alpha_{t-1}S_{t-1}(\tilde{R}_t - R_f), \tag{4}$$

and budget constraint is given by

$$Y_t + L_t \geq C_t + H_t + S_t + I_t^{Entry}(1 - A_{t-1})A_t + \alpha_t I_t^{Participation} \tag{5}$$

with L_t represents the current value of savings from the previous period, S_t, S_{t-t} representing old and new savings, R_f and $\tilde{R}_t$ the risk-free and equity market returns, A_t a binary variable stating whether the agent is participating to the equity market, I^{Entry} the entry fees for the equity market, and $I^{Participation}$ the participation fees. Notice that agents cannot have negative savings, i.e. they cannot incur debt other than for real estate. Also, I do not simulate inheritances, meaning that agents begin all with zero wealth and initial inequality only stems from income.

Total net wealth is bequeathed at death. This comprises liquid wealth S_t and net property value $M_t\overline{h}$:

$$W_t = L_t + D_t M_t \overline{h} + k, \tag{6}$$

where k is a curvature parameter ensuring that bequests are profitable only above a minimum (De Nardi, French and Jones, 2010).

Thus, in each period $t = 0, ..., T$, the value function for tenants and home buyers is given by:

(7)

$$V_t^R(X_t^R) = \max_{\{C_t, h_t, \alpha_t, D_t^O\}} \left\{ \frac{(C_t^{1-\omega} h_t^{\omega})^{1-\gamma}}{1-\gamma} + \pi_t \beta E_t[V_{t+1}(X_{t+1})] + (1-\pi_t)\theta E_t \left[\frac{W_{t+1}^{1-\gamma}}{1-\gamma} \right] \right\},$$

$$X_t^R = \{Y_t, L_t, A_{t-1}\},$$

where X_t^R represents the vector of state variables, which includes income, accrued savings, and the binary variable A_{t-1} for the participation to the equity market. Agents decide over non-durable and housing consumption, the amount to invest in equities, as well as homeownership. After retiring, agents cannot decide on homeownership any longer. Similarly, counterfactual homeowners use the value function of tenants, short of the choice over D^O. For homeowners, the value function is given by:

(8)

$$V_t^O(X_t^O) = \max_{\{C_t, \alpha_t\}} \left\{ \frac{(C_t^{1-\omega} \overline{h}^{\omega})^{1-\gamma}}{1-\gamma} + \pi_t \beta E_t[V_{t+1}(X_{t+1})] + (1-\pi_t)\theta E_t \left[\frac{W_{t+1}^{1-\gamma}}{1-\gamma} \right] \right\},$$

$$X_t^O = \{Y_t, L_t, A_{t-1}, \overline{h}, M_t\}.$$

Thus, homeowners decide only over non-durable consumption, as well as the share of their liquid savings invested in equities. The vector of state variables contains, in addition to the state variables mentioned for tenants, also the size of the owned real estate, as well as its net price.

I solve the maximization problem by backward induction, partially following the endogenous grid point method (EGM), first proposed by Carroll (2006). EGM is a fast way to resolve this kind of models, avoiding root finding by calculating the inverse Euler equation. This approach finds current optimal consumption by directly using an interpolation of future consumption, given an exogenous grid of end of period assets. For all types of agents, non-durable consumption is thus always found using EGM. For tenants, I define housing consumption as a function of non-durable consumption, by applying the intratemporal Euler equation. For homeowners, since housing consumption is fixed, the problem is automatically simplified. However, the homeowner's problem requires two additional exogenous grids, namely, one for the size and one for the net price of the real estate object. Similarly, for home buyers, I find the optimal non-durable consumption by EGM iterating over the exogenous grid of real estate sizes, and then compare the levels of the value function. The housing consumption which gives the highest level of the value function is set as the size of the real estate to purchase. Provided that agents can afford the purchase, whether the agent switches to the homeowners state or remains tenants depends ultimately by the comparison of the levels of the value function.

For all agents, the optimal level of equity holdings (if the agent participates to the equity market) is computed at the start of the algorithm by root-finding. This is because, differently from the consumption choice, it does not follow an intertemporal Euler equation. It also does not need the current optimal level of (overall) consumption to be estimated, since it depends on the level of end of period assets, which are exogenous. Moreover, the consumption choice relies on expected future resources, for which the level of equities is necessary. Participation to the equity market starts if the agent can afford the entry and participation costs, and achieves a higher level of the value function by participating.

Notice that I cannot use a discrete choice EGM as proposed by Iskhakov et al. (2017) since the amount of real estate to purchase theoretically continuous, or at least non-binary. Druedahl and Jørgensen (2017) propose an EGM method for multi-dimensional models, however their approach assumes multiple budget constraints - e.g. for cash-on-hands and pension fund - whereas my model has only one. In terms of speed, my approach is still very fast, with the longest calculation time surprisingly for owners, instead of tenants or purchasers, given the iterations on all possible real estate values and net prices. Once I have retrieved the policy functions for all periods and agent types, I simulate the lives of 10,000 agents, by generating random incomes, housing prices and equity returns according to the moments from external data.

In order to generate the lives of the counterfactual homeowners, I use the same policy function of tenants until the time of the purchase. When an agent could acquire homeownership, she switch to the policy function of tenants without the choice over homeownership. This is equivalent to an agent in the real world who discovers that she has no access to the property market for the rest of her life, for example because of a credit ban. Counterfactual homeowners thus remain tenants, but the time period of the "missed" purchase is kept as reference point. This approach provides perfect copies of the life-cycle of homeowners until the time of purchase. After the purchase, it provides a counterfactual to the homeownership decision. Note, that this is not the same as a tenant that would acquire but cannot because of monetary constraints. Such tenants keep using the policy function 7 which considers for future periods the possibility of property acquisition.

