Homeownership, politics and housing bubbles

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Abstract

Recent housing bubbles have occurred in countries with historically high levels of homeownership (e.g. USA, Spain and the UK) rather than those where housing rentals are widespread (e.g., Austria, Germany and Switzerland), and have been accompanied by an increase in households indebtedness. In this paper we show that these empirical regularities can be reconciled within a political economy model of credit market regulation. We consider an overlapping generation model where households have different tastes about housing tenure, and young households may face a collateral constraint, due to a regulatory ceiling on their loan-to-value (LTV) ratio. We show that (i) the equilibrium homeownership rate depends on the expected change of house prices and the tightness of the financial constraint, (ii) a housing bubble equilibrium arises only if there is no collateral constraint, and (iii) if households vote upon the LTV ratio, and the economy's initial homeownership rate is sufficiently high, a housing bubble accompanied by credit expansion and a jump in homeownership jointly arise as a political equilibrium.

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1 The model

We consider a simple discrete-time, infinite-horizon OLG model which emphasizes two dimensions of heterogeneity across households: income and tastes for housing tenure. In each period $t \geq 1$, a unit mass of two-period lived, non-altruistic households are born, each endowed with either high (H), medium (M) or low (L) income y_i, with $y_H > y_M > y_L \geq 0$. At $t = 1$, a generation of initial old is alive.[1]

Households care about (second-period) consumption and housing services, and only a positive measure set $N_\epsilon \subset \mathcal{I} := [0, 1]$ of young households benefits from a utility premium that arises from owning their residence (*pride of homeownership*). Given housing purchase and rental prices, households optimally decide whether to become *renters* (R) or *owner-occupiers* (O) at time t. Houses are either rented from a set of competitive (risk-neutral) real estate agencies or bought/sold in a competitive housing property market. Homebuyers purchase their house when young at price q_t and resell, when old, at the resale price q_{t+1} (before buying second-period consumption). Renters pay a price ρ_t for their house when young and return it to the real estate agencies when old. The consumption good is bought on a competitive market, and its price is set equal to one (numeraire).[2]

The total amount of housing supplied to young homeowners and young renters is formed by houses owned by old homeowners and those managed by the real estate agencies. The initial housing owned by all old households at $t = 1$ is $\hat{H} < H$, where $H > 0$ is the (fixed) overall housing stock.

The purchased housing can also be used as loan collateral. Households who choose to buy housing can borrow subject to a collateral constraint, by which their borrowing cannot exceed a fraction $\phi_t \in \Phi := [0, 1]$ of the expected value of the house. The supply of collateralized loans is possibly restricted by regulation which sets a maximum Loan-to-Value (LTV) $\bar{\phi}$ ratio on ϕ_t.

[1] For ease of notation, L (respectively M or H) will be used to denote the measure of households with low (resp. medium or high) income, so that $L + M + H = 1$.

[2] For simplicity, we do not model the production side of the consumption sector, and assume the consumption good is supplied inelastically.

1.1 Households

The expected utility function of household $i \in \{L, M, H\}$ is quasi-linear in consumption and housing[3]

$$u(h_{i,t}, c_{i,t+1}) = \gamma \cdot \log(\epsilon_i \cdot h_{i,t}) + E_t\left[c_{i,t+1}\right] \tag{1}$$

Here, the parameter $\gamma > 0$ captures the preference for housing services relative to the consumption good, whereas the parameter ϵ_i captures household i's pride of homeownership: it is equal to one if $i \notin N_\epsilon$, whereas it is larger than one if $i \in N_\epsilon$ and household i becomes an owner-occupier. Also, $E_t[\cdot]$ denotes rational (model-consistent) expectations conditional on all the information available as of time t.

Let $s_{i,t}$ denote the financial savings of household i given their tenure decision. The objective (1) is then maximized subject to standard budget constraints (2) and (3), a collateral requirement (4) and non-negativity constraints (5)

$$\begin{aligned} s_{i,t} &= y_t - \rho_t h^R_{i,t} && \text{if renting} \\ s_{i,t} &= y_t - q_t h^O_{i,t} && \text{if buying} \end{aligned} \tag{2}$$

$$c_{i,t+1} = \begin{cases} \max\left\{0, s_{i,t}(1+r)\right\} & \text{if renting} \\ \max\left\{0, s_{i,t}(1+r) + q_{t+1}h^O_{i,t}\right\} & \text{if buying} \end{cases} \tag{3}$$

$$s_{i,t} \geq -\phi_t E_t q_{t+1} h^O_{i,t} \tag{4}$$

$$h_{i,t} \geq 0, \quad c_{i,t+1} \geq 0 \tag{5}$$

Since households have zero second-period income, young households who opt for rental housing are not eligible for loans as they would not be able to fulfill their debt obligations. By contrast, owner-occupiers can access the financial market subject to the collateral requirement (4), and are protected by limited liability: if default on loans occurs, the house is transferred to the financial sector in the form of second-period repayment, and homeowners' consumption drops to zero. The financial position of the initial old $s_{i,0}$ is exogenously given.

