CAGE

Working Paper

753/2025
May 2025

Income Inequality and Housing Affordability

Teng Ge and Ali Moghaddasi Kelishomi

Income Inequality and Housing Affordability

By Teng Ge* and Ali Moghaddasi Kelishomi†

May, 2025

Abstract

Rising income inequality poses significant challenges to housing affordability. Using a general equilibrium search model with heterogeneous buyers and sellers, this study explores the relationship between income inequality and housing market outcomes. Our theoretical framework unveils three distinct equilibria: affordable (integrated), pooled (partially segregated), and vertical (fully segregated). We demonstrate that a mean-preserving increase in income inequality leads the market to transition from an affordable matching equilibrium to a vertically segmented one, passing through a region of multiple equilibria where small shifts in fundamentals can generate large, discontinuous changes in market outcomes. Similar market dynamics are predicted by increasing the proportion of rich buyers. Through the externality related to the composition of sellers in the market, poor buyers are worse off and rich buyers are better off as the market transitions from affordable to vertical equilibria. Leveraging Chinese data, we illustrate the model's applicability to real-world scenarios. Our findings have important policy implications, such as progressive taxation and redistribution, targeted affordable housing policies, and policy signalling, for addressing housing affordability challenges in an era of rising income inequality.

JEL: C78, D31, R13, R31

Keywords: Income Inequality; Affordable Housing; Housing Price; Search and Matching.

*Oxford Brookes Business School, Oxford Brookes University. E-mail: tge@brookes.ac.uk

†Corresponding author, School of Business, Loughborough University, Epinal Way, Loughborough, UK. E-mail: a.moghaddasi@lboro.ac.uk. Declarations of interest: none

1 Introduction

Rising income inequality, a global phenomenon prevalent across various nations, has emerged as a critical societal challenge, hindering economic mobility, and exacerbating social disparities (Alvaredo et al., 2018). At the same time, soaring housing prices have provided significant challenges to housing affordability (Hilber and Vermeulen, 2016). What impact does the rise in income inequality have on the housing market affordability? Previous literature offers mixed results on the relationship between income inequality and house prices, with findings heavily dependent on chosen mechanisms and data contexts. This paper investigates the nexus between income inequality and the dynamics in housing market affordability through the lens of search-and-sorting in a frictional market.

We construct a general equilibrium search model where house buyers and sellers meet potential trading partners. House buyers are ex-ante heterogeneous with different willingness to pay, while the developers endogenously choose their type of properties to build, executive or affordable. Upon completion, investments are irreversible, and developers become sellers of the corresponding type. Buyers and sellers search for potential partners to trade with. When matching is mutually agreeable and buyers and sellers match, the house price is determined through Nash bargaining.

We point out that buyer and seller sorting has non-trivial effects on housing market affordability in a model with two-sided heterogeneities. This gives rise to three different market equilibria, which are of interest: in the *vertical housing equilibrium*, the market is segmented into a high-end market in which rich buyers exclusively trade with executive house sellers, and affordable house sellers only trade with poor buyers; in the *pooled housing equilibrium*, rich buyers trade with either type of sellers; and finally, in the *affordable housing equilibrium*, developers only invest in affordable houses, there is no provision of executive housing in the market, hence, affordable house sellers trade indiscriminately with both rich and poor buyers. The sustainability of affordable housing equilibrium relies on the availability of rich buyers; a low stock results in reduced demand for executive housing, ensuring the affordable housing equilibrium is sustainable. Given the free entry into the market, if the market instead builds some executive housing, the rich become pickier, the stock of executive sellers increases and then so does the demand for executive housing. Consequently, this transition brings the market into a state of vertical housing equilibrium. Therefore, our model provides a microfoundation resemblance to *Say's law*: 'supply creates its own demand', in a version of the housing market.

The literature traditionally mainly focuses on the relationship between house prices and income, placing less or no emphasis on the distribution of income and income inequality. Our paper contributes to a growing new branch of literature on housing markets and income inequality by deepening the understanding of the impact of income inequality on housing market affordability. We show that rising income inequality triggers four distinct forces in the housing market: an income effect, a queue length effect, a composition effect, and a forgone value effect. Among these, the composition effect, which reflects a shift toward more executive sellers and fewer affordable homes, dominates when the market transitions from integrated to more segmented equilibria. This shift increases competitive pressure on affordable housing, driving up prices for poorer buyers while simultaneously expanding supply at the top end, lowering prices for richer buyers.

Our model uses a mean-preserving income spread to study how changes in income inequality affect housing market outcomes. As inequality rises, the market transitions from an affordable matching equilibrium to a vertically segmented one, where rich buyers trade exclusively with executive sellers. This endogenous sorting creates a segmented market structure, reinforcing the strategic complementarity between rich buyers and executive sellers. As a result, developers reallocate supply toward executive housing, reducing the availability of affordable homes.

This shift generates a composition effect that raises prices for poor buyers while lowering them for rich buyers, even without the changes in income. Poor buyers face longer search times and reduced liquidity due to growing queue lengths and tighter competition for affordable units. These dynamics are non-linear: small changes in fundamentals, including marginal increases in inequality, can trigger abrupt equilibrium shifts due to the model's multiplicity. Within each equilibrium, further increases in inequality affect prices through the income effect, but these changes do not necessarily imply improved affordability for any group.

Our research makes two key contributions to the study of inequality, housing affordability and urban economics. First, we explicitly model the search process in the housing market, recognising the significance of considering time on the market as a crucial factor in addition to the price for market clearance. In a hot market, not only are prices elevated, but the time to sell is also shorter. Conversely, if the market is cold, sellers not only reduce their prices but also experience an extended period before a sale is concluded. Moreover, the search friction generates local monopoly power so that the transaction prices are not determined only by supply and demand but also by opportunity costs. As a result, our model can generate housing market equilibria in which soaring transaction price co-exists with excess supply. This mechanism is missing in traditional models of residential investment (see, for examples: Bertaut, 2002; Case et al., 2005; Hongyu et al., 2002; Muellbauer and Murphy, 1997; Wang, 2011; Zhang, 2016). Secondly, it contributes to the existing search-and-bargaining literature that has been silent on the importance of income inequality in driving the housing market dynamics (see, for example: Albrecht et al., 2007, 2016; Carrillo, 2006; Genesove and Han, 2012; Wheaton, 1990). Our research endeavours to fill this gap.