1. *Calibration*

Agents enter the model at the age of 25 and can live for up to 95 periods, hence until the age of 120. The long life span ensures a slower dissaving, which better matches observed patterns. I use data from the Federal Statistical Office of Switzerland (Federal Statistical Office, 2023*b*), with minimal survival probabilities past the age of 105. Income levels by age group are modeled on historical wages, using data from the Federal Statistical Office(Federal Statistical Office, 2022*a*). Retirement age is reached after 40 periods, or at the age of 65. I set the risk aversion parameter γ at 5. The utility discount factor β is chosen at 0.96. The relative importance of housing in total consumption, given by ω is set at 0.22, according to data from the Federal Statistical Office (Federal Statistical Office, 2021) on total household expenditures and similar to values used by Cocco, Gomes and Maenhout (2005); Yao and Zhang (2005); Chetty, Sándor and Szeidl (2017); Vestman (2019). To my knowledge, there are no systematic studies on the size and intensity of bequests in Switzerland, and available estimates vary widely. As for the bequest intensity parameter θ, its value can be derived by first setting the marginal propensity to bequest (MPB). De Nardi, French and Jones (2010) calculates a MPB of 0.88, and the same value is used by Bommier et al. (2020). Yao, Fagereng and Natvik (2015) show that the marginal propensity to consume out of wealth increases with age, reaching 0.09 at the age of 80. The estimates by Fagereng, Gottlieb and Guiso (2017) in their model with bequest imply a MPB of around 0.64[1]. This study is particularly relevant since the underlying model is close to mine, as well as because of its focus on the relationship between age and equity shares in the portfolio. In calibrating my model, I find that the size of θ increases exponentially with the MPB, and assuming a MPB of over 0.80 implies an unrealistically strong bequest motive. Moreover, none of the studies above have carefully analyzed the relationship between bequest motive θ, bequest curvature k and age profile of the portfolio composition. The size of θ and k are related to each other, and very large values of k (as in De Nardi, French and Jones, 2010) lead to a "reversed" age profile of the risky component in the portfolio, with stocks becoming increasingly prominent during retirement age. The choice is then between using a lower MPB, or a low k. I find that with a MPB of 0.7 (which implies $\theta = 77.38$) and $k = 4.5$ (which implies that the bequest motive becomes active for a total net wealth of around $19,000$ CHF, see Bommier et al. (2020) for an explanation on the derivation of both θ and k, given the model) I can successfully replicate the age profile of total net wealth and share of homeowners at the age of 65 as seen in the data (1).

[1]My own calculations using their estimates and parameters

Using Data from the Swiss national bank, I calculate an annual risk-free interest rate of 1.8% (Swiss National Bank, 2022*a*). The average equity premium is set at 4% with 16% standard deviation, similar to Cocco, Gomes and Maenhout (2005); Yao and Zhang (2005); Chetty, Sándor and Szeidl (2017). Also, following Cocco, Gomes and Maenhout (2005) I do not assume any correlation between equity market and real estate prices. As for wages, historical data document an average growth of 4% p.a., with a 3.5% standard deviation (Historical Statistic of Switzerland, 2012). The replacement rate z is set at 0.8, i.e. agents receive 80% of their last income in pension payments. Though arguably high, it offers a better match with the data than a lower value, e.g. 0.6, which is considered the minimum covered by the mandatory savings in the first and second pillar.

Housing prices, both for rents and purchases, are calculated using historical average square meter prices since 1970 from the Swiss statistical office and the Swiss national bank (Swiss National Bank, 2022*b*; Federal Statistical Office, 2023*a*). According to the data, the average return in real estate value of 2.7%, with a 4% standard deviation. Following Fagereng, Gottlieb and Guiso (2017), I include a small probability of a large drop in the value of equity -50%. Though I model that prices for both renting and purchasing are the same, I also assume that homeowners consider a small possibility of seeing the value of their property decrease considerably (-50%). With respect to the share of current property price paid as rent, I derive $\psi_r = 0.0275$ from the available data (Swiss National Bank, 2022*b*). Due the peculiarity of the Swiss setting, and for simplicity reasons, I set $\psi_o = \psi_r$. Thus, if the rental square meter price is equal to the square meter price of the mortgage, tenants and homeowners have the same housing costs.

Participation to the equity market in Switzerland is around 36% for the 50+ population, according to Christelis, Jappelli and Padula (2010) and Christelis, Georgarakos and Haliassos (2013), who use SHARE data. To meet this target, I set an initial entry cost of 9% of the average income per period. The per-

period participation fees correspond to 1% of the average income level. Equation 5 shows that the amount of per-period participation fees actually paid depends on the amount of equity held in the portfolio. On average, simulated agents pay less then 120 CHF per period in "account fees" (as a reference, Fagereng, Gottlieb and Guiso (2017) use 300$.) Together, the choices for these two parameters provide a realistic modeling of participation to the equity market.

