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Housing Policy, Homeownership, and Inequality

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Abstract:

Policymakers are reckoning with widening disparities in income and wealth. Perhaps no set of policies have the potential impact the distribution of wealth than those that affect home ownership.

Housing Policy, Homeownership, and Inequality *†

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Abstract

Policymakers are grappling with widening disparities in income and wealth. For most households, housing assets constitute the largest component of wealth. While housing has been extensively studied in the heterogeneous-agent macroeconomic literature, there is limited guidance on the distributional consequences of housing policy. This paper studies the relative impacts of a range of housing policies on inequality and welfare. We develop and estimate a quantitative life-cycle model in which households endogenously choose between renting and owning, and may become landlords. The model allows us to assess the distributional effects of borrower-based macroprudential limits, institutional investor participation in rental markets, rental income taxation, and housing supply policies. Calibrated to the Irish housing market, the model quantifies policy impacts on homeownership, welfare across the wealth distribution, and broad measures of income, wealth, and consumption inequality. We show that the distributional effects of housing policies depend critically on credit conditions: policies that appear regressive or benign in isolation can have markedly different, and in some cases reversed, effects under tight versus loose credit regimes.

JEL classification codes: E21, G51, R21, R28, R31

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1. Introduction

For the majority of households, wealth is housing wealth. Housing is simultaneously one of the most important goods consumed by individuals, while also dominating most households' asset portfolios. As a result, housing market policies that affect access to homeownership, rental costs, or the structure of rental markets can have far-reaching consequences for the distributions of wealth, income, consumption, and welfare. A large literature studies the distributional effects of housing policies, typically looking at a particular policy in isolation. Because housing is both a consumption good and an asset, the distributional impact of a policy depends heavily on the prevailing credit environment. This is especially salient in a world where macroprudential regulation makes credit tightening a central tool for achieving financial stability.

We contribute to the housing and inequality literature by developing a heterogeneous-agent life-cycle general equilibrium model in which households endogenously choose between renting, owning, and becoming owner-landlords. Using this framework, we provide a quantitative analysis of the distributional consequences of housing supply policies, institutional investor participation, and rental income taxation, and show how the effects of these policies depend on whether credit conditions are tight or loose. To our knowledge, this is the first paper to study these policy dimensions within a unified life-cycle model that features endogenous tenure choice, landlord behavior, and general equilibrium price adjustments, while speaking directly to inequality in housing, income, consumption, and wealth.

While each of these policy areas has been studied in other contexts, there is little existing work that evaluates their distributional implications in a life-cycle setting with endogenous renters, homeowners, and landlords. In particular, institutional investors and rental income taxation have received almost no attention in quantitative models designed to study inequality, and housing supply policies are typically analyzed without a life-cycle or distributional lens. Our framework allows each of these policies to be evaluated on its own terms with respect to housing, income, consumption, and wealth inequality. We also explore how these policies interact with macroprudential credit constraints by estimating their effects under tight and loose credit regimes.

The distributional effects of housing policies under tight and loose credit conditions are non-additive. Policies that appear regressive or benign when evaluated in isolation can have substantially different, and sometimes quantitatively reversed, effects depending on the credit environment. Borrower-based credit constraints restrict access to homeownership and increase housing inequality, but their effects on income and consumption inequality depend crucially on rental market conditions. When rental supply is elastic—either due to housing supply expansions or the presence of institutional investors—credit tightening leads to lower rents and smaller increases in post-housing inequality. The presence of institutional investors even reverses the relationship between tight credit and consumption inequality. These interaction effects arise endogenously through equilibrium prices and cannot be captured in partial-equilibrium or single-policy analyses.

To discipline the quantitative analysis, we calibrate the model to the Irish housing market, which provides a particularly informative setting due to the introduction of borrower-based macroprudential measures following the Global Financial Crisis, the rapid expansion of institutional investors in rental markets, and persistent housing supply constraints. In the model, heterogeneous households face loan-to-value (LTV) and loan-to-income (LTI) limits that map directly to Irish policy rules. Housing supply is generated by a construction sector subject to land and permitting constraints. Rental housing is supplied endogenously by domestic owner-landlords and, in some experiments, by foreign institutional investors who supply rental housing elastically above a profitability threshold.

Individually, we show that institutional investors substantially reduce income and consumption inequality at the cost of lower homeownership and domestic wealth accumulation; that rental income taxation is largely borne by renters rather than landlords, exacerbating inequality despite its apparent progressivity; and that housing supply expansions generate broad-based reductions in post-housing inequality even when effects on homeownership and housing wealth are muted. Taken together, the results demonstrate that the distributional consequences of housing policy depend fundamentally on how non-credit policies interact with the credit environment, rather than on the policies themselves in isolation.

The remainder of the paper is organized as follows: section 2 reviews the related literature; section 3 presents the model; section 4 discusses calibration; section 5 reports the main policy experiments and distributional results; and section 6 concludes.

2. Related Literature

This paper relates to several strands of literature studying housing, tenure choice, and inequality. We organize the discussion around four policy dimensions that feature centrally in our analysis: credit constraints, rental market structure, rental income taxation, and housing supply.

2.1. Housing, tenure choice, and inequality

A large empirical literature documents the central role of housing in shaping inequality. Causa, Woloszko, and Leite (2019) show a strong negative correlation between homeownership rates and wealth inequality across OECD countries, and demonstrate that removing housing from measured wealth increases Gini coefficients substantially. Dustmann, Fitzenberger, and Zimmermann (2022) show that income inequality is amplified once housing expenditures are taken into account, particularly in environments where the relative cost of renting rises over time. These findings relate closely to Kaplan and Schulhofer-Wohl (2017), who show that inflation experienced by households differs systematically across the income distribution due to heterogeneity in consumption baskets.

More recent work emphasizes the importance of housing tenure in understanding inequality dynamics. Christophers (2021) argues that the divergence between renters and homeowners is central to the evolution of housing wealth inequality. Bartels and Schröder (2020) show that rental income has been an important contributor to rising income inequality in Germany, while Kindermann and

Kohls (2018) use household survey data and a life-cycle model to show that institutional features of rental markets can have large effects on the distribution of wealth.

Our paper builds on this literature by embedding tenure choice and landlord behavior in a general equilibrium life-cycle model, allowing us to study how housing policies affect housing, income, consumption, and wealth inequality jointly, and how these effects depend on credit conditions.

2.2. Credit constraints and macroprudential policy

A large theoretical literature emphasizes the central role of credit conditions in shaping equilibrium outcomes in housing markets. In influential heterogeneous-agent macro housing models, Kaplan, Mitman, and Violante (2020) develop a life-cycle framework with incomplete markets and endogenous tenure choice, highlighting the importance of household heterogeneity and borrowing constraints for housing demand and allocation. Building on this framework, Greenwald and Guren (2021) show that changes in borrowing constraints and credit supply conditions can generate large movements in house prices, rents, and housing demand through general equilibrium effects. In these models, credit conditions matter not only because they restrict individual access to homeownership, but because they alter equilibrium prices and the allocation of housing services across households. While this literature does not focus on inequality as a primary outcome, it establishes credit availability as a fundamental state variable of the housing market in models closely related to ours.

This lineage motivates our approach of treating credit conditions as an organizing axis for the analysis. If equilibrium prices and rents respond endogenously to borrowing constraints, then the distributional effects of housing policies that operate through these prices—such as housing supply, rental market structure, or taxation—cannot be understood independently of the prevailing credit environment. Our contribution builds directly on this insight by embedding a rich distributional structure into a life-cycle general equilibrium model and explicitly studying how the effects of non-credit housing policies differ under tight and loose credit regimes.

A substantial empirical and quantitative literature studies the effects of borrower-based macroprudential policies on housing markets and household outcomes. Georgescu and Martin (2024) show, using euro-area household survey data, that loan-to-value (LTV) and debt-service-to-income limits can increase wealth inequality, even as they reduce exposure to financial instability. Acharya, Bergant, Crosignani, Eisert, and McCann (2022) document that borrower-based measures reallocate mortgage credit toward higher-income borrowers and away from urban areas, relieving price pressure in high-demand regions. Tarne, Bezemer, and Theobald (2022) emphasize that the distributional consequences of macroprudential policy depend critically on which borrowers are constrained, showing that restrictions on buy-to-let investors can have markedly different effects from restrictions on first-time buyers.

Ireland has featured prominently in this literature. Kinghan, McCarthy, and O'Toole (2019) show that the introduction of borrower-based measures induced wealthier households to increase down-payments, while poorer households tended to shift toward lower-value housing. Closest to our work is Castellanos, Hannon, and Paz Pardo (2024), who study Ireland's LTV and LTI reforms in a life-cycle general equilibrium model and show that younger and poorer households are disproportionately excluded from homeownership.

Our contribution differs in two key respects. First, we study LTV and LTI constraints separately in order to isolate their distinct distributional roles. Second, and more importantly, we use credit conditions as an organizing axis, examining how the distributional effects of other housing policies—such as housing supply, rental market structure, and taxation—vary under tight versus loose credit regimes. This allows us to connect the macro-housing literature on credit-driven price dynamics to the study of inequality in housing, income, consumption, and wealth.

2.3. Rental market structure and institutional investors

A growing literature studies the role of institutional investors in housing markets. Empirically, this work documents that institutional investors tend to increase house prices while reducing rents, reshaping tenure patterns across cities (e.g. Banti and Phylaktis (2025)). In macro-housing models, deep-pocketed investors are often introduced as stand-in rental firms supplying housing services competitively (e.g. Kaplan et al. (2020)).

Oosthuizen (2023) is closest to our approach, introducing institutional investors alongside household landlords in a life-cycle general equilibrium model and showing that increased investor participation can improve welfare for renters despite reducing homeownership. However, existing models typically focus on aggregate or welfare effects and do not provide a comprehensive analysis of inequality across housing, income, consumption, and wealth.

Our framework extends this literature by allowing institutional investors to compete directly with domestic owner-landlords in a setting with endogenous tenure choice and credit constraints. This allows us to quantify how institutional investor participation reshapes inequality, and how these effects depend on whether credit conditions restrict access to owner-occupation.

2.4. Rental income taxation

Housing taxation has been extensively studied, particularly in the context of mortgage interest deductions and owner-occupied housing. Floetotto, Kirker, and Stroebel (2016) and Sommer and Sullivan (2018) analyze mortgage interest deductions in heterogeneous-agent models, emphasizing welfare and homeownership effects. Alpanda and Zubairy (2016) study housing-related fiscal policy in general equilibrium and document sizable output costs of raising revenue through housing taxation.

In contrast, there is very little work studying the distributional incidence of rental income taxation in a life-cycle framework with endogenous renters, homeowners, and landlords. In particular, existing models do not quantify how rental income taxes affect renters and landlords differently once rents and prices adjust in general equilibrium. Given that rental income has been shown to be an important part of rising inequality (see, for example Bartels and Schröder (2020)), understanding how taxes on this income are bourne is worth understanding on a deeper level.

We contribute to this literature by showing that rental income taxation creates a wedge between rents paid and net returns received, with the burden falling disproportionately on renters rather than landlords—an effect that is amplified under tight credit conditions. This highlights how policies that appear progressive in statutory terms can exacerbate inequality in equilibrium.

2.5. Housing supply and inequality

A large reduced-form literature emphasizes the role of housing supply constraints in shaping prices and inequality. Glaeser and Gyourko (2018) show that housing supply restrictions disproportionately benefit older and wealthier households. Rognlie (2016) and La Cava (2016) link rising housing scarcity to increases in the capital share of income. Been, Ellen, and O'Regan (2019) summarize evidence that new housing supply moderates prices, particularly for low-income households.