1.1 Related literature

There have been recent studies that have explored topics related to our work. Määttänen and Terviö (2014) builds an assignment model featuring two-sided heterogeneity, imperfectly transferable utility, and exogenous distribution of house quality that can generate a positive assortative matching between wealth and house quality. However, their model predicts a contrary outcome to our empirical observation, suggesting that an increase in inequality will drive down the equilibrium house price. The effect mechanism in their model differs from ours. In our model, the dynamics stem from the feedback that the change in income distribution exerts on the distribution of housing qualities. Additionally, we demonstrate the existence of other possible sorting equilibria, a feature not considered in their model.

Kösem (2021) presents another pertinent study that establishes a relationship between inequality and housing prices through the nexus of the housing market and the mortgage market. In their model, an increase in mean-preserving income inequality results in a higher proportion of risky borrowers in the mortgage market, leading to a decrease in housing demand and, consequently, a decline in housing prices. Her findings for the U.S. housing market reveal a positive association between the Gini coefficient and housing prices, yet a negative association with the growth of housing prices. Additionally, the author identifies a negative correlation between inequality and the price-to-income ratio. In contrast, our model delves into the complex impact of income inequality on housing prices. Depending on the types of matching equilibria and option values derived from the search process, the negotiated price may either increase or decrease with income inequality. Thus, our model offers a more comprehensive theory on the relationship between income inequality and housing market affordability.

Recent literature has explored the impact of spatial sorting and superstar cities on income inequality and housing affordability. Couture and Handbury (2022), Van Nieuwerburgh and Weill (2010) and Diamond and Gaubert (2022) investigate spatial sorting across cities or commuting zones and its impact on living costs and amenities, while Gyourko et al. (2013) and Chen et al. (2019) find that the concentration of high-income households in supply-constrained locations exacerbates income segregation and perpetuates inequality. In their model households/cities are heterogeneous in terms of ability/productivity. Following an increase in the dispersion of productivity shocks, more able households may find it optimal to sort into more productive cities. Since housing construction is restricted, the flow of workers to high-productivity cities pushes the housing prices up in these cities and results in a higher price dispersion. Our model differs in terms of the method and assumption. We do not model the source of income inequality; instead, our model focuses on the endogenous response of housing supply to changes in income distribution within a city and affordability. Additionally, We refrain from imposing any restrictions on housing construction, other than the natural time-to-build assumption, and emphasise the implications of search frictions in our analysis. We show that even in the absence of supply constraints, changes in income inequality can lead to significant shifts in the composition of housing types and affect affordability.

Empirical studies on developing countries reveal contrasting results compared to the findings in the previously mentioned studies. For instance, Zhang et al. (2016) employs self-reported housing value and income data, revealing a positive association between the Gini coefficient and the housing price-income ratio, as well as the housing vacancy rate in China. The authors show that increased inequality, measured by either the Gini coefficient or income gap, drives up the price-to-income ratio. Furthermore, the study finds that inequality has a larger negative effect on house affordability for low-income households compared to middle-income households. Interestingly, the housing cost burden of the top-income family is observed to decrease with increased inequality. Our model provides a plausible theory to explain how housing prices adjust in response to inequality. More importantly, our model could generate these non-monotonic adjustments in house affordability and explain why different income groups are influenced differently in the housing market. In section 5, as an illustrative example, we leverage Chinese data to demonstrate how our model suitably explains certain salient features of the Chinese housing market. Specifically, we discuss the deterioration of housing market affordability in recent years, even in cities that have witnessed an excess supply of housing.

In the context of Germany, Dustmann and Zimmermann (2021) investigated how income inequality amplified both housing and non-housing consumption from 1993-2013. Utilising a a fixed price model, their empirical findings reveal that higher inequality implies a higher housing expenditure share for low-income families, but a lower housing expenditure share for high-income families. This observation is consistent with our model's prediction in Pooled Matching equilibrium. Despite other contributing factors, such as the rise in single households and changes in dwelling size and quality, there still exists a 41% unexplained increase in housing expenditure share for the bottom quintile. Our model offers a plausible explanation for these observations.

In a different context, Bertrand and Morse (2016) provide evidence for a similar supply-driven demand channel in the U.S. They argue that higher income inequality in a market increases the supply of "rich" goods within this market which might then induce the middle-income consumers to demand and consume more of these goods. Our model, however, focuses on the housing market and the associated sorting mechanisms.

A natural benchmark for comparison is Rosen (1974)'s hedonic pricing model, which provides a foundational framework for analysing housing markets without search frictions. Rosen conceptualises housing as an implicit market for property characteristics, with equilibrium achieved purely through price adjustments. In this frictionless setting, transactions occur instantaneously, with no account taken of search time or inventory. By contrast, frictional search-and-matching models emphasise that housing markets clear not only through prices but also via inventories and time, particularly the time required to complete transactions (Zhu et al. (2017); Han and Strange (2015)). The search frictions in our model generate three important implications. First, our model predicts three distinct pure-strategy Nash equilibria: the integrated affordable matching equilibrium, the segregated vertical matching equilibrium, and an intermediate pooled matching equilibrium. Each equilibrium is characterised by its own distribution of transaction prices and time-to-sell. Second, unlike the Rosen model where equilibrium takes the form of an implicit market for each hedonic attribute, requiring all consumers in that market to value attributes identically, our model allows rich buyers, with higher willingness to pay, to compete with poor buyers for affordable housing in the same market under pooled matching. This competition generates an externality that reduces affordability for poor buyers. Third, our model predicts regions of multiple equilibria, where small shifts in fundamentals can trigger large, discontinuous changes in market outcomes, which lead to innovative approaches in policy implications for policy makers. These insights highlight that incorporating search frictions fundamentally alters both the structure and dynamics of the housing market, capturing mechanisms of affordability and segmentation that are absent in Rosen's frictionless framework.

Our study can also be related to the growing empirical evidence challenging the "trickle-down" economic hypothesis. For example, Matlack and Vigdor (2008) shows that income inequality is associated with higher housing costs, measured by rent per room, by the poor where the elasticity of supply is small. We link the problem of affordability to the composition of supply rather than merely inelastic housing supply due to zoning laws or other housing market regulations.

The remainder of the paper is organised as follows. Section 2 sets up our theoretical model. We discuss the mapping of the market equilibria in section 3. Section 4 presents our main results. In section 5 we discuss our model's relevance to the housing dynamics in China's economy. Section 6 proposes policy implications to improve the housing affordability issues in the long run. Section 7 concludes.

2 Model

In our model time is continuous. All agents are assumed to be risk neutral, have the same discount rate $r \in (0, 1)$, and live infinitely. There are three types of agents in the market: buyers, sellers, and developers. Let b be the measure of active buyers in the market, λ be the share of rich buyers, R-type, who have a higher willingness to pay in the property market, and $1 - \lambda$ be the share of poor buyers, P-type, who have a lower willingness to pay in the market.[1] Let s be the measure of ex-ante heterogeneous sellers in the market, η be the share of sellers in possession of one unit of an indivisible luxury executive house, E-type, and $1-\eta$ be the share of sellers in possession of a unit of affordable house, A-type. Note that s , b , λ, and η are all endogenous variables determined in the model.