4. Numerical results, baseline

1. Comparison with the Swiss Household Panel

To assess the performance of the simulation against reality, I compare the life cycle profiles of the fictious agents with survey data from the Swiss Household Panel (SHP). The SHP is a yearly panel collected since 1999, and comprises between 3,000 to 10,000 representative households per wave (Tillmann et al., 2022). The survey covers personal and household wide dimensions on family composition, income, employment, housing conditions and assets, among others. Despite the richness of waves, systematic questions on total assets have been collected only in 2012, 2016 and 2020. Hence, I define a sample using these three waves, and include individuals aged between 25 to 95 with a non-zero income. This approach leaves me with 21,994 unique individuals. For the comparison with the simulated data, I use information on the individual-level (e.g. personal income or pensions) whenever possible. For some dimensions, e.g. assets and property value, only data at the household level are available. In these cases, I divide the values by the number of adults living the household. Since I do not calibrate the model on the SHP, an exact matching between simulated and actual data cannot be expected. Also, since the model lacks some important asset classes, such as voluntary payments to the pension funds and second homes, the dynamics of wealth accumulation and decumulation in the simulated data are considerably simplified. Nonetheless, the comparison between actual and simulated data is a helpful instrument to visualize how the modeled setting diverges from reality. Figure 1 shows the life cycle profiles of some major financial dimensions for both the simulated data and the SHP. Overall, the shape of the profiles fairly similar for the two data sources. In particular, available income (panel A) and housing expenditures (panel B) are almost exact matches[2].

Liquid wealth (panel C) grows in the early years faster than in the SHP data, and upon retirement the simulated agents have considerably more liquid wealth than SHP individuals. As stated above, a possible reason for this discrepancy is the lack of voluntary payments to the second and third pension pillar, which are not comprised in the displayed SHP measure. Panel D shows that the pattern of homeownership acquisition is similar between the two datasets, with two important differences. First, in the SHP data, more young individuals are homeowners, possibly because of inheritances. Second, in the SHP data, homeownership decreases during retirement age. Since I do not allow for house reselling in the model, this channel of wealth decumulation is absent in the simulated data. Similarly, the net value of property, defined as current value of the property minus the outstanding mortgage decreases, decrease during old age, likely due to downsizing, while the upward trend in the simulated data is due to future projections of housing prices in my simulation (panel E). Despite these differences in liquid and housing wealth, total net wealth (panel F), shows a similar development between simulated and actual data. Taken together, the discrepancies between simulated and survey data are all attributable to aspects of the model which are knowingly different from reality. Thus, while the model is able to replicate realistic financial patterns through life, the interpretation of further results has to consider its shortcomings.

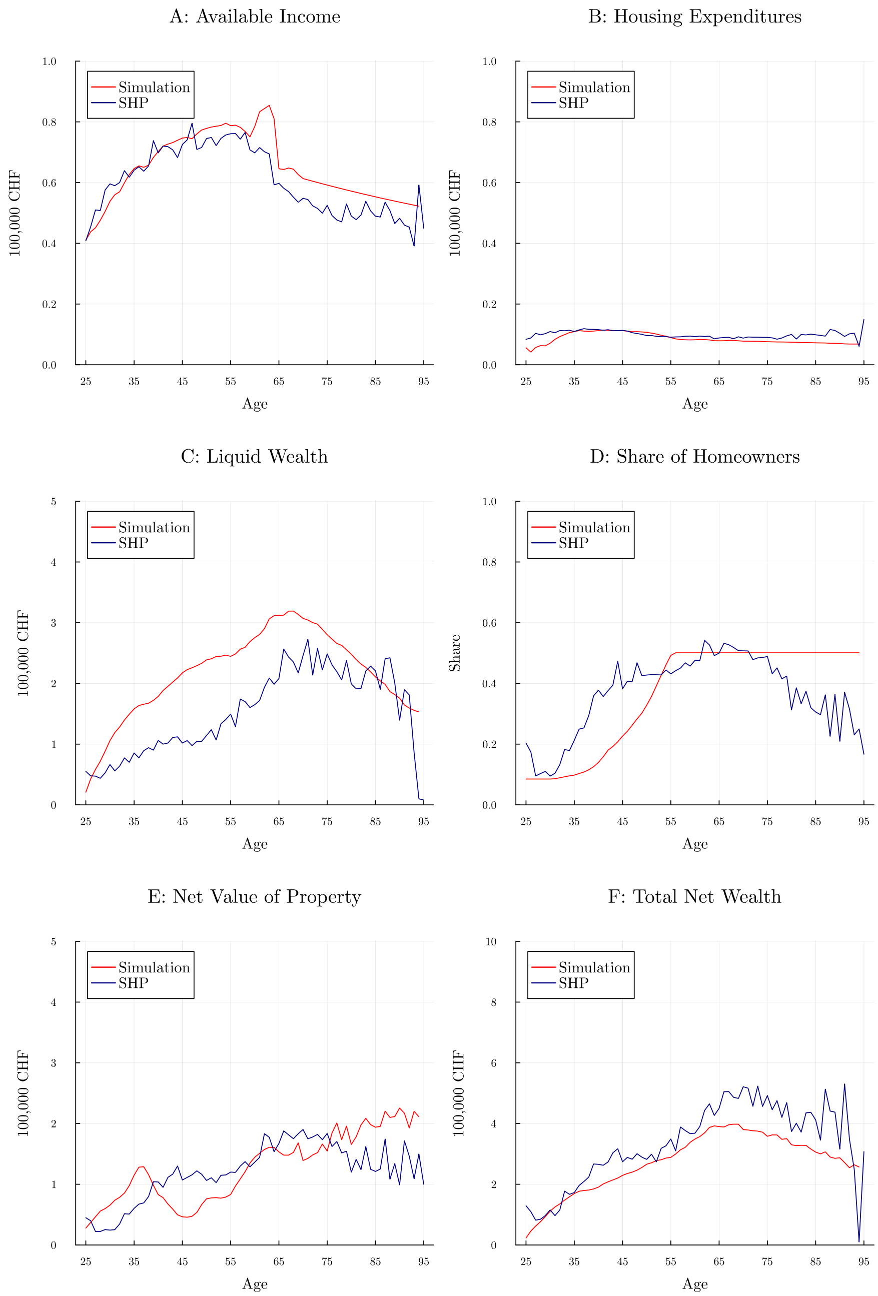

Figure 1. : Comparison with Swiss Household Panel

Note: Data from the Swiss Household Panel and from simulation exercise. Values are in terms of 2020 Swiss francs. Values are winsorized at the bottom and top 5%.