[3] The choice of quasi-linear preferences guarantees analytical tractability, but has almost no bearing on the qualitative findings.

1.2 Banks

Credit is supplied by a large number of risk-neutral, perfectly competitive banks. Let $\bar{r} > 0$ denote the banks' cost per unit of funds, and r the (risk-free) interest rate on loans. The implicit assumption is that banks fail to price the risk of default potentially resulting from the birth and burst of housing bubbles (e.g. Glaeser, 2011, 2014). One explanation for the under-pricing in lending decisions may be the existence of agency problems (moral hazard) within financial institutions. For example, under limited liability of the banks' managers, financial intermediaries may underrate the price for risk.

The competitive banks set the fraction ϕ_t consistent with borrowers' expected ability to fulfill their debt obligations, provided the actual LTV ration does not exceed the regulatory ceiling $\bar{\phi}$. Since borrower i's (expected) repayment requires $E_t q_{t+1} h^O_{i,t} \geq -s_{i,t}(1+r)$ or equivalently $s_{i,t} \geq (1+r)^{-1} E_t q_{t+1} h^O_{i,t}$, it follows that $\phi_t \leq 1/(1+r)$. In any candidate equilibrium, optimal lending decisions involve zero (expected) profits – hence $r = \bar{r}$ – and no rationing on quantity: all banks lend up to the limit set by the maximum LTV ratio – i.e. $\phi_t = 1/(1+r)$ – such that the supply of loans is equal to the expected discounted value of housing.

1.3 Rental agencies

A large number of perfectly competitive real estate agencies operates by trading houses on the rental and the housing markets. As a result of competitive pressure, optimally set rents will fulfill a basic *no arbitrage condition*: at equilibrium, the overall housing stock H is allocated between the rental and the property markets so that no further imbalance between market prices can be profitably exploited.

2 Equilibrium analysis

The policy variable $\bar{\phi}$ is the outcome of a majority vote involving both young and old households. We focus on a "once-and-for-all" voting (e.g. Browning, 1975) according to which (i) at $t = 1$ voting occurs and the chosen policy $\bar{\phi} \in \Phi$ is committed to for all $t \geq 1$; (ii) each household — both young and old — votes sincerely (and not strategically) according to her own truthful preferences.[4] If any type of indifference arises for household i, then the

[4] That is, instead of specifying preference orders explicitly, we simply assume the latter are induced by the voters' utility function (1), see e.g. Farquharson (1969).

policy is uniformly randomly chosen over the indifference set $\phi_i \subseteq \Phi$. We hence define a *political equilibrium* as follows:

Definition 1 *Given preferences and endowments, a political equilibrium is a collection of price sequences* $\{\rho_t^*, q_t^*\}$, *allocations* $\left\{h_{i,t}^*, s_{i,t}^*, c_{i,t+1}^*\right\}$ *and a voting outcome* $\bar{\phi}^*$ *such that*
(i) the majority of voters supports $\bar{\phi}^*$*;*
(ii) $\rho_t^*, q_t^* > 0$ *for all* $t \geq 1$*;*
(iii) given prices, the allocations maximize expected utility (1) subject to (2), (3), (4) and (5) for all $t \geq 1$*;*
(iv) the housing and rental market clear at prices $(\rho_t^*, q_t^*, q_{t+1}^*)$ *for all* $t \geq 1$*, i.e.*

$$\int_{N^O} h_{i,t}^{O^*} di = H^0; \quad \int_{\mathcal{I}\backslash N^O} h_{i,t}^{R^*} di = H - H^O$$

where N^O *is the equilibrium subset of home-owners and* H^O *is the equilibrium supply of housing;*
(v) prices $(\rho_t^*, q_t^*, q_{t+1}^*)$ *satisfy* $\rho_t^* + \frac{E_t\left[q_{t+1}^*\right]}{1+r} = q_t^*$ *for all* $t \geq 1$.