Ex-ante homogeneous developers are free to enter the market and to choose any type of development i, $i \in \{E, A\}$ they wish to build. We assume that construction takes time and that time-to-build is a random variable following a Poisson process with parameter α. Developers pay a construction cost c^i, $i \in \{E, A\}$, in each period such that $c^E > c^A$, until the construction is complete. Upon completion, the developer becomes a seller who possesses a unit of indivisible property of i-type to sell. The construction costs are irreversible. Let D^i be the present discounted value of a developer that has chosen to invest in an i-type property, $i \in \{E, A\}$. The value function is then defined recursively by

$$rD^i = -c^i + \alpha(S^i - D^i), \tag{1}$$

where S^i is the value of being a seller in possession of a property of i-type.

The housing market is frictional. Buyers and sellers meet randomly in the housing market.[2] Although there might be some directed search behaviour in the property market,

[1] Although variation in willingness to pay may reflect differences in credit access, actual income or wealth disparities, or a combination of these factors, our model interprets willingness to pay primarily as buyers' income.

[2] Genesove and Han (2012) employed a random search model incorporating a constant return to scale matching function. Their findings demonstrate that the model exhibits a very good fit with key market indicators, including time on the market and number of visits per house. Moreover, the applicability of the random search model may be particularly pertinent to markets such as Chinese or UK property markets where housing developments are usually a mix of affordable and executive. Hence, local and

empirically, buyers search a range of sub-markets segmented by location and housing style (see, for example, Piazzesi and Stroebel (2020)). The assumption of random search does not change the fundamental mechanism of our model.[3]

A standard matching function determines the total number of contacts, $m = m(s, b)$, as a function of the number of buyers and sellers in the market. We assume that the matching function $m(s, b)$ is increasing, strictly concave, and homogeneous of degree one. The probability that a seller meets a buyer is $m(s, b)/s = \theta(q)$, where $q = b/s$ denotes the buyer-seller ratio or the queue length. Similarly, the probability that a buyer meets a seller is $m(s, b)/b = \theta(q)/q$. We also assume that θ maps the positive real numbers $[0, \infty)$ onto itself; note that $\theta'(q) > 0$, $\theta(0) = 0$, and $\theta(\infty) = \infty$. In other words, if there are very few buyers per seller, buyers could instantly find a seller but it takes an extremely long time for a seller to contact a buyer; the opposite is true when there are many buyers for each seller.

The i-type unmatched seller value function is defined recursively by

$$rS^i = -v + \theta(q)\{\lambda[\max(p^{i,R}, S^i) - S^i] + (1 - \lambda)[\max(p^{i,P}, S^i) - S^i]\} \tag{2}$$

An i-type seller pays a flow cost of advertising, v, while unmatched and meets a prospective buyer at the rate $\theta(q)$. The buyer is a rich buyer with probability λ, in which case the seller receives price $p^{i,R}$, determined by Nash bargaining if the transaction price is not less than the hold-up value.[4] On the other hand, if the buyer is a P-type, which occurs with probability $1 - \lambda$, she receives price $p^{i,P}$, given it is not less than the continuation value of the search.

The present value of a j-type buyer, $j \in \{R, P\}$, is defined by a similar recursive equation

nonlocal searches may look for housing across different types of housing in the market rather than directing their search to the perfectly segmented market.

[3]By allowing for a segmented market and directed search, for example, poor buyers search only in the affordable housing segment which would shorten the queue for the executive housing. This increases the outside option of the rich buyers in the market, which in turn only shifts the wealth threshold levels but not the types of market equilibria. See, for example, Albrecht et al. (2007).

[4]Given the irreversibility of the investment, once the investment is completed, the option value for a seller is to hold up the trade and search for a suitable buyer. On the other hand, the option value of a developer is to quit the market.

as:

$$rB^j = \omega + \frac{\theta(q)}{q}\{\eta[\max(y^{E,j} - p^{E,j}, B^j) - B^j] \\ + (1-\eta)[\max(y^{A,j} - p^{A,j}, B^j) - B^j]\} \quad (3)$$

where ω is the flow value while unmatched in the market, e.g. the value of renting. A j-type buyer contacts a prospective seller at the rate $\theta(q)/q$. The seller is an E-type with probability η. $y^{E,j}$ is the buyer's willingness to pay for an E-type house and $p^{E,j}$ is the transacted price, determined by Nash bargaining. We assume that the willingness to pay of a R-type buyer is always higher than a P-type buyer, for any given type of property, i.e. $y^{i,R} > y^{i,P}, i \in \{E, A\}$.

We assume that buyers' enjoy more living in E-type properties, therefore they are willing to pay more for it, i.e. $y^{E,j} > y^{A,j}$, $j \in \{R, P\}$. Although P-type buyers may visit E-type sellers in the market, they rarely trade. This is either because the executive houses are priced above the poor buyers' budgets or because the negotiations may break down. For simplicity, we restrict our focus on parameter values so that the P-type buyers who encounter E-type sellers never trade in the equilibrium.

Furthermore, for simplicity, without loss of generality, we assume that buyers' preferences are non-homothetic. This means that higher-income households do not simply scale up their housing consumption proportionally as their income increases; instead, they exhibit different preferences compared to lower-income households.[5]

[5] Empirical studies have shown that housing demand is non-homothetic. For example, Earnhart (2002) finds that high-income households place significantly greater value on additional interior space per person than low- or medium-income households, indicating that wealthier households prioritise spaciousness more intensely. Similarly, Schulz et al. (2023) show that new teleworkers with higher incomes are willing to pay more for high-quality home offices, influencing their housing choices and potentially leading to suburbanisation. Goodman (2002) further supports the non-homothetic nature of housing preferences by demonstrating that income elasticities for housing demand are less than one and vary over time, with permanent income affecting housing demand more substantially than transitory income. These findings collectively highlight that as income changes, housing demand does not change proportionally, but varies in both magnitude and the attributes valued, confirming the non-homothetic nature of preferences.