Despite extensive empirical evidence, there is little work studying the distributional effects of housing supply policies in a heterogeneous-agent life-cycle model with endogenous tenure choice. Existing quantitative models of housing supply typically abstract from life-cycle heterogeneity or focus on aggregate outcomes rather than inequality. This is not trivial as the price effects induced by supply shocks affect the ability of lower income households to move onto the housing ladder, but also remove pressure on households that do not make a transition from renting to buying.

Our paper fills this gap by showing how housing supply expansions affect inequality through lower house prices and rents, and by demonstrating that these effects depend on the prevailing credit environment. While our construction sector is stylized, the model captures the key equilibrium channels through which supply policies interact with credit constraints to shape post-housing income and consumption inequality. Critically supply policy the only way policy[1] that our model suggests is able to improve welfare of low income households, while also expanding homeownership rates.

3. Model

We construct a dynamic, general equilibrium life-cycle model where heterogeneous households derive utility each period from consumption and housing services. Households have access to a risk-free bond as a savings instrument and can fulfill their housing service needs by either renting or by purchasing their home. Households can also become landlords, by purchasing housing to

[1]Expanding credit could also have this effect, but we generally take the view that tight credit policy provides other financial stability benefits to households that we don't quantify here and so may be important tools going forward.

rent to other households. Home purchases can be financed through mortgages subject to credit constraint rules. In this context, we study a number of policies and market characteristics that affect households' ability to become homeowners, including: taxes on rental income, tightening of liquidity constraints, changes in the provision of housing supply, and the existence of institutional investors. In this section, we describe the structure and main assumptions of this model.

3.1. Households

Our model consists of finitely-lived, heterogeneous households who receive idiosyncratic shocks to their labor income.

3.1.1 Demographics and Preferences

Households survive for a maximum of 80, annual, periods, with conditional survival probability at each age, j, given by ς_j. They work for wages during the first 45 periods of life, at which point they retire. When referring to household variables, we will suppress time t notation for simplicity and index by the household age, j. Individual households maximize their lifetime utility over consumption of goods and housing services given by:

$$\mathbb{E}_0 \left[\sum_{j=1}^{N} \beta^{j-1} u\left(c_{ij}, s_{ij}(h_{ij})\right) \right] \tag{1}$$

where β is the discount factor, $c_{i,j}$ is household consumption of non-housing goods, and $s_{i,j}$ is their consumption of housing services, which is a function of their housing ($h_{i,j}$). We denote household net wealth in time t as $a_{i,j}$. To limit notational clutter, we will suppress individual, i, subscripts on household choice and state variables[2] except in cases such as equilibrium, where their relationship to aggregates is critical. Preferences are such that the instantaneous utility function u is given by:

$$u(c_j, h_j) = \varsigma_{j-1} \frac{\left[(1-\phi)c_j^{1-\gamma} + \phi s(h_j)^{1-\gamma}\right]^{(1-\theta)/(1-\gamma)} - 1}{1-\theta} + (1-\varsigma_j)\psi(h_j) \tag{2}$$

where the first part represents the utility from consumption and housing services; the elasticity of substitution between consumption and housing services is given by $\frac{1}{\gamma}$ and the intertemporal elasticity of substitution is $\frac{1}{\theta}$. The parameter ϕ measures the taste for housing services relative to consumption goods. Households are divided into two types, which differ solely in their preference for housing. Transfers of bequests happen only between households of the same type.

The additive ψ factor represents a "warm-glow" bequest motive similar to that used in De Nardi (2004). However, unlike De Nardi (2004), households derive a warm glow from bequests of housing wealth (and only from the first, owner-occupied, housing unit if any). Specifically:

[2]All household-level variables will vary based on heterogeneity induced by their labor income shocks.

$$\psi(h_j) = \psi_1 \left(1 + \frac{p_h h_j^o}{\psi_2}\right)^{1-\theta} \quad (3)$$

where h_j^0 is equal to zero if the individual has no housing assets, and the first (owner-occupied) unit of housing owned if $h_j > 0$. This encourages households to remain homeowners, which is useful in our case as households in the model otherwise liquidate their lumpy housing assets to smooth consumption in retirement resulting in counterfactually low levels of homeownership in older age groups.

3.1.2 Housing Services

Households may consume housing services either through rental markets or through purchasing owner-occupied housing. Denote r_h the rental rate for housing services, and p_h the price of a unit of housing purchased. Renters receive $s(h = 0) = 1$ in home services while homeowners $s(h > 0) = \omega > 1$, providing a linear premium in homeownership associated with the first house. This provides a utility incentive to own rather than rent, but only for the first house owned. We assume that homeowners occupy their first unit, $h = 1$, of housing and rent remaining units, $h > 1$, to other households.

Further, homeowners have access to two different sizes of housing, where the larger size of housing has a multiple h_q of floor space compared to the smaller size (which is instead the only size available to renters). We assume that both price and housing services are linear in floor space, meaning that the price of a larger-size house is $h_q p_h$ and housing services from a larger house are $s(h > 0) = h_q \omega$.

Homeowners can purchase housing outright or through a mortgage. Mortgage holders borrow money from banks to finance the purchase of their homes and make interest payments each period. Renters pay rental payments to landlords corresponding to a fraction r_h (the rental yield) of the house price p_h. All homeowners, with mortgage or not, face costs associated with the depreciation of their home equal to $\delta_h p_h$, as well as property taxes $\tau_h p_h$ for each housing unit they own (multiplied by h_q) in the case of a larger-size house.

In addition to endogenously choosing between renting and occupying their own home, households may choose to become landlords by purchasing housing for the purpose of supply rental units to the market. These housing units can only be of smaller size.

3.1.3 Financial Markets

Households have access to a risk-free bond, b, which pays r_b one period in the future. For simplicity we model these bonds as being issued by externally-owned financial institutions, thus r_b is determined exogenously. Bond interest income is taxed at rate τ_k. Bonds act as a savings vehicle for households, who are unable to borrow in this asset. Households have the ability to borrow in order to finance housing purchases. This borrowing originates from the same external financial institutions. The interest rate on mortgage loans is equal to $r_l = r_b + \kappa$, where κ is an exogenous premium earned by the financial intermediaries who provide loans and safe assets in the form of bonds. As such the only constraint on the supply of mortgage credit in the model comes from macroprudential rules, which we describe next. This simplification is used by similar models such as Kaplan et al. (2020) and is primarily introduced for tractability.

Borrowing is limited by macroprudential lending regulations and thus subject to maximum LTI and LTV limits. A household j's maximum level of borrowing is subject to the following two constraints:

$$\begin{aligned} d_{j+1} &\leq \lambda_{LTV} p_h(h_q) \\ d_{j+1} &\leq \lambda_{LTI} y_j \end{aligned} \tag{4}$$

where λ_{LTV} and λ_{LTI} denote the macroprudential loan-to-value and loan-to-income ratios respectively and y_j is gross household income. These limits are binding at origination of the loan. Further, when households apply for a mortgage they cannot exceed retirement age, and to be approved for a loan the debt taken must be below a fraction of their expected remaining lifetime labor income. Macroprudential constraints in Equation 4 appply only at origination of a new mortgage loan, which we emphasize with the 0 superscript on the constraint. This is computationally convenient, but also the way such rules work in practice. It is possible for negative income shocks (or in non-steady-state for price increases) to bring an existing loan outside of these rules.

At each new period, households with debt need to pay r_l% of their loan as interest repayments. The loan principal can then be repaid in full, in part, or can be refinanced. In the case of refinancing the debt is considered a new loan and it is once again subject to Equation 4.

3.1.4 Income process

Households' labor income is given by $W_t \ell^i_{j,t}$, where W_t is the aggregate wage and households are subject to idiosyncratic productivity shocks given by:

$$\ell^i_{j,t} = \exp(\varepsilon^i_{j,t}) N^i_{j,t} \tag{5}$$

The term $\varepsilon^i_{j,t}$ is a transitory, mean zero, shock realized in each period, while the permanent component of households' wages follows an age specific trend $n_{j,t}$ given by:

$$N^i_{j,t} = N^i_{j-1,t-1} \exp(n_j) \tag{6}$$

3.1.5 Household Problem

The household problem, detailed above, can be summarized by the following value function. In this problem, we suppress t subscripts for household level terms as age (j) sufficiently tracks household time and time t is relevant to the household only through aggregate variables which retain the subscript here. All of these household level variables are unique to the individual household i and for ease of exposition we suppress this notation here as well with the exception of their labor productivity shock to emphasize this as the source of household heterogeneity.

$$V(b_j, h_j, d_j; \varepsilon_j^i) = \max_{c_j, \ell_j^i, b_{j+1}, h_{j+1}, d_{j+1}} u(c_j, s_j(h_j)) + \mathbb{E}_t V(b_{j+1}, h_{j+1}, d_{j+1}; \varepsilon_j^i)$$

$$\begin{aligned}
&\text{Subject to:}\\
&c_j + a_{j+1} \leq W_t \ell_j (1-\tau_w) + a_j\\
&\ell_j^i = \exp(\varepsilon_j^i) N_j\\
&d_{j+1} \leq \lambda_{LTV} p_h h_j\\
&d_{j+1} \leq \lambda_{LTI} y_j\\
&a_j = \begin{cases} -r_h p_h + (1 + r_b(1-\tau_k)) b_j & \text{if } h_j = 0\\ (1-\tau_h - \delta_h) h_j p_h + r_h p_h (\lfloor h_j \rfloor - 1)(1-\tau_{rh}) & \\ \quad + (1 + r_b(1-\tau_k)) b_j - d_j(1+r_l) & \text{if } h_j \geq 1 \end{cases}
\end{aligned} \tag{7}$$

Every period a household of age j enters with an endogenous state vector consisting of safe bond assets (b_j), housing (h_j), and mortgage debt (d_j). They realize the value of their exogenous idiosyncratic labor shock (ε_j^i), and choose: consumption (c_j), labor[3] (ℓ_j) savings in bonds for the following period (b_{j+1}), their debt for the following period (d_{j+1}) and next period housing h_{j+1}. Housing in turn determines utility derived from housing services s_j. Households pay taxes on: labor income, interest income, and property wealth, with the respective marginal tax rates being τ_w, τ_k and τ_h, respectively.

In the household budget constraint we summarize the value of their cash-on-hand wealth with the variable a_j. If they are a renter, this is simply the value of any safe assets they hold less their rental payments. If they are a homeowner, this is the net value of their house plus any rental payments on homes owned beyond their first, safe assets, and payments on any mortgage debt.

3.2. Government

The Government taxes labor income, interest income, and property wealth, with the respective marginal tax rates being τ_w, τ_k and τ_h. It may also levy a tax τ_{rh} on rental income (this is one of the policies we look at later), i.e. each rented house will generate revenue corresponding to a fraction τ_{rh} of the rental income $r_h p_h$ it generates. Government revenues are thus given by:

[3] Though without disutility from labor they trivially supply all labor fully.

$$G_{Rev} = \tau_w W_t N^w + \tau_k B_t r_b + \tau_h p_h N_t + \tau_{rh} r_h p_h R_D \tag{8}$$

where W_t is total wages earned in the economy, B_t is total financial assets (excluding debt), and R_D is the total demand for rental properties i.e. the number of properties earning rental income. Number of houses must always equal population, N_t, as we do not model homelessness. These revenues are partly used to fund pension income ($Tr(\ell^i_{J_R,t})$) for retirees; the individual pension income of a household is heterogeneous and depends on labor income in the final year of working life. Government transfers to individual (retired) households are thus given by:

$$Tr(\ell^i_{J_R,t}) = \gamma_{repl} \ell^i_{J_R,t} \tag{9}$$

which says that the Government provides pension income to retirees, in proportion to their final working income; γ_{repl} represents the replacement rate of pension payments relative to an agent's income during their last year of working life. Typically, the Government will spend less than its total revenues on pensions; we assume that the rest is spent on public services providing a certain level $u(g)$ of utility to all agents equally. This means that the Government runs a balanced budget, and also that $u(g)$ can be ignored as it does not influence households' utility maximisation problem.