2. Wealth and participation patterns

Figure 2 plots the life cycle of the average liquid wealth (panel A) and total net wealth (panel B) for the simulated agents, as well as the counterfactual home-

[2]The SHP data do not contain precise information on non-hosing expenditures

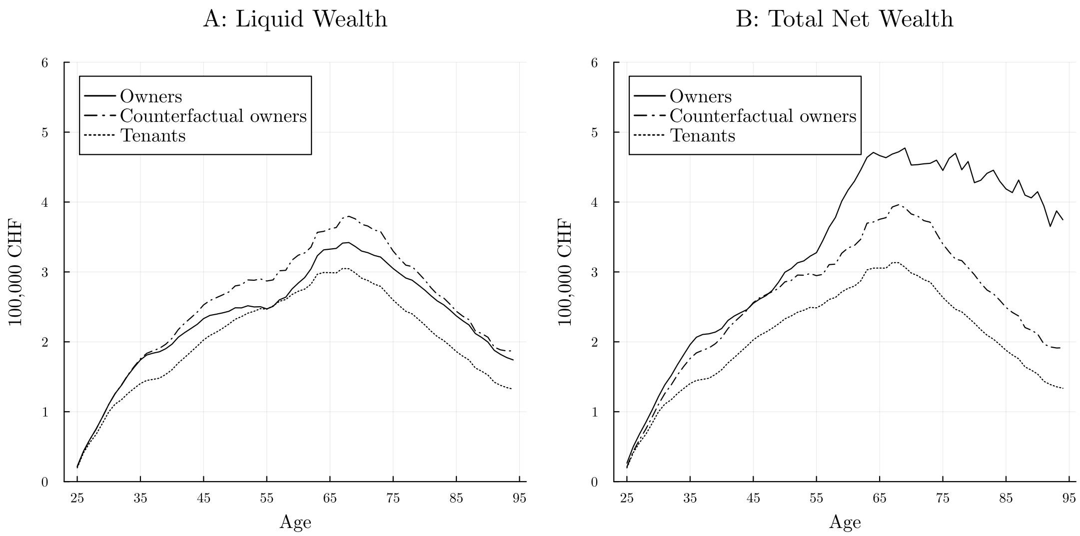

Figure 2. : Life-cycle wealth

Note: Values are in terms of 2020 Swiss Francs. Values are winsorized at the bottom and top 5%.

owners. Note, that each group comprises individuals based on their state upon retirement. Hence, the group of owners is composed by actual owners and eventual owners, i.e. tenants who still have to purchase the property. The group of tenants entails only those agents who fail to acquire a property before retirement. Finally, the group of counterfactual owners entails all those agents who could have become homeowners but were prevented from doing so.

The results from the simulation indicate that the liquid wealth of counterfactual homeowners is somewhat higher than that of actual homeowners, for most of the agents' lives. Before the age of 35, the profiles of owners and counterfactual homeowners are practically identical, since housing acquisition does not meaningfully start before the age of 35 (see panel D, Figure 1). During the core years of the agents' working life and until retirement (age 35-65), counterfactual homeowners have on average 10% more liquid savings than actual homeowners. The difference shrinks again in later years (age 65-95), though it does not disappear and remains stable at 7%. Thus, had homeowners abstained from a house purchase, they would have had a higher liquid wealth. Homeowners are, however the wealthiest group in terms of total net wealth. Before retirement, the steady appreciation of the property leads homeowners to overcome the drop in liquid wealth caused by the down payment. Upon retirement, homeowners have 21% more net wealth than counterfactual owners. During old age, while both homeowners and counterfactual homeowners dissave the accumulated liquid wealth, the model constraint that the property cannot be resold functions as saving mechanism, preventing homeowners from depleting too much of their total wealth. By the age of 95, homeowners have 83% more total net wealth than counterfactual homeowners. Thus, given the same initial conditions and conditional on preserving the property, homeownership is the main driver of long-term wealth. Finally, compared to tenants, both owners and counterfactual homeowners have more liquid and total net wealth. Since I do not include inheritances in my model and all agents start with zero wealth, initial economic disparities between agents arise solely from income differences. Initial economic conditions are therefore the strongest predictor of lifetime wealth.