When an i-type buyer and a j-type seller meet, the trade takes place and a match is formed if the joint matching surplus is positive. The pair then leave the market. Otherwise, either party could reject the trade and continue searching for a new partner. The price is determined through a symmetric Nash Bargaining as follows:

$$p^{i,j} = \arg\max(p^{i,j} - S^i)(y^{i,j} - p^{i,j} - B^j)$$

whereas $i \in \{E, A\}$ and $j \in \{R, P\}$ are the seller and buyer types, respectively. The above bargaining problem leads to the solution of the following

$$p^{i,j} = S^i + \frac{1}{2}(y^{i,j} - S^i - B^j) \tag{4}$$

To keep the steady state tractable, we assume that in each period there is an exogenous inflow of new buyers into the property market where ϕ is the share of R-type buyers and $1 - \phi$ the share of P-type buyers. The steady-state requires that the buyer's outflows equal buyer inflows for each type of buyer, i.e.

$$\frac{\phi}{1-\phi} = \frac{\lambda}{1-\lambda} \frac{\eta I^{ER} + (1-\eta) I^{AR}}{(1-\eta) I^{AP}} \tag{5}$$

Whereas $I^{ER} \in \{0, 1\} =$ indicates whether or not the E-type seller trades with a R-type buyer. Similarly for I^{AR} and I^{AP}.

The endogenous state variables λ, η, and q are determined by the steady-state condition, (5) and two free entry conditions of developers (1) such that $D^i = 0$ in a steady-state equilibrium; hence, the model is closed.

3 Equilibrium in the Property Market

In this section, we analytically characterise the steady-state equilibria of our modelled market.

We focus only on pure strategy Nash equilibria, although mixed strategy equilibria often exist. We use *(i,j)*, where $i \in \{E, A\}$ and $j \in \{R, P\}$ to represent a trading pair in a given equilibrium. An equilibrium pattern occurs when (i) the joint surplus is positive for all matched pairs in equilibrium, and (ii) the steady-state condition defined by Equation (5) is satisfied.The steady-state equilibrium in our model is defined as follows:

Definition 1. *A steady state equilibrium is a dynamic equilibrium in which the value functions of sellers (S^i), value functions of buyers (B^j), the queue length (q), the functions of transaction prices (p^{ij}), the fraction of rich buyers (λ), and the fraction of executive sellers (η) are all constant. These equilibrium values satisfy functions (2), (3), (4), (5) and the free entry conditions.*

Given the assumption that the *(E,P)*-pair never matches, the remaining three pairings will lead to 2^3 possible Nash equilibria. We can eliminate some of these possible patterns as steady-state equilibrium. For instance, with a finite construction cost, the degenerate case where the property market shuts down can be ruled out. It is also straightforward to verify that whenever a P-type buyer trades in the market, an R-type buyer with a higher willingness to pay must trade as well. Therefore, we rule out the possibility of having *only* (A,P) trading in the market as an equilibrium outcome.

Furthermore, the property market equilibria where the poor buyers are inactive are not appealing. Hence, we assume that $y^{AP} > c^A/\alpha + w/r$, which guarantees the poor buyers' participation in the market.[6] Accordingly, we focus our analysis on those three matching equilibria in Proposition 1.[7]

Proposition 1. *Assume that* $y^{AP} > \frac{c^A}{\alpha} + \frac{w}{r}$*, there are three possible equilibria in a decentralised property market:*

1. *Affordable housing equilibrium (AM),* $\{AR, AP\}$*;*
2. *Pooled housing equilibrium (PM),* $\{ER, AR, AP\}$*;*
3. *Vertical housing equilibrium (VM),* $\{ER, AP\}$*.*

Take the *VM* equilibrium as an example. In VM, only the $\{ER, AP\}$ pairs are trading in the market. There is no negative matching; i.e., the R-type buyers are not trading

[6]It is straightforward to show that when the set-up cost is above the P-type buyer's budget set, i.e., $y^{AP} < c^A/\alpha + w/r$, then only R-type buyers actively participate in the property market. The possible equilibria in this case are $\{AR\}, \{AR, ER\}$, and $\{ER\}$. We are not interested in these cases because they are not theoretically or empirically appealing.

[7]Other 5 possible equilibria are: $\{0\}$, $\{AP\}$,$\{AR\}$,$\{AR, ER\}$,$\{ER\}$.

with A-type sellers. Nash bargaining implies that the surplus from the *(A,R)*-pairs is sufficiently low in the VM equilibrium, and the R-type buyer's willingness to pay for A-type properties must be such that

$$y^{AR} - S^{A} - B^{R} \leq 0 \ , \tag{6}$$

Positive surplus from trade provides sufficient incentives for the *(A,R)*-pairs to match under the transferable utility condition, which is not consistent with the VM. Intuitively, when the rich buyer's willingness to pay for executive houses, y^{ER}, is high enough to make their outside option, B^{R}, too high to give up searching for E-type sellers, the *(A,R)*-pairs do not match, and thus *VM* is achieved. Accordingly, the threshold value of y^{ER}, defined by condition (6), is the lower bound of *VM*, above which the market equilibrium is the *VM*. Note that the values of B^{R} and S^{A} required to calculate the threshold are defined in *VM*.

On the other hand, in the pooled housing equilibrium (PM), rich buyers purchase both affordable and executive houses, while poor buyers only trade with affordable house sellers. The *(A,R)*-pair match only if the net match surplus is positive in the PM equilibrium as:

$$y^{AR} - S^{A} - B^{R} \geq 0 \ , \tag{7}$$

Since B^{R} is increasing in y^{ER}, given the value of y^{AR}, the values of y^{ER} that ensure equation (7) holds with equality then define the upper bound of y^{ER} in the PM equilibrium. Note that the threshold value of y^{ER} for the lower bound VM is not necessarily the same as the upper bound of PM. This is because the thresholds depend on the matching sets which vary across VM and PM equilibria.

Given the set-up cost c^{E}, if the rich buyers' wealth is sufficiently low such that their willingness to pay for executive houses is not high enough to cover the setup cost, developers will not invest in the E-type properties in any market equilibrium. Hence, the minimum value of the rich buyer's willingness to pay, y^{ER} is such that $S^{E} = c^{E}/\alpha$ is high enough to generate sufficient incentives to invest in E-type houses. This entry condition for E-type sellers defines the lower bound for the PM equilibrium, which is also the upper bound for AM. Hence, values of y^{ER} that are lower than this threshold imply the housing market is in affordable housing equilibrium.