3.3. Production

The production of final consumption goods follows a constant returns to scale production function, with labor equal to the number of households of working age:

$$Y_t = A_t N^w_t \tag{10}$$

where Y_t is total output, A_t is the aggregate labor productivity, and N^w_t is the number of agents of working age. As a result, the aggregate wage level is equal to $W_t = Y_t / N^w_t$ (pre-tax), with individual wages depending on realizations of their idiosyncratic labor shocks.

3.3.1 Construction Sector

Housing is built by a construction sector, which produces Y_h every year. The simulation starts with one (small) unit of housing per capita, and to maintain this the construction sector needs to meet demand for new housing from the new population (equal to the number of newly born households minus the deceased: $n_t N_{1,t-1} - \sum_{j=1}^{J-1} \varsigma_j N_{j,t-1}$, call it ΔN_t), plus maintenance of existing properties, which depreciate at rate δ_h.

The exact demand for new housing depends on the composition of small and large houses in new demand, with a higher proportion of larger houses in total new demand, ν^{hq} requiring a higher output by the construction sector. Specifically, new housing demand is given by:

$$\nu^{hq} h_q(\Delta N_t) + (1 - \nu^{hq})(\Delta N_t) \tag{11}$$

We assume that depreciation forces homeowners to pay for repairs costing $\delta_h p_h$ (or $\delta_h p_h h_q$) for each unit they own, leading to a demand for construction equal to $\delta_h H_s$, where H_s is the total housing supply.

Given depreciation and construction output, the housing supply changes according to the following law of motion:

$$H_{s,t} = (1 - \delta_h) H_{s,t-1} + Y_{h,t} \tag{12}$$

To keep up with population growth and depreciation (there needs to be at least one housing unit for each household at all times), equilibrium requires that:

$$Y_{h,t} \geq \nu^{hq} h_q(\Delta N_t) + (1 - \nu^{hq})(\Delta N_t) + \delta_h H_{s,t-1} \tag{13}$$

which implies that the steady-state proportion of large housing units remain constant.

The production function of the competitive construction sector is Cobb-Douglas, with inputs land L, and materials M:

$$Y_{h,t} = A_{h,t} L_t^{\alpha} M_t^{(1-\alpha)} \tag{14}$$

where $A_{h,t}$ is the productivity of the construction sector, and α is the constant share of land in production. The amount of land permits is fixed to $\bar{L}$ and determined by the Government. The price of a unit of land is $p_{L,t}$ (determined competitively), while we set the price of materials to 1. Profit maximization (with respect to the amount of materials) among competitive construction firms results in the following housing investment function:

$$Y_{h,t} = A_{h,t}^{(1-\alpha)} ((1 - \alpha) p_{h,t})^{(1-\alpha)/\alpha} \bar{L} \tag{15}$$

with construction increasing with prices. It follows that there is a unique price $p_{h,t}^*$ that will ensure equilibrium between demand and supply of housing, and this is the price that satisfies:

$$Y_{h,t}(p_{h,t}^*, ...) = \nu^{hq} h_{q,t}(\Delta N_t) + (1 - \nu^{hq})(\Delta N_t) + \delta_h H_{s,t-1} \tag{16}$$

$$A_h^{(1-\alpha)} ((1 - \alpha) p_h^*)^{(1-\alpha)/\alpha} \bar{L} = \nu^{hq} h_q(\Delta N_t) + (1 - \nu^{hq})(\Delta N_t) + \delta_h H_{s,t-1} \tag{17}$$

Note that while the characteristics of the construction sector are major determinants of the equilibrium price, they are not the only ones: there is also a component that depends on housing demand, and specifically the composition of large vs small housing ν^{hq}. This means that within the model, house prices are flexible to demand shifts.

3.4. Institutional Investors

In a number of simulations, housing units can also be purchased by institutional investors, who are deep-pocketed entities with funding from abroad whose business model is to purchase housing to generate rental returns. Whether or not they decide to invest in the domestic housing market depends on the level of rental returns that they can achieve; in the absence of aggregate risk, the house price does not matter to them. We assume that these investors face a certain cost of investing into the local housing market. This is given by some external funding costs that they face.

If the net domestic rental return (ie, r_h net of rental income taxes, or $(1-\tau_{rh})r_h$)[4] is greater than or equal to their funding cost (denoted by r^{ii}), plus any additional costs of owning a housing unit, i.e. depreciation and property tax, then the institutional investors will demand as many housing units as are available for them to purchase, as local housing becomes profitable for them. r^{ii} depends on external factors and is set exogenously.

We assume that institutional investors are limited in the number of housing units available for them to purchase. Specifically, households have first access to housing units, i.e. institutional investors can only purchase any units corresponding to the difference between the housing supply H_s and the household demand for housing $H^{hh}_{d,f}$.[5] Therefore, the demand for housing by institutional investors, H^{ii}_d, will be:

$$H^{ii}_d = \begin{cases} 0, & \text{if } (1-\tau_{rh})r_h < r^{ii} + \delta_h + \tau_h \\ H_s - H^{hh}_{d,f}, & \text{if } (1-\tau_{rh})r_h \geq r^{ii} + \delta_h + \tau_h \text{ and } H_s > H^{hh}_{d,f} \\ 0, & \text{if } (1-\tau_{rh})r_h \geq r^{ii} + \delta_h + \tau_h \text{ and } H_s \leq H^{hh}_{d,f} \end{cases} \tag{18}$$

By demanding any excess supply not demanded by households for each level of r_h greater or equal to $(r^{ii} + \delta_h + \tau_h)/(1-\tau_{rh})$ (call this r^{ii}_h) - and thus ensuring that the market for housing always clears in these cases - institutional investors effectively render r^{ii}_h the upper bound level of rental yields. In equilibrium, with institutional investors present, we have that:

$$r_h = r^{ii}_h = (r^{ii} + \delta_h + \tau_h)/(1-\tau_{rh}) \tag{19}$$

3.5. Equilibrium

We define a competitive equilibrium as a set of prices $(W_t, p_{h,t}, r_{h,t})$ such that at every time t, conditional on these prices optimal choices derived from the household problem (agent maximization

[4]Note that if these investors are set up as corporations, they would pay tax on profits rather than on the rental income itself, i.e. tax would be paid after accounting for costs, and at a lower marginal rate. We abstract from this complication here but note that we also did not deduct mortgage interest payments from the rental income subject to tax in the case of households (as would be the case when calculating rental income tax) to avoid unnecessary complications. The fact that these investors may have a more favourable tax situation due to the lower tax rate on profits can instead be approximated by assuming a lower r^{ii}.

[5]If this were not the case, they would either own all or none of the housing units.

of their value function) $(c_{i,j}, b_{i,j+1}, h_{i,j+1}, d_{i,j+1})$ are consistent with the aggregate market clearing conditions given in Equation 20.

Goods Market:

$$\sum_j \sum_i c_{i,j,t} + G_t = Y_t = A_t N_t^w$$

Housing Market:

$$\begin{aligned} H_{d,f} = H_s &\iff \sum_j \sum_i h_{i,j,t} = (1-\delta_h) H_{s,t-1} + Y_{h,t} \\ H_{d,n} = N_t &\iff \sum_j \sum_i \lfloor h_{i,j,t} \rfloor + H_d^{ii} = N_t \end{aligned} \tag{20}$$

Rental Market:

$$R_d = R_s \iff N_t - N^{oo} = H_{d,n} - N^{oo}$$

Labor Market:

$$\sum_j \sum_i \ell_{i,j,t} = N^w$$

We include the rental market conditions for clarity (with N^{oo} representing the population of owner-occupier households), but these are trivially satisfied given the second housing market clearing condition. At the steady-state equilibrium, prices remain constant between periods; the population, output, housing supply and wealth grow at a constant pace. We also note that mortgages are financed from deep-pocketed foreign agents. This is done largely for computational simplicity, but implies that there is no internal equilibrium condition limiting the availability of mortgage loan availability. Credit demand is rationed by exogenous rates and individual borrowing constraints.

4. Solution and calibration

To solve the model we solve the household problem for a schedule of prices and simulate the model economy for a large number of households.[6] We allow this model economy to run until we observe convergence to a steady-state.

The algorithm to determine an equilibrium is as follows:

1. Choose initial guess of p_h and r_h
2. Derive the optimal choices of households at every possible combination of age, wealth, housing, income, and debt, at these prices. The household optimisation problem is solved by value function iteration.

[6] We start the simulation with a minimum of 20,000 households, with the number growing as iterations increase.

3. Given the optimal choices of households for p_h and r_h, simulate the model for a large enough number of periods until a steady-state is reached.[7]

4. In the steady-state, check that:
   - Total housing demand (in terms of floor space) is equal to the supply of housing from the construction sector;
   - Total housing demand (in terms of number of units) is equal to the population;
   - Rental demand is equal to supply from landlords (and if present, institutional investors). It can be shown that this is equivalent to the condition above.

5. If equilibrium conditions in 4 are not met: update p_h and r_h and repeat the process from (1); else, we have reached the steady-state equilibrium.

Note that there can be situations in which the demand for floor space is in equilibrium with the supply, but there are too many or too few homes for rent, or vice-versa. This depends on the composition of the demand for large vs smaller-sized housing units. For instance, if the demand for floor space $H_{d,f}$ is equal to the supply H_s, the number of housing units demanded $H_{d,n}$ could range from a low of H_s/h_q if all units demanded are of large size (in which case there will probably be a shortage of rental units), to a high of H_s if all units demanded are of small size (in which case there will be too many units for rent).

The steady-state solution of the model rests in the interactions between the market for housing units, the rental market, and the construction sector. As we show below (compare Figure 1 and Figure 2), there is a continuum of (p_h, r_h) combinations satisfying:

- $H_{d,f} = H_s$ (demand for housing floor space is equal to the supply);
- and equally, a continuum of (p_h, r_h) combinations satisfy $H_{d,n} = N_t$ (i.e. the number of housing units demanded is equal to the population).

In both cases, equilibrium rental yields are a positive function of house prices, but the slopes are different. These two curves intersect in one single point, giving us a unique equilibrium with prices (p_h^*, r_h^*) that satisfy all the equilibrium conditions above.

4.1. Calibration

For the calibration of the parameters used in the model, we draw from the literature, or alternatively choose parameter values so as to match data for Ireland; these data are derived primarily from the 2021 wave of the Household Finance and Consumption Survey (HFCS) (Household Finance and

[7]We find that 100 periods are typically more than enough for convergence, but simulate the model for twice as many periods. We look for a constant housing demand as a share of the population as an indicator of steady-state.