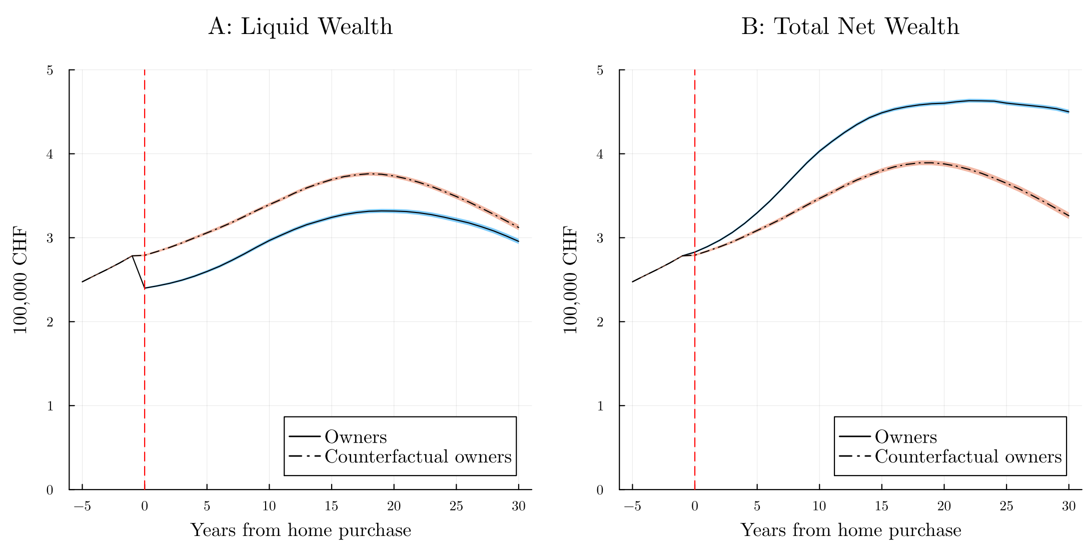

Figure 3. : Evolution of wealth

Note: Values are in terms of 2020 Swiss Francs. Values are winsorized at the top 5%. Colored areas represent 95% confidence bands. Agents acquiring property in the first life period are excluded in these visualizations.

So far, there is no strong indication that homeownership boosts liquid savings. To better explore the dynamics of savings after the home purchase, Figure 3 presents the evolution of mean liquid wealth and total net wealth for homeowners and counterfactual homeowners, between 5 years before and 30 years after the house purchase.[3]. Homeowners' liquid wealth decreases around the time of the purchase, due to the required down payment. It then recovers in the following years, tracking the same evolution but remaining below that of counterfactual homeowners. The difference in liquid wealth between the two groups starts at around $31,200$ CHF, or 13.8% of the liquid wealth of counterfactual homeowners. The absolute amount roughly corresponds to the average down payment ($35,000$ CHF). Within 30 years, the average difference shrinks considerably to $19,700$ CHF (or 6.8% difference between the two groups). Therefore, homeowners offset at least some of the lost liquid wealth. A possible reason for the diminishing difference in liquid wealth over time may be a lower total consumption. However, Figure A1 in the appendix rules out this channel: homeowners' total consumption remains almost identical to that of counterfactual homeowners, and the differences between the two groups are not statistically significant. The spike at event time 0 is due to the down payment. The widening gap in total net wealth between homeowners and counterfactual homeowners can be seen in panel B of Figure 3. While counterfactual homeowners' total wealth starts declining around 20 years after the "failed" purchase, homeowners' wealth remains constant. Comparing panel A and B, it becomes once more evident that the lack of wealth decumulation is attributable to the retainment of the real estate object in the portfolio.

Figure 4 sheds light on the changes in the participation to the equity market. Here, I can confirm the findings from previous studies, both with respect to the intensive and extensive margins. Homeownership crowds out participation to the stock market, mostly for those agents that yet have to enter (panel A). The partic-

[3]Note, that for this as well as for all the other event studies, agents acquiring property in the first period (17% of all homeowners) are excluded, since they do not have any wealth before the year of the purchase.

ipation rate of counterfactual homeowners stabilizes at 90%, around 15 years after the missed purchase, while rate of actual homeowners stabilizes at 40%. For those homeowners still participating, the equity share in their liquid portfolios increases by 4.7 percentage points (+32%) at the time of the purchase, compared to the period before and the value for counterfactual homeowners (double difference). This result is somewhat higher, but still compatible with the 2.7 percentage points increase found by Sodini et al. (2023). The difference in equity shares between homeowners and counterfactual homeowners remains mostly stable for the entire period analyzed. Across the entire populations, counterfactual homeowners invest larger amounts of liquid wealth into equities, due to the higher participation rate (panel C). However, conditional on participation, the increase of the equity share among homeowners is higher than the relative decrease in available liquid wealth due to the down payment. Thus, participating homeowners invest more into the equity market also in absolute terms. Their savings in equities increase by $7,450$ CHF (+17%) compared to the period before the purchase and their counterfactual version (panel D). After 30 years, participating homeowners have 32% more savings in equities than participating counterfactual homeowners. Thus, while homeownership clearly has a positive effects on the equity shares, the crowding out effect mitigates other potential benefits.

To better understand the consequences on long term liquid wealth, we need to differentiate among (1) homeowners participating before and after the purchase, (2) homeowners who would have participated to the equity market, had they not acquired the property, and (3) homeowners who would have not participated to the equity market, had they not acquired the property.[4] The allocation to one of these groups is not random, and it strongly correlates with the income level at the time of the purchase. The income level also conditions the saving behavior

[4]Other cases such as homeowners stopping or starting to participate after the purchase, although plausible in the actual world, are not available in the results of the current simulation. While this can be seen as a shortcoming of the model, it facilitates the interpretation of the analysis.