Point (i) requires the existence of a majority, point (ii) requires both the housing and rental prices to be strictly positive, whereas points (iii) and (iv) are conventional optimality and market clearing conditions for a competitive equilibrium with price-taking. Finally, point (v) states that the political equilibrium is arbitrage-free.

To characterize the political equilibrium, we proceed by backward induction. We first determine the optimal housing decision rules and the competitive equilibrium conditional on ϕ, with households acting as price-takers. As a second step, we look at the political choice of the maximum LTV ratio $\bar{\phi}$, taking into account the distribution of voters associated with each choice of $\bar{\phi}$. According to the previous definition, households vote once and for all their preferred policy when holding rational expectations about the effects of the voting outcome on the competitive equilibrium path of the economy. Any political equilibrium therefore features time-consistent policy supporting a competitive outcome.

2.1 Steady-state equilibrium

Whether households optimally decide for renting vis-á-vis buying their house crucially depends on the interplay between their different preferences about housing tenure, on the one hand, and the tightness of the financial constraints relative to the households' financial position, on the other.

Specifically, the equilibrium distribution of households by tenure is characterized as a function of well-defined thresholds in the economy's income distribution, whose relevance in turn depends on whether the policy constraint is operative or not. Notice that a regulatory ceiling $\bar{\phi} \geq \frac{1}{1+r}$ on the LTV ratio is immaterial for the market behavior of banks, as the competitive supply of collateralized loans has to fulfill a sharper restriction — see Section (1.2). If this is the case, then, irrespective of the household's income profile, the renting versus buying decision is simply driven by her deep preferences for homeownership: the proud ($i \in N_\epsilon$) buy, the others ($i \notin N_\epsilon$) rent.

When the regulatory constraint is operative, by contrast, it effectively reduces credit availability in the economy, and hence possibly impacts on the tenure decision of households. Notice that, by force of the no arbitrage condition, the rental price for a housing unit is strictly lower than the one required for house purchasing. As a consequence, while low and medial income candidate renters would greatly benefit from housing services by lowering their second-period consumption, candidate buyers might be forced to scale down their housing demand in order to enjoy strictly positive consumption. Hence, to induce them to purchase their property, the degree of pride of homeownership has to be sufficiently high. As a main consequence, an overly low income profile, as well as a tight constraint on borrowing, may well lead households to alter their housing tenure decision rather than simply induce downsizing. The equilibrium distribution of renters and home-buyers in the model is reported in the Appendix.

Formally, let $\mathcal{Y} := \{L, M, H\}$ denote the income distribution across young households, and collect the model's parameters in the set $\Omega := \{\mathcal{Y}, \epsilon_i, N_\epsilon, r, \gamma\}$. Let also

$$V_i^j(\mathbf{p}; \bar{\phi}) := \max_{h_i^j, c_i^j} U_i(h_i^j, c_i^j), \qquad j \in \{R, O\} \tag{6}$$

denote indirect utility from either renting or buying, given prices $\mathbf{p} := (\rho, q)'$ and policy $\bar{\phi}$. Assuming that indifferent households become renters, household i will opt for home-buying if and only if $V^O(\mathbf{p}; \bar{\phi}) > V^R(\mathbf{p}; \bar{\phi})$.

The following result holds:

Lemma 1 *For any given couple $(\Omega, \bar{\phi})$, a unique competitive equilibrium exists.*

Proof. - See the Appendix. ■

The analysis of the political equilibrium requires distinguishing the voting behavior of (initial) old and young households. Old homeowners form a homogeneous N-sized group who vote for the LTV policy (if any) supporting the highest price on the owner-occupied housing market. More directly related to the economy's distribution of income are the young households' preferences over LTV policies. As argued above, both (candidate) renters' and home-buyers' preferences for voting outcomes change with their income level and the tightness of the financial constraint. Remarkably, the preferences of young households need not be single-peaked, as sufficiently wealthy individuals may find themselves indifferent across a subset of alternative policies which all enforce an unconstrained access to the market of collateralized loans.

[...]

3 Bubbly equilibrium

To be written.

4 Conclusion

To be written.

Appendix

Proof of Lemma 1

In what follows, we characterize the (renting and home-buying) housing and consumption demand functions of a general household $i \in N$ with income $y_i \in \mathcal{Y}$ and taste for home ownership ϵ_i.