Consumption Network, 2022). Table 1 gives an overview of all the parameters used in the model, their values in the baseline model, and their source. Ireland is a useful baseline as it is characterized by extremely tight housing markets and there is a wealth of empirical work on the impacts of the type of policies we wish to study.[8] We view these results as most relevant for similarly tight housing markets, for the United States this is the "third-type" (growing and inelastic supplied) of housing markets discussed in Glaeser and Gyourko (2018). However, we also wish to emphasize that qualitatively most of our results hold across a broad range of calibrations. In section 6 we show results calibrated to values for a median European country. The remainder of this section describes our calibration choices.

The discount rate β, households' preferences for homeownership ω_1 and ω_2, and the luxury of housing bequests ψ_2 were calibrated jointly to approximate the Irish homeownership rate in the 3.5 LTI scenario (the closest to reality), with consistently high homeownership rates for retirees, as per the data; the resulting values are 0.96 for β, 1.3 and 1.6 for ω_1 and ω_2, and 10 for ψ_2. The HFCS also suggests that only very rarely do households own more than 4 housing units, so we set h_{max} at 4.[9] We have two household types, differing by their levels of preference for housing (ω_1 and ω_2), because in the data the distribution of wealth appears to be bimodal, with the largest peak around 0 net wealth; in order to achieve this in the model, we need two types of households, of which one has less strong preferences for housing and is therefore less inclined to save:[10] [11] we set the share of households with this characteristics (type 1) at 60% of the population, giving a higher peak of the bimodal distribution at a low net wealth as per the data.

The age-earning profile of labor income was determined using the following regression on HFCS data:

$$y_i = \beta_{const} + \beta_{age} * a_i + \beta_{agesq} * a_i^2 + \gamma X_i + \epsilon_i \tag{21}$$

where y_i is the household's log labor income, a_i is the age of the reporting person minus 20 (to match our model), X_i is a vector of controls including household size, type, number of dependents and education levels, and we filtered for households whose reporting person is male, aged between 20 and 65 (i.e. with a_i between 0 to 45), and employed. The resulting age-earning curve was then scaled down such that, conditional on the steady-state population distribution, the average wage results equal to 1.

Still from the HFCS, we have that households with the lowest education level earn about three

[8]There is a large literature has used Ireland to empirically study borrower based credit rules, see for example Kelly, McCann, and O'Toole (2018).

[9]The number of housing units owned by any single household does not ever go above this number in our simulations even when left unrestricted.

[10]We could also have achieved this by having different values for β, for instance.

[11]The existence of two types of households with different preferences for housing is also useful to generate higher wealth inequality, which is notoriously difficult to match to real data. Note also importantly that in equilibrium both types of households have significant holdings of all types of assets, as well as borrowing, just to slightly different extents. I.e., we do not have a situation in which one set of households are a 'borrowing' type and the other set is a 'saver' type.

Table 1: *Calibrated parameters of the baseline model.*

Parameter	Name	Value	Source/Calibration
Household utility			
Discount factor	β	0.96	Internal
Preference for home-ownership (hh type 1)	ω_1	1.60	Internal
Preference for home-ownership (hh type 2)	ω_2	1.30	Internal
Ratio of quality between house sizes	h_q	1.25	Internal
Share of households of type 1		0.6	
Preference for housing w.r.t. consumption	ϕ	0.30	
Elast. of substitution, housing and cons.	$1/\gamma$	1.25	Kaplan et al. (2020)
Inter-temporal elasticity of substitution	$1/\theta$	0.5	Kaplan et al. (2020)
Altruistic motive for bequests	ψ_1	-9.5	De Nardi (2004)
Luxury of beq. of 1st home	ψ_2	10	HFCS, Internal
Average prob. of being bequest recipient	π_{beq}	0.05	
Maximum number of housing units	h_{max}	5	HFCS, Internal
Banking sector and mortgage market			
Exogenous risk-free rate on deposits	r_b	0.00	Ireland
Intermediation wedge	κ	0.02	Ireland
Loan-to-income macroprudential threshold	λ_{LTI}	6	Policy variable
Loan-to-value macroprudential threshold	λ_{LTV}	0.9	Policy variable
Construction sector			
Land permits per capita	L	$(nN_t)/10$	HFCS, Internal
Productivity of the construction sector	A_h	1.384	HFCS, Internal
Depreciation of housing stock	δ_h	0.01	Standard
Wages			
Age-earnings profile: coeff. on age	β_{age}	0.0326379	HFCS, regression
Age-earnings profile: coeff. on age squared	β_{agesq}	-0.0004863	HFCS, regression
Age-earnings profile: constant	β_{const}	9.614493	HFCS, regression
Standard error of the white noise process	σ_ϵ	0.12	
Autoregressive coefficient	λ	0.985	
Government			
Tax on labor income	τ_w	0.34	HFCS, Ireland
Tax on interest income	τ_k	0.34	Ireland
Tax on property wealth	τ_h	0.001	Ireland
Tax on rental income	τ_{rh}	0.40	Ireland
Social security replacement rate	γ_{repl}	0.50	

times less than those with the highest. We use this fact to determine the distance between the highest and lowest wage levels at each age, and we select 5 total skill levels. We made the transition between skill levels unlikely; this resulted in a standard deviation of 0.12 and an autoregressive coefficient of 0.985 for the idiosyncratic wage process. The creation of the respective Markov chain of transition probabilities between wage/skill levels follows Tauchen (1986).

The wedge between the interest rate on deposits and that on mortgages, κ, is set at 2%: according to Central Bank of Ireland data and our calculations, the average difference between mortgage and deposit rates since 2003 is just above 2%, while it has over time moved as low as less than 1% and as high as 3%. The same data tells us that nominal deposit rates have been well below 2% on average, with an ECB target inflation rate of 2%, i.e. a negative average real return; as our model is entirely in real terms, we select r_b to be 0%. We further select LTV and LTI thresholds of 0.9 and 6, respectively, as internal thresholds a prudent bank would set for itself in the absence of an external authority setting macroprudential policy.

For the construction sector parameters, A_h and L, we calibrate them jointly so as to achieve a steady-state equilibrium price of housing p_h that is consistent with the observed average house price-to-income ratio in Ireland. Depending on how they are calculated (e.g. using only labor income or with all income, or only employees, or taking the median vs the average etc.), price to (gross) income ratios for Ireland, based on the HFCS, generally range from 5 to 7, and we settle for 5.8 in our baseline. We allow land permits L to expand with the population, and set them at $L = \frac{(nN_t)}{10}$, i.e. one every 10 new agents in the population;[12] the corresponding value of A_h giving us an equilibrium p_h of 5.8 is 1.384.

In terms of the tax rates, these were determined as follows: τ_k was set equal to the Deposit Income Retention Tax (DIRT), which stands at 34%; τ_w was determined as the average income tax rate theoretically paid by households in the HFCS sample when including all labor-related taxation plus credits, and this also stands at 34% based on our calculations; τ_h is the approximate local property tax (LPT) rate on a house worth €300,000, based on current LPT bands, i.e. 0.1%; and the property income tax is based on the higher marginal income tax rate of 40%.

5. Results

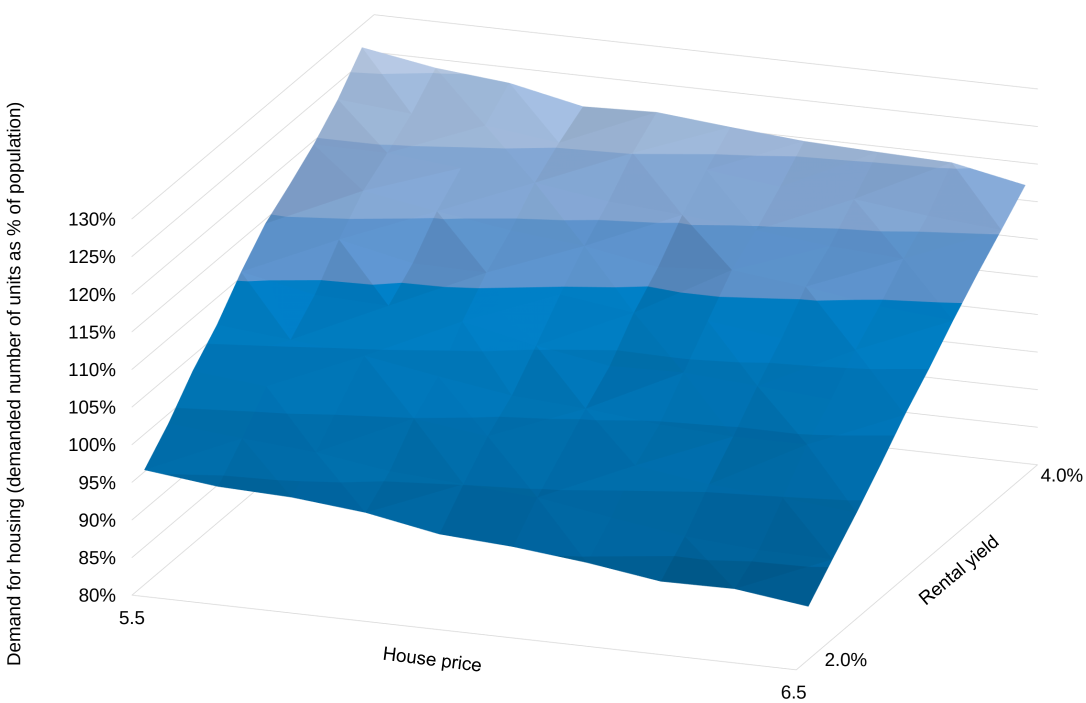
We estimate the baseline model in line with the calibration described above. Before presenting our main inequality results, we will first make a few general observations about the joint housing and rental markets, and inequality in the context of our model. The structure of our model is such that housing demand is generally a decreasing function of house prices, while it is increasing in rental return, which makes owning a house vs renting more attractive financially. The opposite holds for rental demand. Accordingly, there can be a continuum of combinations of p_h and r_h that lead to an

[12] For the population itself, we take survival probabilities from the Human Mortality Database (2020) (Ireland, 2017), and set a cohort growth rate n of 0.5%.

equilibrium in the housing and rental market: e.g., a higher p_h, which decreases demand, can be compensated for by a higher r_h to discourage renting.

To show this, we simulate the baseline model for a number of combinations of prices and yields. Figure 1 displays the level of $H_{d,n}$, expressed as a percentage of the population, for each p_h and r_h combination, confirming that demand increases with the rental yield and decreases with the house price. Here we can see how demand for housing reaches equilibrium at a number of combinations of p_h and r_h, ranging from low-price low-yield equilibria to high-price high-yield ones. Indeed, taking a slice of Figure 1, taken along the Z axis at the point where demand is 100% of the population, would give us a curve in (p_h, r_h) space, with all the combinations of prices and yields satisfying $H_{d,n} = N_t$.