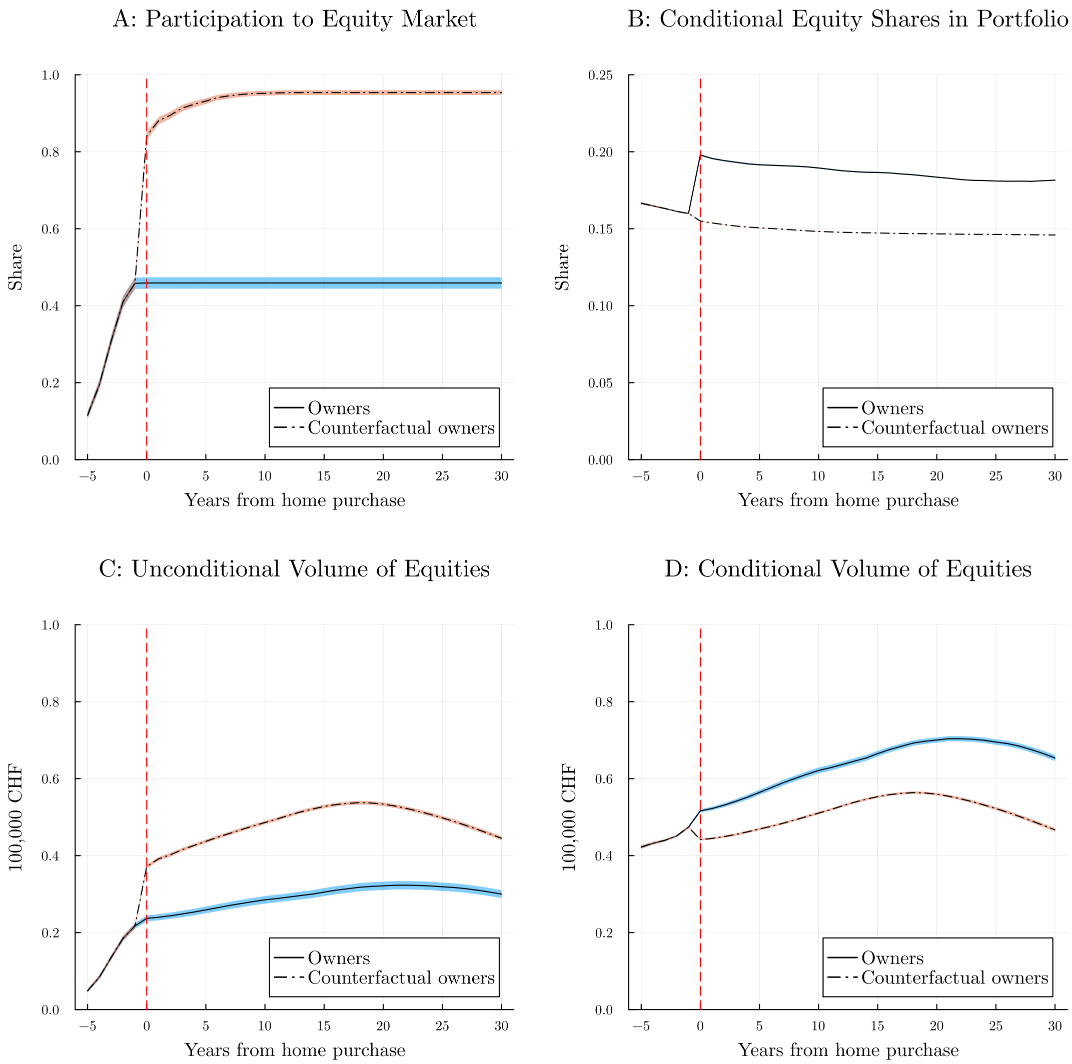

Figure 4. : Evolution of participation to the equity market

Note: Monetary values are in terms of 2020 Swiss Francs. Values are winsorized at the top 5%. Colored areas represent 95% confidence bands. Agents acquiring property in the first life period are excluded in these visualizations.

(e.g. poorer agents have to better ensure against the risk of mortgage default), and the size of the property, which, in turn, comes with a different down payment and drop in liquid wealth. Thus, comparing the levels of liquid wealth among the three groups is of limited value. Nonetheless, the general development of savings can indicate if the increment of risky shares in the portfolio has a tangible effect on wealth growth. Figure 5 rejects this hypothesis: The liquid wealth of agents participating before and after the purchase always remains below that of the same, counterfactual agents. The same applies to the other two groups, though the liquid wealth profiles of actual and counterfactual homeowners are closer to each other.