The demand of household i for rental housing solves

$$\max_{h_i^R} \quad \gamma \log(h_i^R) + [(y_i - \rho h_i^R)(1+r)]$$

$$s.t. \quad y_i - \rho h_i^R \geq 0, \quad h_i^R \geq 0$$

where the first constraint (no borrowing) reflects the inability of candidate renters to obtain a loan because of their adverse repayment prospects. If this constraint is slack, then the first-order condition for an interior solution delivers

$$h_i^R = \frac{\gamma}{(1+r)\rho}, \quad c_i^R = y_i(1+r) - \gamma$$

Otherwise, the constrained solution $h_i^R = y_i/\rho$ obtains, which implies zero (second-period) consumption. The unconstrained solution arises if and only if $y_i \geq \frac{\gamma}{1+r}$.

By the same token, the demand of household i for housing solves

$$\max_{h_i^O} \quad \gamma \log(h_i^O) + y_i(1+r) - rqh_i^O$$

$$s.t. \quad y_i - qh_i^O \geq -\phi q h_i^O, \quad h_i^O \geq 0$$

where the first constraint is the collateral requirement.[5] If the latter does not bind, then the first-order condition for an interior solution yields

$$h_i^O = \frac{\gamma}{rq}, \quad c_i^O = y_i(1+r) - \gamma$$

Otherwise, the constrained solution $h_i^O = \frac{y_i}{(1-\phi)q}$ obtains, which implies zero (second-period) consumption. The unconstrained solution arises if and only if $y_i \geq \frac{\gamma(1-\phi)}{r}$.

Whether constrained or not, individual housing demands are uniquely defined for any given Ω and (strictly) downward sloping, and so will the aggregate demand for both rental and owner-occupied housing be. As a consequence, a unique competitive equilibrium with fixed supply H will exist.

[5]Notice that the home-buyer i will always be able to fulfill her debt obligations provided $\phi \leq (1+r)^{-1}$, as the latter implies $s_i(1+r) + qh_i^O \geq 0$.

Equilibrium distribution of households by tenure

We derive the equilibrium distribution of households conditional on the regulatory ceiling $\bar{\phi}$ on their LTV ratio. Recall that the regulatory constraint is non-active when $\bar{\phi} \geq (1+r)^{-1}$. We accordingly consider two distinct cases.
Non-active regulatory constraint: $\bar{\phi} \geq \frac{1}{1+r}$. Since individual housing demands on the two markets are as follows

$$h_i^{R*} = \frac{1}{\rho} \min\left\{y_i, \frac{\gamma}{1+r}\right\}, \quad h_i^{O*} = \frac{1}{q} \min\left\{\frac{y_i}{1-\phi}, \frac{\gamma}{r}\right\} \tag{7}$$

we can easily contrast the generic household i's equilibrium value function $V_i^j(\mathbf{p}^*, \bar{\phi})$ from the two housing options (renting vs. buying) conditional on the parameter set Ω and the equilibrium prices $\mathbf{p}^*$. By the equilibrium notion (**??**), in any competitive equilibrium the no arbitrage condition condition $\rho^* = \frac{r}{1+r} q^*$ holds. Also, perfect competition in the lending market leads to $\phi = (1+r)^{-1}$. This has two crucial implications for housing demand: first, whichever household i is constrained on the rental market – i.e. $y_i < \gamma(1+r)^{-1}$ – will also be so on the owner-occupied one for it holds $(1+r)^{-1} = r^{-1}(1-\phi)$, and no positive consumption can be enjoyed upon entering either market. Second, if unconstrained, the housing and consumption allocations are strictly positive and yet independent of the housing tenure decision, i.e. for each household i with $y_i \geq \gamma(1+r)^{-1}$ it holds

$$\begin{aligned} h_i^{R*} &= \frac{\gamma}{(1+r)\rho^*} = \frac{\gamma}{rq^*} = h_i^{O*} \\ c_i^{R*} &= y_i(1+r) - \gamma = c_i^{O*} \end{aligned} \tag{8}$$