Figure 1: *Surface area representation of demand for housing units as a percentage of population under the baseline model, by p_h and r_h.*

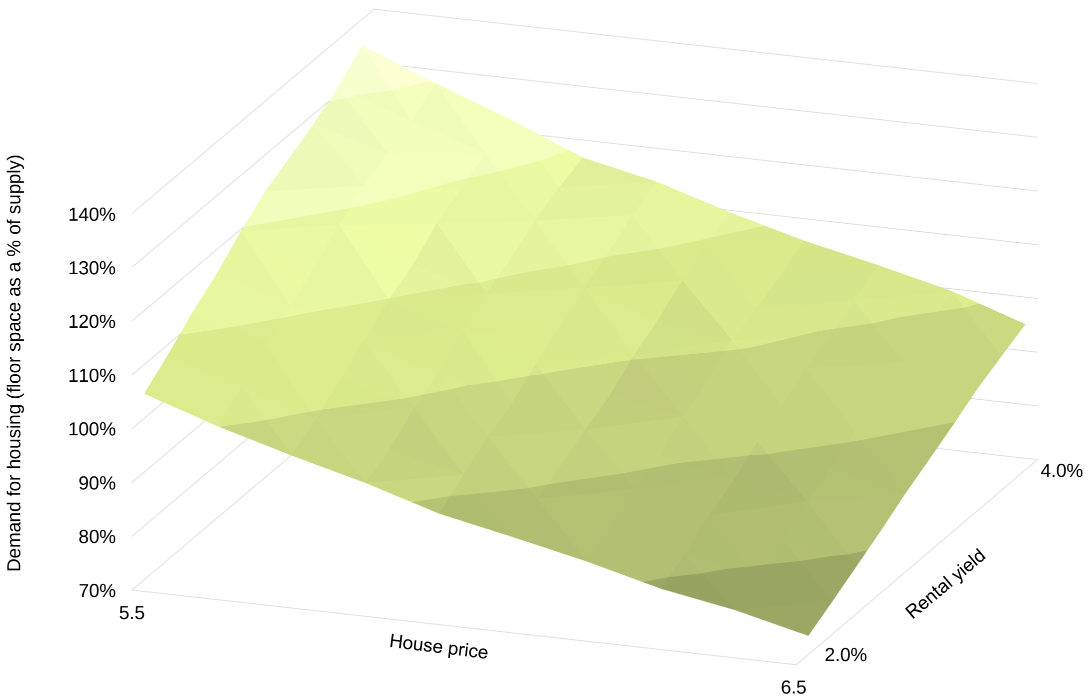


In Figure 2, we do the same thing for housing demand in terms of volume, or floor space, and we express it relative to total supply. This is also a decreasing function of prices and an increasing function of yields, and the collection of points where the plane intersects the 100% line represent all combinations (p_h, r_h) satisfying $H_{d,f} = H_s$.

This curve is not the same as the $H_{d,n} = N_t$ curve, as it is steeper. The only point where housing supply, housing demand, and rental demand and supply are all balanced is at the intersection of the $H_{d,f} = H_s$ and $H_{d,n} = N_t$ curves - this is the equilibrium of the model. Figure 3 visualises this.

Let us now abstract from supply considerations (imagine that $H_{d,f} = H_s$ at all times), and consider all the combinations of prices and yields that satisfy the demand for housing units. Out

Figure 2: *Surface area representation of demand for housing floor space as a percentage of supply under the baseline model, by p_h and r_h.*



of all these, are some preferable to others from a social perspective? It turns out that a low-price, low-yield combination is strictly better than a high-price, high-yield one from the point of view of equality. In fact, when prices and yields are high, landlord households enjoy high levels of housing wealth from their properties and higher levels of income from rent; meanwhile renters, who are poorer, find it harder to access home-ownership due to the high house prices, while also paying high rents. On the other hand in a low-price, low-yield world, renters would benefit from lower rents and easier access to housing, while wealthier households would have lower housing wealth and rental income; this would lower several measures of inequality. Indeed, we will see how in general any policy change that would lead to an equilibrium increase in p_h when keeping r_h constant, or vice-versa, will tend to lead to an increase in consumption inequality and a deterioration in welfare for the poorer households, the opposite also being true. Indeed, when we take a set of combinations of p_h and r_h that lead to housing unit demand equal to 100% of the population as per Figure 1, and calculate a number of Gini coefficients for households in these economies (assuming for the moment that supply = demand at all times), we observe that the consumption Gini coefficient rises markedly and monotonically, with p_h (and r_h), going from 34.0% when p_h is 5.5, to 35.4% with p_h of 6.5, indicating increasing inequality.

Going back to our full baseline specification, we report several measures of inequality in the first column of Table 2 and Table 3. In our baseline specification, p_h^* is calibrated to 5.8 times the aggregate wage and the corresponding optimal rental yield is around 2.48%. Homeownership is high at 75%

and measures of inequality are relatively low. We note that from these levels, an increase in housing demand by households (for example, due to an increase in preference for home-ownership) would shift the planes in Figure 1 and Figure 2 up, and lead to a lower equilibrium rental returns for each level of prices, and vice-versa.

Our primary interest is in the change in inequality, homeownership, and welfare measures as a result of policies. In the following four sub-sections we discuss four classes of housing policy:

1. Credit restrictions, by tightening of borrower-based regulation (subsection 5.1);
2. Introduction of institutional investors (subsection 5.2);
3. Decreased tax rates on rental income (subsection 5.3);
4. Housing supply policy, through construction sector efficiency and permitting (subsection 5.4).

We present results for the distributional impacts of these policies in Table 2 and Table 3, and we discuss them below. For our institutional investor, rental tax, and supply side policies we include estimates under both tight and loose credit constraints to understand how these policies interact. Finally, in subsection 5.5 we provide estimates for a scenario that combines a number of these policies in a negative way to demonstrate the quantitative implications of a series of potentially harmful policies.

5.1. Credit tightening: macroprudential measures

Credit conditions play a central role in a large lineage of heterogeneous agent life-cycle models because they affect equilibrium house prices and rents in general equilibrium.[13] While our primary interest is in distributional outcomes, rather than price dynamics, movements in prices and rental yields are a key transmission channel through which credit constraints affect households' tenure choices and welfare. For this reason, we begin by briefly describing how shifts in borrower-based macroprudential measures alter equilibrium prices and rents in our model.

Credit constraints affect housing markets through both extensive-margin tenure choice and general equilibrium price adjustments. Tightening borrower-based macroprudential rules restricts access to mortgage credit for some households that would otherwise become homeowners, shifting them into the rental market. At the same time, tighter credit can constrain landlords' ability to finance additional housing purchases, affecting the supply of rental units. These shifts jointly increase rental demand relative to owner-occupied demand and require an adjustment in equilibrium rental yields to clear the market.

In general equilibrium, the response of house prices and rents to tighter credit depends on housing supply conditions and the composition of housing demand. Empirical studies have

[13] See, for example Greenwald and Guren (2021)

Table 2: *Model outcomes: Macroprudential rules and institutional investors*

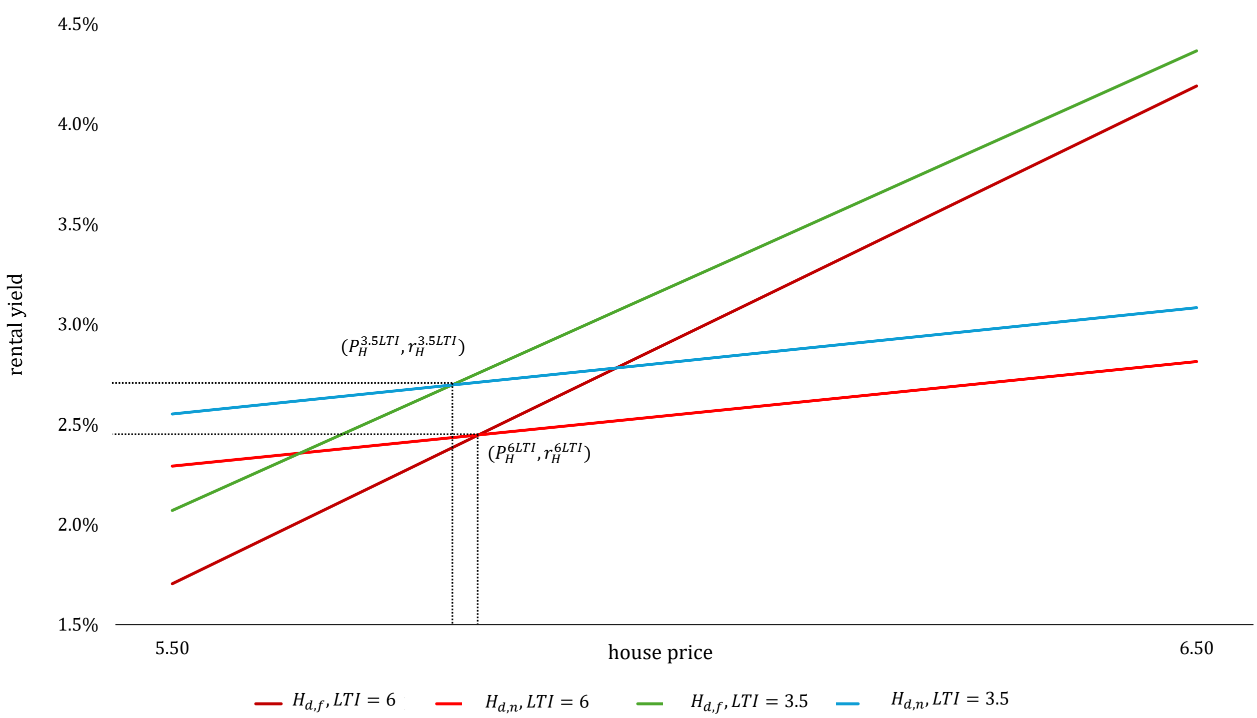
Simulation	Baseline	Section 5.1	Section 5.1	Section 5.2	Section **??**
LTI	6	3.5	6	6	3.5
LTV	90%	90%	75%	90%	90%
τ_{rh}	40%	40%	40%	40%	40%
Inst. inv.?	NO	NO	NO	YES	YES
r^{ii}	-	-	-	0%	0%
L	L	L	L	L	L
A_h	1.384	1.384	1.384	1.384	1.384
Housing Gini	38.0%	43.8%	38.8%	38.0%	44.8%
Wealth Gini	41.8%	40.7%	41.2%	43.2%	42.7%
Income Gini	28.0%	28.2%	28.0%	27.5%	27.4%
Consumption Gini	34.3%	34.5%	34.8%	33.3%	32.7%
CEV wrt baseline (all)	0%	-0.4%	-0.2%	2.0%	2.3%
CEV (low 20% wealth)	0%	-3.2%	-1.9%	8.4%	7.6%
CEV (top 20% wealth)	0%	0.9%	0.0%	-1.2%	-1.0%
Homeownership	75.0%	69.7%	74.5%	72.9%	65.9%
% landlord HHs in pop.	19.8%	23.1%	21.4%	14.7%	15.7%
p_h	5.8	5.78	5.82	5.8	5.76
r_h	2.48%	2.70%	2.63%	1.83%	1.83%
rent % avg. wage	14.4%	15.6%	15.3%	10.7%	10.7%

Notes: (i) Ginis on income are based on post-tax income from labor, transfers, rents (received), and interest. (ii) CEV stands for Consumption Equivalent Variation, or the amount of consumption in the Baseline simulation that would make the households indifferent between living there vs in the simulation in question, calculated as per Equation 7 (negative value = better off in Baseline); it is expressed as a percentage of the aggregate wage.

found that borrower-based macroprudential policies lead to a decline in house price growth.[14] In our framework, house prices are ultimately anchored by construction-sector fundamentals and population growth, and therefore respond only modestly to changes in credit conditions.[15] Rental yields, by contrast, adjust more strongly. As tighter credit increases the share of households that rent, rents must rise relative to prices to incentivize landlords to hold additional housing stock. As a result, price-to-rent ratios emerge as the key equilibrium object linking credit conditions to distributional outcomes.

Figure Figure 3 illustrates this mechanism by plotting equilibrium housing demand for housing units and floor space under loose and tight loan-to-income (LTI) limits. Tightening the LTI constraint shifts housing demand toward smaller units and rental housing, leading to a substantial increase in rental yields and only a small decline in house prices. While the limited dispersion in house prices partly reflects our stylized modeling of housing quality, the qualitative result that rental yields respond more strongly than prices is robust and central for the inequality results that follow.