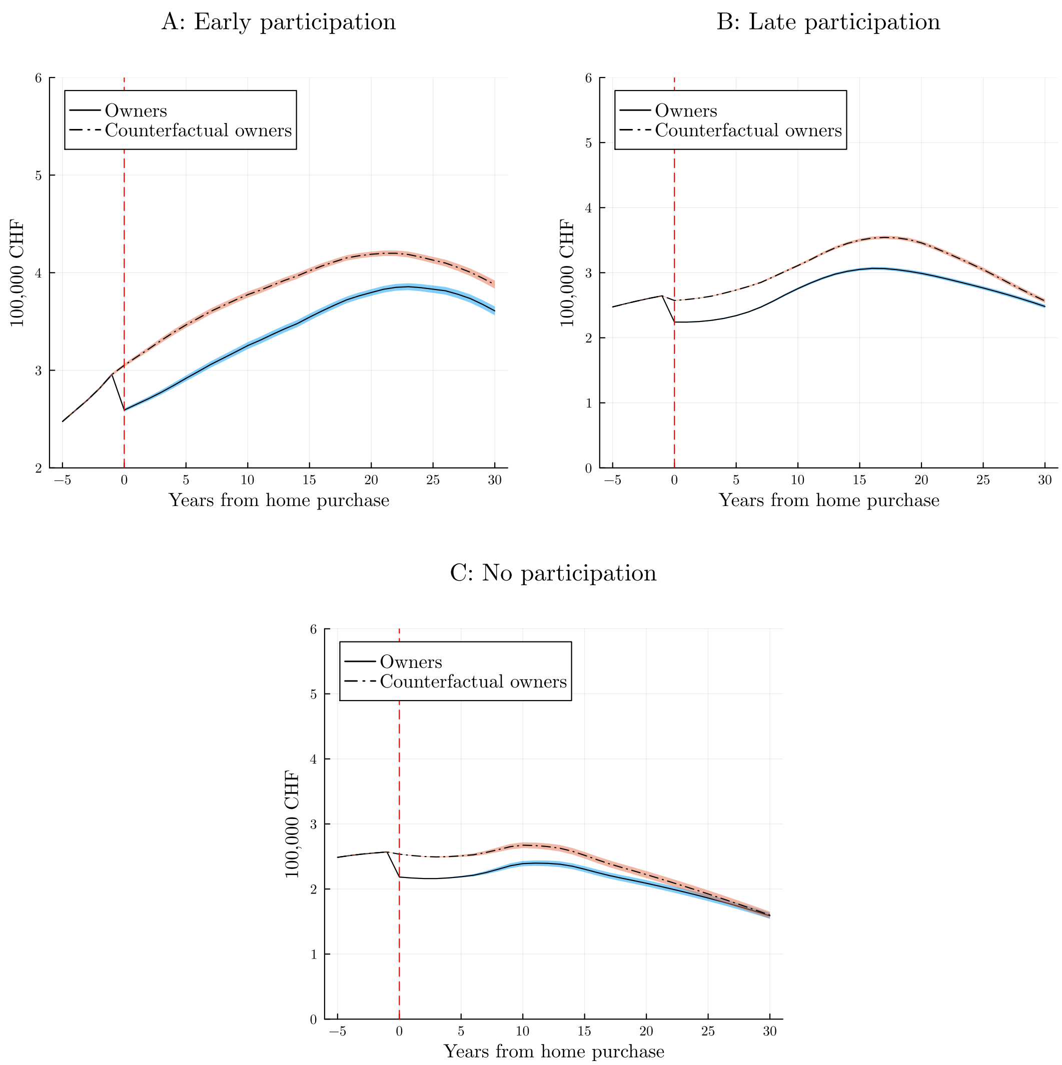

Figure 5. : Evolution of liquid wealth by participation to the equity market

Note: Monetary values are in terms of 2020 Swiss Francs. Values are winsorized at the top 5%. Agents acquiring property in the first life period are excluded in these visualizations.

Thus, overall, the down payment for the property decreases the available liquid savings of homeowners in the short, medium and, mostly, long run. Though the propensity to invest in risky assets is lowered, agents that were already participating to the equity market increase the share of equities in their portfolios. However, despite an average positive return from these assets, there is no proof that this behavior corrects the drop in liquid wealth. Nonetheless, homeowners are still wealthier than tenants, due to more favorable initial economic conditions, and the property acting as saving device, limiting wealth depletion during retirement.

5. Alternative scenarios

1. No equity market

A simple way to assess the role of the higher equity shares in homeowners' portfolio is to compare the baseline scenario with one without equity markets. To achieve this, one only needs to set a improbably high entry cost. This approach also leaves the agents' policy functions unchanged, as the entry cost is set exogenously in the forward-phase of the simulation. There is also no need for counterfactual homeowners as defined previously, since we can simply compare the wealth profiles of the participating homeowners from the baseline with their non-participating version in the new scenario. Note, that the de-facto absence of the equity market slightly changes the number of total homeowners, though by 40 additional agents. These "new" homeowners were ignored in the following analysis. Panel A of Figure 6 presents the total net wealth profile over the agents' life, in both scenarios. Homeowners in the universe without equity market are not clearly worse off, and during long stretches of the their lives, the two groups do not have a significantly different net wealth. Until before retirement, homeowners with access to the equity market have a higher net wealth by around $9,100$ CHF on average (3.2% of the baseline agents' wealth). After retirement, the liquid wealth is not significantly different between the two groups. On average, homeowners in the baseline around 1.5% (500 CHF) more liquid wealth than in the scenario without equity markets. Panel B of the figure shows that the liquid wealth of homeowners in the baseline rises to higher levels after the purchase. The difference between the two groups is statistically significant, at least during the first 15 years of homeownership (on average around 17,400 CHF, 5.3% of homeowners' liquid wealth). On average, between 0 and 30 years after the home purchase, homeowners' liquid wealth is 4.4% (17,300 CHF) higher if they have access to the equity market. Since this large increase does not seem to be translated is into higher total wealth over the course of the lifetime, it is possible that agents consume away part of the excess savings. However, we can rule out this channel, as total consumption is barely different between the two scenarios (see Figure A2 in the appendix). Homeowners with access to the equity market also do not buy larger dwellings, and the opposite is true, albeit minimally (2.5% smaller).