It follows that in equilibrium $V_i^R(\mathbf{p}^*, \bar{\phi}) < V_i^O(\mathbf{p}^*, \bar{\phi})$ if and only if $\epsilon_i > 1$. That is, when $\bar{\phi} \geq \frac{1}{1+r}$, household i becomes an owner-occupier if and only if $i \in N_\epsilon$, irrespective of y_i.
Active regulatory constraint: $\bar{\phi} < \frac{1}{1+r}$. In this case we have $\phi = \bar{\phi}$ and $(1+r)^{-1} < r^{-1}(1-\bar{\phi})$. Using (7) and the no arbitrage condition, it follows that for household i with $y_i < \gamma(1+r)^{-1}$ it holds:

$$\begin{aligned} h_i^{R*} &= \frac{y_i}{\rho^*} > \frac{y_i}{(1-\bar{\phi})q^*} = h_i^{O*} \\ c_i^{R*} &= 0 < y_i\left[(1+r) - \frac{r}{1-\bar{\phi}}\right] = c_i^{O*} \end{aligned} \tag{9}$$

and home buying will occur if and only if $V_i^R(\mathbf{p}^*, \bar{\phi}) < V_i^O(\mathbf{p}^*, \bar{\phi})$, which is equivalent to requiring

$$\gamma \log\left(\frac{\alpha}{\epsilon_i}\right) < y_i(1+r)\frac{\alpha-1}{\alpha}, \qquad \alpha := (1-\bar{\phi})\frac{1+r}{r} \tag{10}$$

Notice that the LHS of (10) is strictly decreasing in ϵ_i and equal tending to zero when $\epsilon_i \to \infty$, whereas the RHS is independent of ϵ_i and strictly positive because of the restriction on $\bar{\phi}$. Let $\epsilon_i = 1$. Since $y_i < \gamma(1+r)^{-1}$ by assumption, a sufficient condition for (10) to be violated is that $\log(\alpha) \geq (\alpha - 1)/\alpha$. Notice that the latter holds with equality at $\alpha = 1$, while

$$\frac{d \log \alpha}{d\alpha} > \frac{d(\alpha - 1)/\alpha}{d\alpha} \quad \forall \alpha > 1 \tag{11}$$

implies $\log(\alpha) > (\alpha - 1)/\alpha$ for all $\alpha > 1$. It follows that, when $y_i < \frac{\gamma}{1+r}$, household i becomes an owner-occupier if and only if $\epsilon_i \geq \underline{\epsilon}_i$, where $\underline{\epsilon}_i > 1$ solves

$$\log\left(\underline{\epsilon}_i\right) = \log(\alpha) - \frac{y_i(1+r)}{\gamma} \frac{\alpha - 1}{\alpha} \tag{12}$$

from which it follows that $d\underline{\epsilon}_i / d\bar{\theta} < 0$.

When $\gamma(1+r)^{-1} \leq y_i < \gamma(1-\bar{\phi})r^{-1}$, household i would be unconstrained on the rental market and not enough wealthy to avoid being constrained by the collateral requirement. Owing to (7) and the no arbitrage condition, we have:

$$\begin{aligned} h_i^{R*} &= \frac{\gamma}{(1+r)\rho^*} > \frac{y_i}{(1-\bar{\phi})q^*} = h_i^{O*} \\ c_i^{R*} &= y_i(1+r) - \gamma < y_i \left[(1+r) - \frac{r}{1-\bar{\phi}}\right] = c_i^{O*} \end{aligned} \tag{13}$$

Hence, home buying will occur if and only if $V_i^R(\mathbf{p}^*, \bar{\phi}) < V_i^O(\mathbf{p}^*, \bar{\phi})$. Since it holds $V_i^R(\mathbf{p}^*, \bar{\phi}) \geq V_i^{Rconst}(\mathbf{p}^*, \bar{\phi})$ – where the RHS is the value function of a constrained renter – a similar argument as the one exploited before proves that, when $\frac{\gamma}{1+r} \leq y_i < \frac{\gamma(1-\bar{\phi})}{r}$, household i becomes an owner-occupier if and only if $\epsilon_i \geq \bar{\epsilon}_i$, where $\bar{\epsilon}_i \geq \underline{\epsilon}_i$. Notice that $\bar{\epsilon}_i > \underline{\epsilon}_i$ if and only if $y_i > \gamma(1+r)^{-1}$ since this implies $V_i^R(\cdot) > V_i^{Rconst}(\cdot)$.

When $y_i \geq \gamma(1-\bar{\phi})r^{-1}$, it is easily verified that $h_i^{R*} = h_i^{O*}$ and $c_i^{R*} = c_i^{O*}$, and therefore $V_i^R(\mathbf{p}^*, \bar{\phi}) \leq V_i^O(\mathbf{p}^*, \bar{\phi})$ always holds, with a strict inequality sign if and only if $\epsilon_i > 1$.

Finally, as a direct consequence of the relations (8), (9) and (13), strictly positive allocations $\{h_i^*, c_i^*\}$ obtain if and only if $y_i \geq \frac{\gamma}{1+r}$ for all $y_i \in \mathcal{Y}$.