Figure 3: *Equilibria of demand for housing floor space ($H_{d,f}$) and housing units ($H_{d,n}$), at 6 and 3.5 loan-to-income ratios. Both demand curves shift upwards, leading to higher yields and slightly lower prices.*



We begin by summarizing the distributional consequences of tightening borrower-based macroprudential policy before turning to a comparison of loan-to-income and loan-to-value constraints.

[14]See, for example, Kelly et al. (2018).

[15]The lack of variation in house price highlights the limitation of having only two sizes of housing due to computational constraints. A more complex modeling of housing quality would be likely to provide additional flexibility of house prices to demand shifts in response to housing policy.

Across specifications, tighter credit reallocates households across tenure states, with the largest effects concentrated among marginal homeowners who are pushed into renting, lifetime renters who face higher rents, and wealthier households that benefit from higher rental yields. These shifts translate into higher inequality in housing and lower welfare for the poorest, while effects on consumption inequality are more muted. We now describe these results in detail, starting with a tightening of the loan-to-income constraint.

5.1.1 Distributional effects of tightening loan-to-income ratios

Tightening borrower-based macroprudential policy through a reduction in the LTI limit has important distributional effects. The households most directly affected are those that would have obtained a mortgage under looser regulation, but instead are pushed into renting. These households experience losses in both welfare and disposable income, as they forego the utility premium from owner-occupied housing, while also suffering from relatively higher rental payments. Poorer households that rent in both scenarios are negatively affected due to these higher rental yields. Wealthy households with sufficiently high incomes, liquid assets, or both are unaffected by the policy directly. Those that own rental properties benefit from higher rental yields.

These effects are summarized in Table 2, which reports the effects of lowering the loan-to-income threshold from 6 to a significantly tighter 3.5. In this simulation, the decline in housing demand generated by the tightening in the LTI limit leads to an increase in the equilibrium rental yield, from the original 2.48% to 2.70%, while p_h falls only slightly to 5.78 times the aggregate wage. Homeownership falls from 75.0% to 69.7%, implying that a substantial fraction of the population (over 5%) has been pushed into the renter class. On the other end of the distribution wealthier households expand landlord ownership, incentivized by the high returns generated by this increase in rental demand.

The distributional consequences are most pronounced at the lower end of the wealth distribution. A larger share of households pay rent, and renters face higher rental payments, leading to significant declines in welfare and post-housing income for poorer households. Middle-wealth households that eventually become homeowners are comparatively less affected in the long run: for these households, tighter LTI constraints primarily delay the age of homeownership rather than permanently altering housing outcomes. However, a subset of households become lifetime renters as a result of the tightening, and for these households the welfare losses are permanent. At the top of the wealth distribution, landlord households benefit from higher rental yields and increased ownership of additional housing units. As a result, income and housing wealth inequality increase markedly, while consumption inequality is affected only modestly.

We can see this as housing Gini coefficients increase substantially, with small increases in income and consumption inequality. The wealth Gini actually falls in this case. This is driven by an increase in savings required to enter homeownership, particularly for those owner-occupiers in the middle of the wealth distribution. From a welfare perspective the policy is slightly negative on average, with consumption equivalent variation (CEV) falling by 0.4%. This masks an improvement of welfare at the top 20% of nearly a percentage point and a loss of more than three percent at the bottom.

5.1.2 Loan-to-value tightening, a comparison

Tightening the loan-to-value (LTV) constraint affects households through a different channel, restricting borrowing based on liquid wealth rather than income. This binds for a narrower group of households, particularly those who are young and relatively high-income that have not yet accumulated sufficient savings. While a delay in housing may have negative effects, they appear less pervasive than those induced by an LTI constraint. The need for a larger deposit both delays home-ownership and incentivises saving behaviour.

When the LTV limit is reduced from 90% to 75% (see column 3 of Table 2) we find a weaker effect on inequality than when from a tightening in LTI; however, it is still significant and in this case the credit tightening actually leads to a slight increase in prices as well as rental yields (raising the rent-to-income ratio). This somewhat counterintuitive result with respect to prices is in line with a literature that finds evidence for LTV ratios increasing prices. Chevallier and El Jouedi (2025) show in a theoretical model that LTV constraints can lead to increased equilibrium prices through a financial accelerator mechanism, creating two potential equilibria (one with a housing bubble and one without). Work by Lyons (2018) supports that this may be the case in our context, finding that introduction of LTV ratios increased sale prices. Our finding of higher prices with tighter LTV (which we wish to emphasize is quite small) is driven by the requirement of a higher deposit, rather than discouraging housing demand. In our model, tighter LTV rules encourage saving behaviour as well as slightly increasing the relative attractiveness of larger houses for owner-occupiers. The situation is similar to Figure 3, only that the demand for housing floor space barely moves compared to baseline, while the $H_{d,n} = N_t$ curve shifts up, leading to higher rental yields and prices at the same time. When LTV limits are tightened further, however, the restriction in credit starts to be much more binding, and leads to results that are closer to the LTI case; when LTV is lowered to 50%, for instance, prices fall back to 5.8 while rental yields increase further (2.7%) and the homeownership rate falls to 71%. This is consistent with Kelly et al. (2018) who use the loan level data in the same Irish context to study the transmission of credit conditions to housing values. They find that in the Irish context borrowers predominantly faced a binding LTI ratio, which served to ration credit, while tighter LTV rules had much smaller effects.

We have shown that borrower-based credit regulations have important distributional consequences. They also may convey large benefits through improved financial stability, which we do not model here. On the one hand our results suggest that central banks, and other financial regulators must calibrate these tools carefully to minimize their impact on low income households. However, because they have a critical role in regulating macro-financial cycles, they may be a necessary tool moving forward. For this reason we will report effects for our remaining policies under both tight and loose LTI regulation. This allows us to investigate whether other policy tools might allow regulators to keep tight credit conditions while also offsetting their negative distributional consequences.

5.2. Institutional investors

The main features of institutional investors in our framework are that (i) they are externally funded and deep-pocketed; (ii) they target a minimum return r_h^{ii} (which depends on their cost of funding, r^{ii}, and other factors as detailed in Equation 19), above which they are willing to supply as many rental units as possible; (iii) they will do so regardless of price (as there are no short-term price fluctuations within our model).

Due to these characteristics, the presence of institutional investors will provide an anchor on rental yields, flattening rental supply at r_h^{ii}. Any equilibrium where institutional investors supply units thus reduces rent, benefiting renters while reducing income of household-landlords. This shifts marginal households from owner-occupiers to renters and out of landlord classes. The extent to which this happens depends on the distance between the equilibrium rental return without institutional investors, and r_h^{ii}: the greater this is, the larger the effect. We assume r^{ii} equal to 0%, leading to $r_h^{ii} = 1.83\%$ as per Equation 19. As this is significantly below the 2.48% rental yield that would prevail in the absence of institutional investors (see above), the effects are quite noticeable. We can see the distributional impact of these investors in the last two columns of Table 2. Their presence leads to fewer households as landlords, reducing this from from 19.8% of the population in the baseline to 14.7%. There is also a large decrease in owner-occupied units as homeownership rates decline by 2.1 percentage points compared to baseline.

Wealth declines across the whole distribution, driven by the fact that less housing stock is in the hands of households, with a lower overrall return. This ultimately concentrates wealth further among wealthy housholds as seen by a rising wealth Gini. However income inequality falls[16] as does consumption inequality due to lower rents. Institutional investors have the potential to significantly reduce inequality by making the poorest households better off. The of the wealth distribution is 8.4% better off relative to baseline calibration, with overall welfare increasing by 2%. The top is hurt, but by a much smaller 1.2%. Rents as a fraction of average gross wages fall very substantially, from 14.4% in the baseline to 10.7%.

As with all of our remaining policy experiments we wish to understand how the presence of these landlords interacts with a tight credit regime. We illustrate this by tightening the LTI ratio to 3.5. When tighter credit pushes households into renting in subsection 5.1 this higher rental demand very strongly drives the rental yield, benefiting household-landlords. Institutional landlords, as modeled here, elastically supply these additional rentals. Thus we see in the final column of Table 2 we see that the presence of these investors offset all of the negative distributional consequences of macroprudential policy. Welfare increases relative to baseline (instead of falling). High levels

[16]Income distributions are the most sticky across our calibrations as the only way income inequality can be affected is through rental income to landlords as income heterogeneity is otherwise exogenous.

of housing and wealth inequality are extremely high in this context and driven by the fact that homeownership rate falls by over 9 percentage points.

Perhaps what is most interesting about this joint policy experiment is that in the presence of institutional investors, credit constraints (which had negative welfare effects previously) appear to be welfare improving. In the baseline case LTI rules lowered CEV by -0.4%. Here the increase this measure by 0.3 relative to the baseline with institutional investors. For at least our calibration, institutional investors appear to prevent the largest negative impact of these credit rules, while credit tightening limits at least some of the negative side effects that investor-landlords impose on wealthier households. Those who are pushed towards renting due to tighter policy do not have to pay higher rents, which has a ceiling at r_h^{ii}. Tighter credit crowds out fewer of the household-landlords than in the setting with institutional investors and loose credit. While this depends on the calibration, the degree of tightening of policy, and the level of r^{ii} it is a useful illustration that these credit controls need not be distributionally harmful (from a welfare perspective) in every context.

While we think this experiment is one that provides a great deal of insight, there are however several important caveats to consider. First is that we do not model competition for housing stock between households-landlords and institutional landlords. Households are crowded out from landlord status, but only because the presence of an efficient and competitive group that puts pressure on yields to remain low. Further these institutional landlords do not exhibit any monopolistic power on pricing. One could imagine large corporate landlords to dominate the market both crowding out domestic landlords and charging monopoly rents. Particularly if they are also pivotal in determining the supply of new units via construction.

For modeling convenience we make these institutional investors external deep-pocketed agents. Our results suggest that these kind of agents may be beneficial if governments can sufficiently protect domestic markets from the kind of anti-competitive behavior that could offset the distributional benefits we find here. Another way to think about them might be a domestic government buying (or building) social housing and renting it out at a favourable rate. In this case, the resulting equilibrium rental rate could in principle be even lower than r_h^{ii}, as such a government might be willing to accept a negative return. That would lead to even lower inequality, at the expense again of reduced homeownership and lower wealth at the upper end of the distribution; in addition, compared to 'external' institutional investors, all housing wealth, as well as all rental income, would stay within the domestic economy. All of this suggests that studying the role of institutional investors on the housing market and on inequality is worth exploring in future work.

5.3. Tax on rental income

In our baseline specification, we have rental income tax standing at 40%. This creates a large wedge between what renters pay, and the income eventually accruing to landlords. Reducing it might potentially reduce the burden to renters, increase the net return to landlords, or both. Here, we look at the effects of changing this tax rate within our framework.