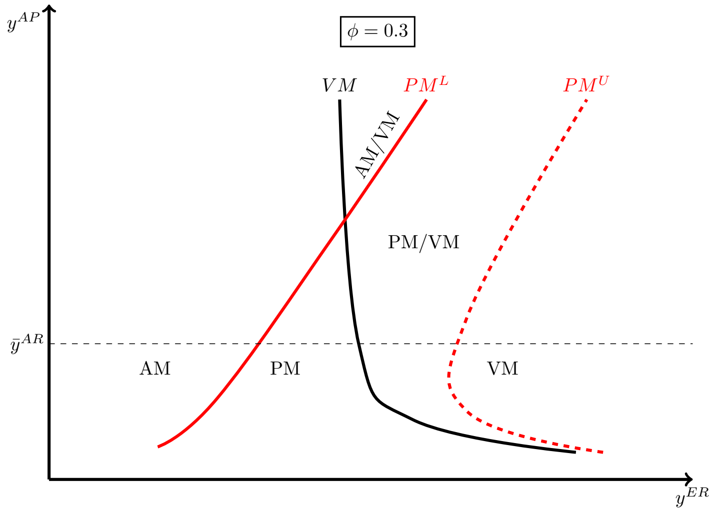


Figure 1: The Equilibrium Pattern.

Note: The Equilibrium Pattern for different values of income distribution. PM^L curve maps the lower-bound (upper-bound) of the PM (AM), and PM^U depicts the upper-bound of the PM equilibrium. This mapping is conducted with the y^{AR} held constant throughout the process of determining the pattern.

Proposition 2. *If $y^{AP} > \frac{c^A}{\alpha} + \frac{w}{r}$, the search-and-matching equilibria of the property market are determined by the income distribution as depicted in Figure 6*

Figure 6 depicts the possible property market equilibria for different values of the parameters of the income distribution, y^{AP} and y^{ER}, given y^{AR} and other exogenous parameters.[8] The thresholds partition the space into five regions: areas where a unique equilibrium of either of *AM*, *PM*, and *VM* occurs; and regions where multiple equilibria *AM/VM* and *PM/VM* exist.

In a relatively equal economy where the gap between y^{AP} and y^{ER} is small, i.e., when the R-type buyers' willingness to pay is not sufficiently higher than that of the P-types, or the proportion of R-type buyers in the market is not sufficiently large, the property market is expected to be in the affordable housing equilibrium *AM*, where both rich and poor buyers trade with affordable house sellers. In other words, the market sorts two segments of trade negatively. Increasing either the R-type buyers' willingness to pay or their proportion in the market will induce more executive house sellers to enter the

[8]We defer the analytical solutions to the market equilibria to the appendices.

market. For low values of y^{AP}, the market transitions to *PM*. The rise in rich buyers' willingness to pay prompts executive house developers to enter the market. Nevertheless, rich buyers continue to trade with affordable house sellers as the number of executive houses remains low and the queue for E-type houses is long. Consequently, a pooled matching equilibrium is achieved.

Further increases in y^{ER} shift the market to the area where multiple equilibria of *PM* and *VM* exist. This occurs as a result of the strategic complementarity between the buyers and sellers.[9] Consider the results of multiple market equilibria. If rich buyers choose to trade exclusively with executive house sellers (such as in *VM*), they match relatively slowly. Because of the slower matching, there must be relatively more executive sellers in number in a steady state compared to *PM*. With a larger number of rich buyers in the market, more executive sellers enter the market in response. As a result, rich buyers prefer searching for executive sellers to trade with rather than affordable house sellers, thereby sustaining the *VM* equilibrium. Conversely, in a Pooled matching equilibrium, rich buyers choose to trade with any seller, allowing them to match relatively fast. Hence, there must be relatively fewer of them in the steady state. Consequently, relatively fewer executive sellers enter the market. This implies that the rich buyers less frequently contact an executive seller and, therefore, prefer to match with the first seller they contact rather than continue searching for the executive sellers. Hence, the *PM* exists.

The presence of multiple equilibria implies that small changes in parameters, enough to shift the market from one equilibrium to another, can lead to significant changes in affordability, prices, and queue lengths. These implications are explored quantitatively in the next section.

Beyond a certain threshold of inequality, the market settles into the unique equilibrium of *VM*. Using the characterisation above, we solve the model analytically in each equilibrium to study what drives affordability. The full solutions are in the appendix. To illustrate, we examine the price p^{AR} in the *PM* equilibrium:

[9] The multiplicity in our paper is related to the literature on multiple equilibria and self-fulfilling fluctuations as the result of search frictions. Further deatails can be found in Burdett and Coles (1999), Moen et al. (2021), and Albrecht et al. (2007) for examples.

$$p^{AR} = \frac{ry^{AR} - w + [r + \frac{\theta(q)}{q}]\frac{c^A}{\alpha}}{2r + \frac{\theta(q)}{q}} - \frac{\frac{\theta(q)}{q}\eta}{2r + \frac{\theta(q)}{q}} \frac{1}{2}(y^{ER} - y^{AR} - \frac{c^E - c^A}{\alpha}) \tag{8}$$

This transaction price is shaped by four forces:

1. **Income effect**: y^{AR} increases price.
2. **Queue-length effect**: longer queues, q, strengthen the seller's bargaining power, raising the price.
3. **Composition effect**: more executive sellers, η, raise rich buyers' outside option, lowering the price.
4. **Forgone-value effect**: rich buyers forgo the gain of matching with executive sellers. The higher this opportunity cost, the lower the price they pay to A-type sellers.[10]

Due to the interactions among these factors, it is difficult to analytically determine the direction of price changes. It is important to note that both the queue-length effect and the composition effect are endogenously determined within the model. For example, an increase in y^{AR} raises prices but may simultaneously shorten queues or attract more affordable sellers into the market (thereby reducing η), potentially offsetting the initial price increases. To quantify these dynamics, we employ numerical comparative statics in Section 4.

4 Inequality and the Property Market Dynamics

This section explores how shifts in income distribution affect housing market equilibria, affordability, and market structure. We simulate two distinct channels: (1) a mean-preserving income spread and (2) changes in the proportion of high-income entrants.

Most parameters in the theoretical model are difficult to observe directly in available data. We therefore calibrate them to ensure the resulting equilibrium outcomes are reasonable.

[10] This effect doesn't apply to rich buyers or in *VM*, where rich buyers never match with A-type sellers.

Table 1: Parameter Values

c^A	c^E	v	ω	e^f	r	g	α
18	25	2	3	0.8	0.06	500	1

Notes. c^A and c^E are the flow construction costs for affordable and executive housing, respectively. v is the flow advertising cost, w the flow value that buyers enjoy while searching in the market, and e^f is the efficiency parameter in the Cobb-Douglas matching function. r, the annual interest rate, is set at 6%.

The values used are listed in Table 1. These parameter values are applied in all exercises unless otherwise specified. To simplify the analysis, we use the income ratio $\frac{Y^{ER}}{Y^{AP}}$ as our measure of inequality.

Our results highlight three key findings. First, as inequality increases, the market transitions from an integrated affordable equilibrium to a vertically segmented one. Second, this transition alters the composition of housing supply—developers shift toward executive housing—resulting in higher transaction costs and search times for poorer buyers. Third, affordability deteriorates for the poor not because of rising prices per se, but due to reduced income and intensified market competition.