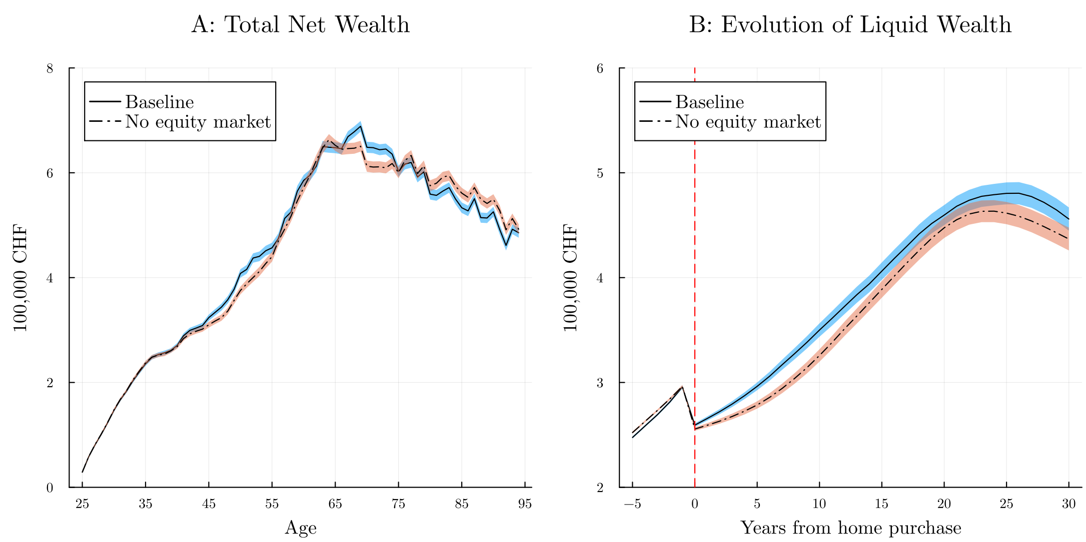

Figure 6. : Comparison of wealth between baseline and universe without equity market

Note: The graphs only comprise those agents from the baseline scenario who were participating before the acquisition of the property. Values are in terms of 2020 Swiss Francs. Values are winsorized at the top 5%. Colored areas represent 95% confidence bands.

Figure 6 suggests that the short- to mid-term effects of the increase in risk shares in the portfolio are quite consistent. In the context of the entire life cycle, these benefits are less salient, albeit still present.

6. Conclusion

This paper analyzes the long-term effects of increased equity shares in homeowners' portfolio, using the Swiss setting as a reference. After property acquisition, those agents that were already participating increase the relative amount of risky assets in their portfolio. This behavior generates over time additional capital gains, especially in the mid-term. However, homeowners are also subject to a crowding-out effect: Had they abstained from the property purchase, more homeowners would have started to participate to the equity market. Also, the required down payment limits the amount of available liquid resource to invest. Overall, there is no strong indication that the additional equity shares in the portfolios contribute meaningfully to the long-term wealth of homeowners. Initial economic conditions and retaining the real estate property in the portfolio during retirement are the most important aspects to consider when explaining the wealth difference between homeowners and tenants. Future works should focus on the effects of proposed reforms which aim to eliminate the imputed rental value taxation.

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Appendix

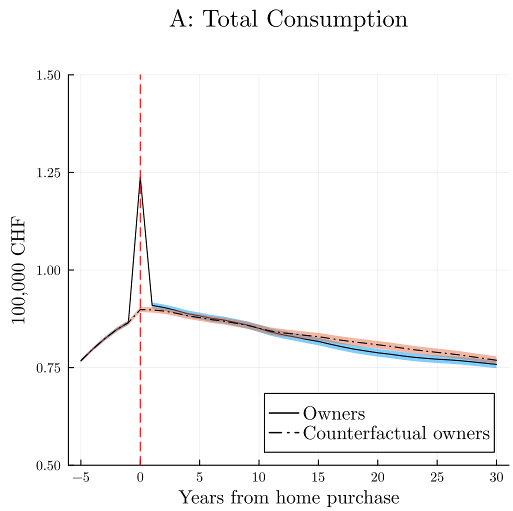

Figure A1. : Event study of total consumption

Note: Values are in terms of 2020 Swiss Francs. Values are winsorized at the top 5%.

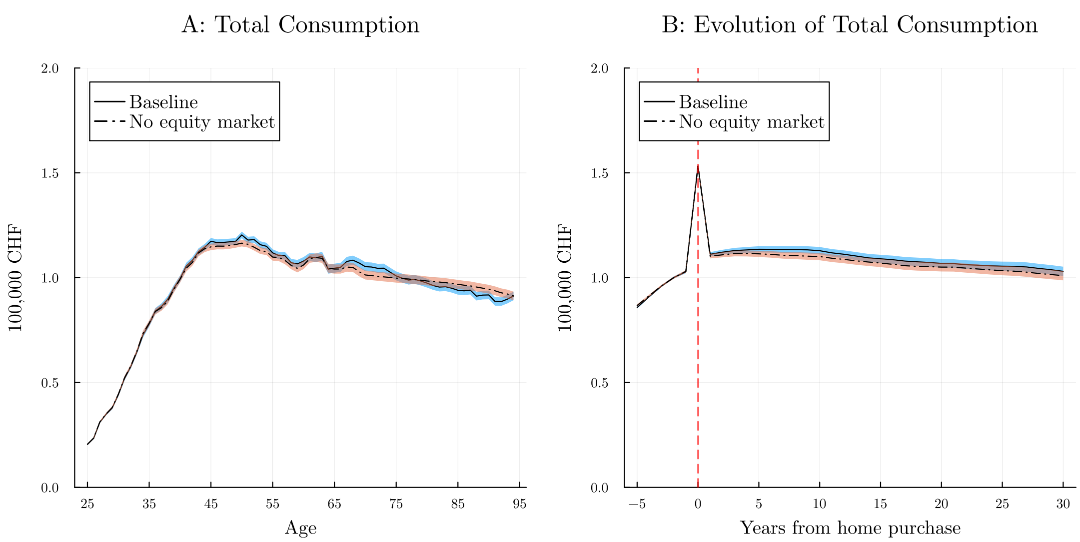

Figure A2. : Comparison of total consumption between baseline and universe without equity market

Note: The graphs only comprise those agents from the baseline scenario who were participating before the acquisition of the property. Values are in terms of 2020 Swiss Francs. Values are winsorized at the top 5%. Colored areas represent 95% confidence bands.