Table 3: *Model outcomes: Taxes and Housing Supply*

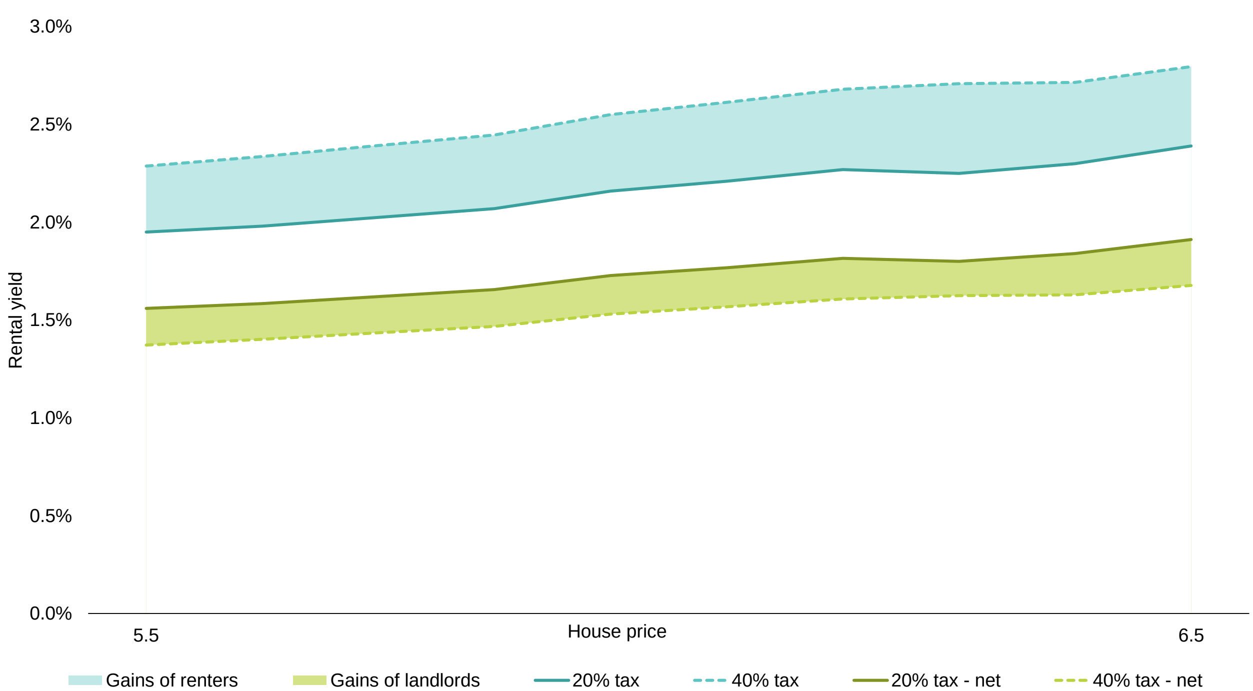
Simulation	Baseline	Sec. 5.3	Sec. 5.3	Sec. 5.4	Sec. 5.4	Sec. 5.4	Sec. 5.5
LTI	6	6	3.5	6	6	3.5	3.5
LTV	90%	90%	90%	90%	90%	90%	90%
τ_{rh}	40%	20%	20%	40%	40%	40%	45%
Inst. inv.?	NO	NO	NO	NO	NO	NO	YES
r^{ii}	-	-	-	-	-	-	0.5%
L	L	L	L	L*1.2	L	L	L*0.8
A_h	1.384	1.384	1.384	1.384	1.44	1.44	1.384
Housing Gini	38.0%	39.4%	43.8%	36.7%	37.6%	43.0%	44.6%
Wealth Gini	41.8%	43.0%	40.7%	41.6%	41.7%	40.8%	40.6%
Income Gini	28.0%	28.0%	28.2%	28.0%	27.9%	28.1%	27.9%
Consumption Gini	34.3%	33.9%	34.5%	33.9%	34.0%	33.9%	35.5%
CEV wrt baseline (all)	0%	1.2%	0.6%	1.4%	0.8%	0.4%	-2.9%
CEV (low 20% wealth)	0%	5.2%	1.3%	1.7%	2.4%	-0.1%	-9.6%
CEV (top 20% wealth)	0%	-0.8%	0.3%	-1.4%	-0.2%	-0.8%	3.6%
Homeownership	75.0%	73.8%	69.7%	76.8%	75.8%	70.6%	68.1%
% landlord HHs in pop.	19.8%	20.0%	24.6%	19.7%	19.9%	23.2%	22.1%
p_h	5.8	5.8	5.8	5.34	5.5	5.48	6.52
r_h	2.48%	2.08%	2.32%	2.30%	2.40%	2.59%	2.91%
rent % avg. wage	14.4%	12.1%	13.5%	12.3%	13.2%	14.1%	18.9%

Notes: (i) Ginis on income are based on post-tax income from labor, transfers, rents (received), and interest. (ii) CEV stands for Consumption Equivalent Variation, or the amount of consumption in the Baseline simulation that would make the households indifferent between living there vs in the simulation in question, calculated as per Equation 7 (negative value = better off in Baseline); it is expressed as a percentage of the aggregate wage.

As with any tax a key question is: who bears the burden? Does the majority of the tax burden fall on renters, increasing their payments, or does it fall mostly on landlords, by reducing their effective after-tax rental yield? The answer to this question is important for the implications of policy for inequality, and it can depend heavily on calibration and indeed the interaction with other policies. In addition, in the reality the revenue generated from such a tax can be used in a number of ways that can further contribute to or mitigate inequality. For instance, the Government could use the tax revenue to decrease other tax rates, subsidize house building, or on social spending (including social housing), etc., all with very different implications, some of which we separately discuss in other sections.

The interaction with other policies can be significant. Are expenses on maintenance, property taxes, or mortgage income deducted from the tax? Do institutional investors pay the same tax rate on their rental income or do they pay a (higher or lower) tax on their profits? For the sake of this exercise, we limit ourselves to observing what changes when the tax rate on rental income is reduced, within the setting of our baseline model, from 40% to 20%. In order to concentrate on the change in the tax rate alone rather than the use of the revenue it generates, we assume that any shortfall in tax revenue from the reduction in the tax is taken from the provision of public services, which do not impact household decisions, income, or wealth.

Figure 4: *Lowering τ_{rh} benefits both renters and landlords, but not in equal measure*



We can see the result of the reduction in τ_{rh} under both loose and tight credit constraints in the second and third column of Table 3. Looking first at the loose regime we see, unsurprisingly, a large decrease in the equilibrium rental yield. Both renters and landlords stand to gain thanks to the reduction in the tax, with the first paying a lower rent and the second receiving a higher after-tax rental income relative to the baseline specification. From the original 2.48%, the equilibrium (gross) rental yield falls to 2.08%. This represents a fall of about 16% in the level of rental payments by renter households compared to baseline, with rents as a proportion of average income falling from 14.4% to 12.1%, meaning that each single renter is better off by more than 2% of average income. Despite the decrease in yields, landlords are also better off because thanks to the decrease in tax, their after-tax return is still higher compared to the after-tax return under the baseline simulation. From getting taxed 40% on a yield of 2.48% (net yield, 1.49%), they are now taxed 20% on a yield of 2.08%, with net yield of 1.66%. That is a more than 11% increase in after-tax income.

All households (apart from owner-occupiers) stand to benefit from a reduction in the tax, but renters significantly more so than landlords under this calibration. We show this in Figure 4, where we have evaluated the equilibrium rental yields and net rental yields (i.e., respectively, what renters pay and what landlords receive after tax) at income tax rates τ_{rh} of 40% and 20%, across a number of different levels of p_h. At all p_h levels, the gains made by renters are about twice as large as those made by landlords when the tax rate is decreased. This suggests that the burden of the tax falls mostly on renters. It thus appears as though, despite the fact that it is a tax levied on landlords' income, rental income tax (at least under our calibration) is a regressive tax, as it hits poorer households more than wealthier ones (in monetary terms, but even more so in proportion to their income). Indeed, while housing and wealth inequality increase with the reduction in the tax (presumably, because landlords have an even higher net return now),[17] consumption inequality declines, and welfare rises significantly on average but especially so that of poorer households.

Tightening the LTI ratio has a similar effect as in subsection 5.1, in that r_h rises, poorer households are worse off, consumption inequality rises, homeownership falls and the share of landlords increases. Here, the macroprudential rules work in something of an additive way and shift welfare metrics in much the same way as they do in the baseline. Note, however, that this is not enough to completely reverse the welfare benefits of lowering τ_{rh} in the first place. Policymakers operating in a tight credit environment might consider such a tax cut as a means to offset the cost of tighter credit rules,[18] though as with many welfare improving policies in our work this would come with much lower rates of homeownership.

5.4. Measures on the construction sector

As described above, the construction sector is a major determinant of the steady-state level of p_h. The specific level of p_h that allows for housing supply to match demand is dependent on characteristics of the production function of the construction sector. As low-price, low-yield equilibria are preferable from an equality standpoint, inequality can be reduced if construction expands. When this happens, a lower price is required for the construction sector to be able to meet housing supply requirements,

[17] And also, there is effectively more money going around, because we did not change any other tax rate.
[18] Provided that landlords are not able to absorb a much larger share of the benefits.

leading to a lower equilibrium price. An increase in construction output can be achieved in a number of different ways, with similar implications. We look at two of these.

First, we assume that the number of land permits is increased by 20% in every period. This leads to a decrease in the equilibrium p_h and r_h, from 5.8 and 2.48% to 5.34 and 2.30% respectively. As seen in column 4 of Table 3, moving to a lower-price, lower-yield equilibrium significantly lowers consumption and housing inequality, and improves welfare on average. This is because lower house prices coupled with lower rental yields lead to significantly lower rental payments (which are $p_h \times r_h$), benefiting poorer households who can enjoy higher disposable income and consumption. Rent as a percentage of the average wage falls from 14.4% to 12.3%. This is the first of our experiments that is able to increase homeownership rates relative to the baseline.

The lower price allows households to purchase houses earlier in life, with or without loans, and therefore to enjoy the associated utility benefits for longer. Utility improvements compared to baseline remain largest for renting households, but they are strong for (non-landlord) homeowners as well due to this. While the wealth of landlord households is negatively affected by the lower house price and lower returns from the properties they rent, we also note that in general these households benefit from the lower house prices earlier in their life.

Next, we simulate an increase in the productivity of the construction sector, with A_h increasing 4% from 1.384 to 1.44. While this is not directly a policy lever, there are many examples of existing policies that directly effect productivity in this market. A common example is improving efficiency of planning and legal systems in which the construction firms can operate.[19] The outcome of this scenario is very similar to an increase in land permits, as seen from column 5 of Table 3, though this policy has less extreme price effects and thus hurts landlords substantially less. From the perspective of winners and losers in our model, it does not matter how the expansion in supply is achieved.

We use this second supply simulation to explore interactions with credit constraints, tightening LTI limits to 3.5 simultaneously with our productivity expansion in column 6. As happens for the baseline simulation, even with the increased housing supply at all p_h levels, tightening the LTI threshold from 6 to 3.5 will lead to lower demand for housing, and an equilibrium with higher rental yield (2.59%), a lower house price (5.48) and lower welfare and homeownership. However, rent relative to the average wage remains slightly below baseline. Qualitatively this tightening looks similar to that in the baseline, but the negative side effects are smaller at the bottom, about a 2.5% CEV reduction in the high supply case after tightening rather than 3.2 in the baseline tightening. This is because house prices in equilibrium are lower, and thus fewer households are affected by the LTI limit even when it is tightened: with p_h of 5.8 and LTV of 90%, a household needs an income of 0.87 for a 90% loan at 6 LTI and 1.49 for an LTI of 3.5; with p_h of 5.20, the equivalent incomes required fall to 0.78 and 1.34, respectively. Further high wealth households are slightly worse (rather than sligtly better) from this policy. Like the case of institutional investors, supply policies interact with credit rules in a non-additive way through the fact that they shift these prices.