4.1 Mean-Preserving Income Spread

We start by examining how rising income inequality affects the housing market while keeping average income, defined as $\phi Y^{ER} + (1-\phi)Y^{AP}$, constant.[11]

Figure (2) shows the market's adjustment path. Starting from an Affordable Matching (AM) equilibrium at point O, an increase in inequality shifts the market toward regions characterised by Pooled Matching (PM) or Vertical Matching (VM) outcomes. At point A, the market enters the multiple equilibria region, where both PM and VM coexist.

[11] We also conduct exercises where only the rich buyers become wealthier, holding the poor buyers' willingness to pay constant. Throughout this exercise, the average income in the economy will rise and the results are discussed in the appendix section (D).

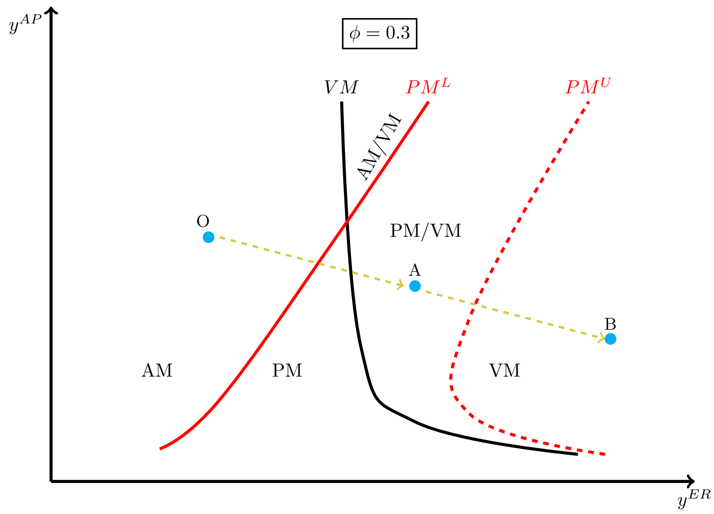


Figure 2: Market Evolution in Response to Mean-preserve Spread.

Notes. A movement from point O to B represents increase in income inequality. PM^L curve maps the lower bound (upper bound) of the PM (AM), and PM^U depicts the upper bound of the PM equilibrium. The y^{AR} is held constant in this exercise.

Further inequality pushes the economy into a unique Vertical Matching (VM) equilibrium at point B, where buyers are fully segregated by income. Throughout this exercise, the average income remains constant, only the distribution changes. This allows the model to generate rich dynamics both within and across equilibria.

Executive House Prices

Figure (3) focuses on how executive house prices respond to a mean-preserving spread in income. When inequality is low (i.e. the income ratio $\frac{Y^{ER}}{Y^{AP}}$ is below 1.48), developers have no incentive to supply executive housing, and no such properties exist under the AM equilibrium.

However, once inequality surpasses this threshold, the market supports the entry of executive sellers, and the equilibrium shifts to PM. As inequality continues to rise within the PM region, transaction prices for executive houses (p^{ER}) increase. This is driven primarily by the income effect and the queue-length effect, which together outweigh the moderating influence of the composition effect.

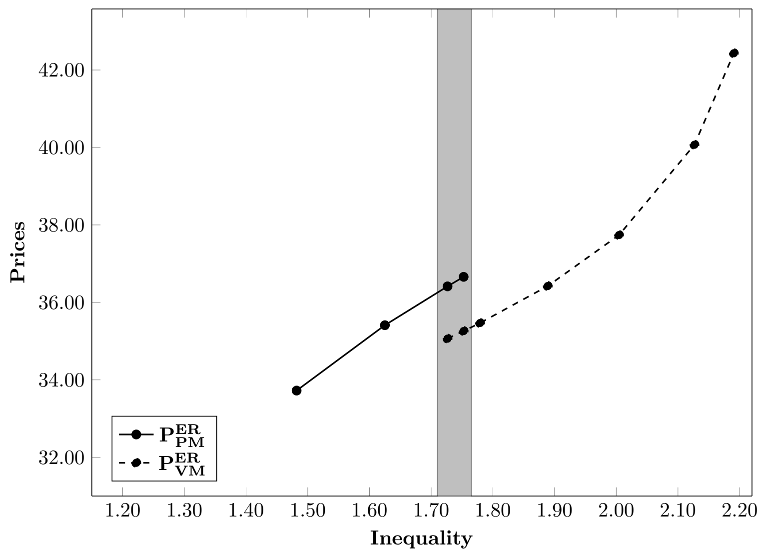


Figure 3: Equilibrium Transaction Prices of Executive Houses.

Notes. The horizontal axis depicts the income inequality measured as $\frac{y^{ER}}{y^{AP}}$. Throughout the exercise the average income is fixed at $\overline{y} = 95$ and the proportion of rich buyers entering the market at $\phi = 0.3$. The rest of the parameters are shown in Table 1.

Eventually, the market enters the multiple equilibria region where both PM and VM outcomes are possible (the shaded band in Figure 2). Within this zone, equilibrium selection becomes sensitive to small changes in fundamentals. In the VM equilibrium, the share of executive sellers(η) is higher than under PM, which intensifies competition among them. This greater supply reduces prices, making executive house prices under VM lower than under PM at similar levels of inequality.

As inequality continues to increase, the market ultimately settles in a unique VM equilibrium, where rich buyers exclusively trade with executive sellers. Here, the income effect dominates once more, and executive house prices rise steadily with inequality.

Affordable House Prices

Figure (4) illustrates how affordable house prices respond to the same income spread. At low levels of inequality (e.g., below 1.48), the market operates under AM, with both rich and poor buyers purchasing from affordable sellers. Rich buyers pay more than poor buyers due to their higher willingness to pay ($y^{AR} > y^{AP}$).

As inequality rises and the market moves into the PM equilibrium,[12] executive house sellers begin to enter, and some rich buyers shift their demand towards executive houses. This introduces the forgone value effect: rich buyers negotiating with affordable sellers possess stronger outside options, namely, the opportunity to match with executive sellers. Consequently, their bargaining position strengthens, allowing them in some cases to pay less than poor buyers for affordable housing.

Further inequality transitions the market into the VM region. In the multiple equilibrium zone (between values 1.73 and 1.75), both PM and VM can occur. However, prices differ across the two. Since η is higher under VM, which leaves poor buyers facing greater competition for affordable housing. As a result, poor buyers may pay higher prices under VM compared to PM.