[19]These are widely viewed as especially salient in the Irish context in which we calibrate our model.

Supply-side policies are commonly supported by economists in the policy sphere as a means of moderating price of housing services and the potentially large negative impacts that they have on lower income households. There are few papers that quantify this effect in the context of heterogeneous macroeconomic models. In recent work, Mense (2025) studies shocks to new housing supply on rental markets, finding that rents fall by 0.19% following a 1% increase in new housing supply. This is smaller than their model estimate of a -0.46 elasticity of rents to new housing builds.[20] Our model estimate for column 5 of Table 3 shows rental yields falling by 3.2% in response to a 2.7% increase in housing builds due to a direct increase in A_h, implying an elasticity of -1.2. Our model primarily works through household demand, with simple supply side mechanics, while Mense (2025) models a rich market for housing and relatively stylized demand. While this elasticity is not a target of our work, both the demand mechanisms studied here, and the supply mechanisms in Mense (2025) appear to be important for determining the relative impact of supply shocks on rents, and therefore distributional welfare.

5.5. A not implausible negative scenario

In the simulations above, we have analysed the distributional impact of policy changes around a relatively favourable baseline scenario. The reality is, however, that a number of advanced economies are far from our baseline scenario at the moment, being concurrently faced with insufficient supply of housing, high rents, tight regulation, high taxation, etc. Here, we simulate a scenario where we combine a number of the above policies in an unfavourable way, to show how quickly they can add up and contribute to significant inequality. Namely, we set land permits to 80% of the baseline rate, allow for institutional investors (but with a relatively higher r^{ii} of 0.5%), we set the LTI limit to 3.5, and we increase the rental income tax rate to 45%. This combination is unfortunately far from implausible.[21]

Under this scenario, a large number of households end up being much worse off. As seen in the final column of Table 3, consumption and housing inequality measures increase substantially compared to the baseline and most other scenarios examined, with the homeownership rate also falling steeply to 68.1%. The equilibrium p_h jumps to 6.52 and the equilibrium rental yield reaches 2.91%; together, this implies that renters spend about 4.5% of the average wage more on rent under this scenario compared to the baseline.[22] For all homeowners, wealth increases substantially compared to the baseline simulation, as housing is more expensive but also of higher return - in fact,

[20] There are a range of elasticities provided as their work estimates elasticities across market segments, here we reference the average.

[21] Indeed, it is not far from the current situation in Ireland: household landlords pay a marginal tax of around 50% on rental income when including all types of taxation (but mortgage repayments are deductible); the planning process is slow and inefficient; construction sector productivity is low by euro area standards; a large proportion of the rental market is in the hands of foreign investment funds; LTI and LTV limits for first-time buyers are respectively 4x and 90% currently.

[22] Note that renters typically earn much less than the average, and we are talking about the gross wage, so this is an even heavier burden to them.

the wealthiest households gain the most wealth, and increase their consumption levels accordingly. On the other hand, renters see their limited wealth further reduced due to the high rental rates. Their net income and consumption, and thus welfare, all fall sharply.

6. Conclusions

How can policymakers set macroeconomic housing policy with distributional consequences in mind? We hope that results highlighted in this paper can shed some light into a range of mechanisms that are worth considering. One of the clearest takeaways is that a given policy's impact on local rental yields is a critical metric to understand its distributional effects. Across all experiments we run there is a tight and very nearly monotonic relationship where falling yields lead to rising average welfare, with large positive effects concentrated among the bottom 20% of households in the wealth distribution. Generally policies that benefit the bottom have some negative impact on the top, but this relationship between yields and welfare are less clear with respect to the welfare of these individuals. While lowering rental yields, whatever the means, helps the bottom of the distribution, it is not clear that doing so must have correspondingly large negative effects on the top.

We read these results as strong evidence in support of supply-side measures. Particularly those aimed at improving efficiency in the supply of housing units as these provide strong benefits without being overly punitive to the top of the distribution. This could be particularly powerful if coupled with increased presence of institutional rental properties, either from well regulated investors or directly provisioned by the government through public housing. A review of rental income taxation (for household landlords) could end up benefiting renters and decreasing inequality. Critically our results suggest that increasing taxes on this income may have quite strong negative implications. Each of these policies could have a role in offsetting the negative distributional side effects associated with tight credit conditions. Macroprudential tightening, either through these borrower-based measures or otherwise, are likely going to be important tools going forward. Governments should be working to understand ways to make sure these tools can continue to provide financial stability, without hurting those at the bottom.

One challenge that is worth mentioning is that policymakers may not agree on the relevant outcome to focus distributional policy objectives. Much of the debate around housing scarcity focuses on getting households on the housing ladder, ultimately increasing homeownership rates. If this is an objective of policy-makers then there is only one solution consistent with our results: increase supply. In all other calibrations we find mechanisms with which to improve distributional outcomes, but these always work through improving the welfare of renting households often while pushing large numbers of individuals into that group. Further we find many policies that increase wealth Ginis, but improve average and bottom quintile welfare. These welfare measures are the more relevant metric for whether an individual is better or worse off, but a policy may be unpalatable or politically difficult if it comes with rising wealth inequality.

We note that there are many unanswered questions remaining and a large number of policy levers we cannot include here. Future work could extend our analysis to different forms of housing policy, such as help-to-buy schemes or more sophisticated (and realistic) taxation and deduction measures. It might also be valuable to drill deeper into a particular policy to fully flesh out the complex heterogeneity provided by a model such as ours, where there are multiple margins and cutoffs that imply winners and losers at multiple different parts of wealth and income distributions. Ultimately we emphasise that any study that wishes to understand the role of policy to affect inequality should take the housing market seriously. For better or worse it is an asset that makes up the majority of households' wealth and is therefore absolutely central to any serious attempt to understand and minimise such distortions.

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Appendix

A. An alternative calibration

While the baseline model is calibrated to Ireland, which we chose for some peculiarities of its housing market (such as relatively tight borrower-based macroprudential policies coupled with insufficient housing supply), the results of this paper are not confined to the Irish situation. Here, we calibrate the baseline model to a 'median' euro area economy,[23] and (i) tighten LTI limits and (ii) introduce institutional investors in this economy to show how, despite differences in preferences, supply and tax rates, the effects are comparable to those we have examined above, and similar results can be repeated for different economies. We do not replicate our full set of results here, but this can be done within our framework for any type of economy.

Some key differences in calibration from Ireland are demographics (with Ireland being a younger economy with rapidly growing population - here we use survival rates for France in 2022 (Human Mortality Database, 2020), and a lower cohort growth rate n of 0.25%) and taxation (European Commission, 2025). There is a lower homeownership rate in the euro area on average (about 5 percentage points lower than in Ireland), but Ireland is pretty close to the median.[24] Euro area economies tend to have a different age-earnings profile, while a price-to-income ratio of 5.8 remains appropriate to the euro area just like for Ireland based on calculations from HFCS data (Household Finance and Consumption Network, 2022). To match these facts, as can be seen in Table A.4, the euro area calibration ends up having higher construction sector productivity and more permits per 'new' population, and lower preferences for housing. Interest rates on both deposits and loans remain the same as monetary policy is the same across the euro area, including Ireland.

As for the policy experiments, these are just as relevant to other euro area countries (or any other economy) as they are for Ireland. For instance, macroprudential policies are widely used in euro area countries (see Durante, Rusnak, and Tereanu (2025) for the current state of borrower-based measures in the euro area), and both supply side considerations and taxation are important determinants of house prices and rent levels anywhere in the world.

The replicated baseline, tight LTI and institutional investors simulations for this median euro area country, and relative results are displayed in Table A.5. We find comparable effects to those discussed in the main sections of this paper (compare Table 2): namely, when LTI limits are tightened this leads to increased housing inequality, a lower homeownership rate, slightly lower p_h and a higher r_h (resulting overall in higher rents relative to income), while when institutional investors are introduced they lead to much lower yields (lowering income and consumption inequality) as well as lower homeownership. This suggests that our results can be generalised to different contexts given

[23]Euro area economies can differ substantially in important aspects for this model - the same can be said about specific local housing markets in large economies such as the United States - so for the purposes of this exercise, where appropriate we choose our parameters to broadly match a hypothetical 'median' euro area economy in each dimension.

[24]Eurostat, https://doi.org/10.2908/ILC_LVHO02

Table A.4: *Calibrated parameters of the baseline model, 'median' euro area country.*

Parameter	Name	Value	Source/Calibration
Household utility			
Discount factor	β	0.96	Internal
Preference for home-ownership (hh type 1)	ω_1	1.50	Internal, EA
Preference for home-ownership (hh type 2)	ω_2	1.25	Internal, EA
Ratio of quality between house sizes	h_q	1.25	Internal
Share of households of type 1		0.6	
Preference for housing w.r.t. consumption	ϕ	0.25	Internal, EA
Elast. of substitution, housing and cons.	$1/\gamma$	1.25	Kaplan et al. (2020)
Inter-temporal elasticity of substitution	$1/\theta$	0.5	Kaplan et al. (2020)
Altruistic motive for bequests	ψ_1	-9.5	De Nardi (2004)
Luxury of beq. of 1st home	ψ_2	10	HFCS, Internal
Average prob. of being bequest recipient	π_{beq}	0.05	
Maximum number of housing units	h_{max}	5	HFCS, Internal
Banking sector and mortgage market			
Exogenous risk-free rate on deposits	r_b	0.00	Euro Area
Intermediation wedge	κ	0.02	Euro Area
Loan-to-income macroprudential threshold	λ_{LTI}	6	Policy variable
Loan-to-value macroprudential threshold	λ_{LTV}	0.9	Policy variable
Construction sector			
Land permits per capita	L	$1.375(nN_t)/10$	HFCS, Internal
Productivity of the construction sector	A_h	1.488	HFCS, Internal
Depreciation of housing stock	δ_h	0.01	Standard
Wages			
Age-earnings profile: coeff. on age	β_{age}	0.0241144	HFCS, regression
Age-earnings profile: coeff. on age squared	β_{agesq}	-0.0003805	HFCS, regression
Age-earnings profile: constant	β_{const}	9.661871	HFCS, regression
Standard error of the white noise process	σ_ϵ	0.12	
Autoregressive coefficient	λ	0.985	
Government			
Tax on labor income	τ_w	0.35	Euro Area
Tax on interest income	τ_k	0.25	Euro Area
Tax on property wealth	τ_h	0.002	Euro Area
Tax on rental income	τ_{rh}	0.35	
Social security replacement rate	γ_{repl}	0.50	

an appropriate calibration.

Table A.5: *Model outcomes: Alternative calibration*

Simulation	Baseline	Low LTI	inst. inv.
LTI	6	3.5	6
LTV	90%	90%	90%
τ_{rh}	40%	40%	40%
Inst. inv.?	NO	NO	YES
r^{ii}	-	-	0%
L	L	L	L
A_h	1.488	1.488	1.488
Housing Gini	39.4%	43.3%	40.7%
Wealth Gini	43.3%	41.8%	44.0%
Income Gini	27.6%	27.9%	27.2%
Consumption Gini	32.9%	32.7%	31.6%
CEV wrt baseline (all)	0%	0.1%	3.2%
CEV (low 20% wealth)	0%	-2.7%	10.1%
CEV (top 20% wealth)	0%	0.4%	-1.9%
Homeownership	75.0%	71.2%	70.3%
% landlord households	20.1%	23.1%	14.0%
p_h	5.8	5.78	5.8
r_h	2.58%	2.80%	1.90%
rent % avg. wage	15.0%	16.2%	11.0%