At sufficiently high levels of inequality, the market stabilises in a unique VM equilibrium. In this equilibrium, rich and poor buyers are fully segmented, and the price of affordable houses declines, not due to the improved affordability, but because poor buyers' incomes have fallen.[13]

To capture the true evolution of affordability, it is necessary to consider the *price-to-income ratio*, which depends not only on absolute price levels but also on the sensitivity of prices to changes in income. This can be expressed using the price elasticity of income:

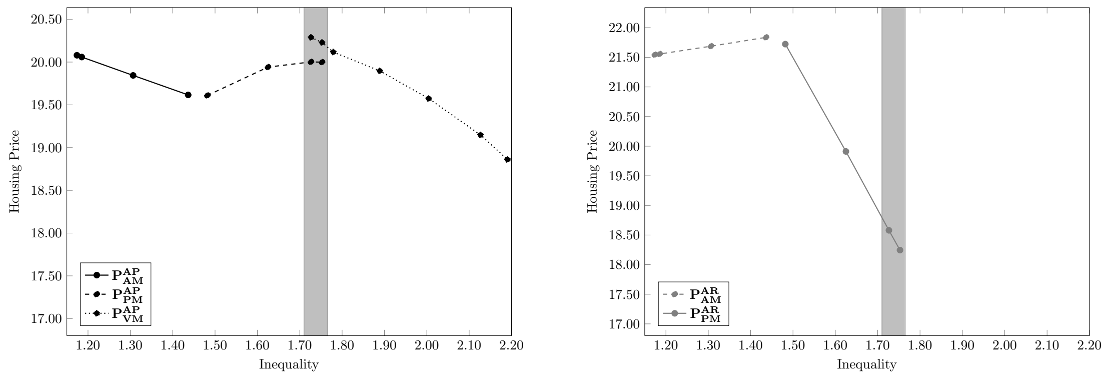
$$\varepsilon = \frac{\partial p^{AP}}{\partial y^{AP}} * \frac{y^{AP}}{p^{AP}}. \tag{9}$$

If prices are highly elastic with respect to income, that is, if they fall faster than income declines, then poor buyers may experience improved affordability in the VM equilibrium. However, if prices are inelastic, falling less than incomes do, then affordability worsens

[12]The gaps that appear in the graphs arise because the numerical analysis is conducted at discrete values of inequality (as depicted on the horizontal axis). This naturally creates discontinuities between equilibrium regions when transitioning from one inequality value to another. These gaps are particularly visible when there is no equilibrium multiplicity for the selected parameter set, e.g., when the equilibrium shifts directly from AM to PM.

[13]Note that the mean-preserving spread exercise is conducted by reducing y^{AP} and increasing y^{ER}, while keeping average income constant.

for poor buyers despite lower nominal prices. We return to this issue in the robustness check section.



(a) Panel A

(b) Panel B

Figure 4: Affordable House Prices for the Poor Buyers (a) and Rich Buyers (b).

Notes. The horizontal axis depicts the income inequality measured as $\frac{y^{ER}}{y^{AP}}$. Throughout the exercise the average income is fixed at $\overline{y} = 95$ and the proportion of rich buyers entering the market at $\phi = 0.3$. The rest of the parameters are shown in Table 1.

Market Composition and Sorting

Table (2) summarises how key state variables evolve in response to a mean-preserving income spread. As inequality increases, the market transitions sequentially from AM to PM, passes through the multiple equilibria region, and eventually reaches a unique VM equilibrium.

Two patterns stand out. First, the share of executive sellers, η,rises steadily with inequality. This reflects developers' increasing incentives to supply luxury housing, driven by the higher profitability of catering to richer buyers. Second, the share of rich buyers actively searching in the market, λ, declines. This is because wealthier buyers match faster and exit the market more quickly when executive housing becomes more prevalent.

Meanwhile, the buyer-to-seller ratio, q, also rises with increasing inequality, indicating intensified competition among buyers. These dynamics suggest that as the market equi-

Table 2: Mean-Preserving Income Spread.

	y^{BL}	y^{GH}	inequality	η	λ	q
AM	90.300	106.000	1.174	0	0.300	2.336
	⋮					
AM	84.000	120.670	1.437	0	0.300	2.846
PM	83.000	123.000	1.482	0.050	0.290	3.002
PM	80.000	130.000	1.625	0.376	0.211	3.962
PM	78.000	134.670	1.727	0.507	0.175	4.822
VM	78.000	134.670	1.727	0.625	0.205	4.481
PM	77.500	135.830	1.753	0.534	0.166	5.087
VM	77.500	135.830	1.753	0.635	0.198	4.639
VM	77.000	137.000	1.779	0.646	0.190	4.816
	⋮					
VM	70.000	153.340	2.191	0.884	0.053	22.360

Notes. The parameter values used to generate the table are: $y^{AR} = 106$, $\overline{y} = 95$, $\phi = 0.3$. The rest of the parameters are shown in Table 1. The grey band indicates the possibility of multiple equilibria. The complete table of the results are summarised in Table (A2) in Appendix.

librium shifts towards more vertically sorted equilibria, the structure of the market increasingly favours rich buyers. As executive sellers continue to enter in greater numbers, poor buyers are progressively squeezed out of the market, facing greater competition (higher q), reduced matching opportunities, and, effectively, exclusion from the housing market. Rising inequality, in this context, not only stratifies market outcomes but also erodes access for lower-income participants.

Time on Market and Inventory

As the housing market clears through both price and time-on-market, we report the average time-to-sell data in Figure 5. This measure serves as a proxy for housing inventory and reveals how changes in income inequality affect market efficiency and liquidity.

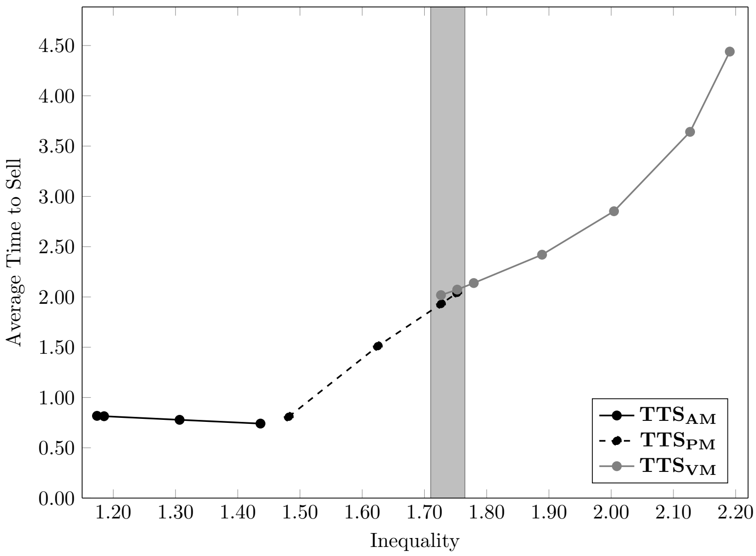


Figure 5: Average Time to Sell a House in the Market.

Notes. The horizontal axis depicts the income inequality measured as $\frac{y^{ER}}{y^{AP}}$. Throughout this exercise, the average income is fixed at $\overline{y} = 95$ and the proportion of rich buyers entering the market at $\phi = 0.3$. The rest of the parameters are shown in Table 1.

In the *AM* equilibrium, where both rich and poor buyers purchase affordable homes, each seller quickly finds a match. Every buyer-seller contact results in a trade, leading to a relatively short time on the market. However, as the market shifts into the *PM* region, the entry of executive house sellers begins to reshape matching dynamics. While affordable house sellers can still trade with all buyers, executive sellers must wait specifically for rich buyers to appear, lengthening their time to sell.

This friction becomes more pronounced in the *VM* equilibrium. With a higher share of executive sellers (η) and a lower proportion of rich buyers (λ), executive sellers face stiffer competition for a shrinking pool of buyers. As a result, the average time to sell increases significantly in *VM*.

The shaded region in Figure (5) illustrates the range where both *PM* and *VM* equilibria are possible. Within this zone, a shift from *PM* to *VM* leads to a small jump in time-on-market. Since the average time to sell corresponds to unsold inventory, this implies that a transition to *VM*, driven by rising inequality, can simultaneously produce higher transaction prices, a greater share of executive housing, and a buildup of unsold homes.

These patterns suggest that inequality doesn't just affect who matches with whom, it also distorts the pace at which the market clears. Under *VM*, despite high prices and upscale development, market liquidity worsens, leaving more properties sitting vacant for longer periods.

The following Proposition summarises the findings from the mean-preserve income spread exercise.

Proposition 3. *A mean-preserving increase in income inequality leads to the following market dynamics:*

1. *The market transitions from Affordable Matching (AM) to Pooled Matching (PM), and eventually to Vertical Matching (VM), passing through a region of multiple equilibria where small shifts in fundamentals can lead to large, discontinuous changes in market outcomes.*

2. *When the market shifts from PM to VM, the composition effect dominates: the*

price paid by poor buyers increases, while the price paid by rich buyers decreases, due to changes in matching patterns and supply composition.

3. *Within each equilibrium, the income effect dominates: as inequality rises further, prices for poor buyers decline and prices for rich buyers increase. These price movements reflect shifting incomes, not changes in affordability.*

4. *Time on the market rises sharply, especially under VM, reflecting reduced liquidity and a build-up of unsold inventory, with abrupt jumps possible when the equilibrium shifts from PM to VM.*

4.2 Influx of Rich Buyers and Market Dynamics

In this section, we examine how property market dynamics evolve as the proportion of rich buyers, denoted by ϕ, increases. Changes in ϕ reflect broader forces of urbanisation and globalisation, for example, high-income households migrating from rural to urban areas, moving from smaller to larger cities, or relocating from developing to developed countries.

In our framework, varying ϕ while holding income levels constant isolates the impact of composition effects on market outcomes.

Figure (6) shows how the equilibrium pattern shifts as ϕ rises. An increase in ϕ enlarges the parameter space in which Pooled Matching (PM) and Vertical Matching (VM) equilibria are sustainable. This happens because a higher share of rich buyers enhances the expected profitability of executive housing, prompting greater entry by executive sellers and lowering the income thresholds required to sustain PM and VM outcomes.

In the AM equilibrium, where only affordable housing is supplied, there is no composition effect. Since $y^{AR} > y^{AP}$, a rise in ϕ increases the expected profit for affordable house sellers. This encourages more investment in affordable housing and leads to shorter queues. The resulting queue-length effect improves affordability for all buyers, as seen in Figure 8, where both p^{AR} and p^{AP} decline in the AM region.

As ϕ continues to rise, the market transitions into *PM*. Rich buyers now trade with both

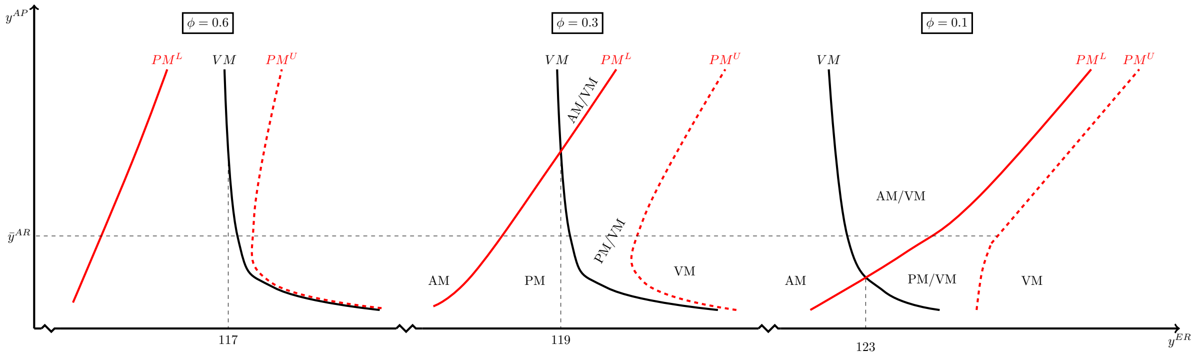


Figure 6: Market Evolution in Response to Urbanisation.

Notes. This mapping is generated by holding y^{AR} constant and for different values of ϕ. PM^L curve maps the lower-bound (upper-bound) of the PM (AM), and PM^U depicts the upper-bound of the PM equilibrium.

executive and affordable sellers, while poor buyers continue to rely solely on affordable sellers. The entry of executive housing increases the share of executive sellers (η), which reduces competition among affordable sellers. This shift introduces a composition effect that dominates the queue-length effect: prices for poor buyers rise, while prices for rich buyers fall.

Eventually, the market transitions into VM, where rich buyers exclusively match with executive sellers. The dominance of the composition effect in this regime continues to raise prices for affordable housing, further straining the poor's access to the market. Importantly, this change occurs without any income effect, thus, the decline in affordability for poor buyers is driven solely by structural reallocation, not reduced purchasing power.

By contrast, rich buyers benefit throughout this process. Comparing Figure 7 with Figure 8, executive house prices decline steadily as ϕ increases. Rich buyers face a more favourable market with more supply and less competition in the executive segment.

The following proposition summarises these findings:

Proposition 4. *An increase in the proportion of rich buyers (ϕ) generates a composition externality in the housing market:*

1. *Poor buyers face higher prices in PM and VM equilibria than in AM, no change in income.*

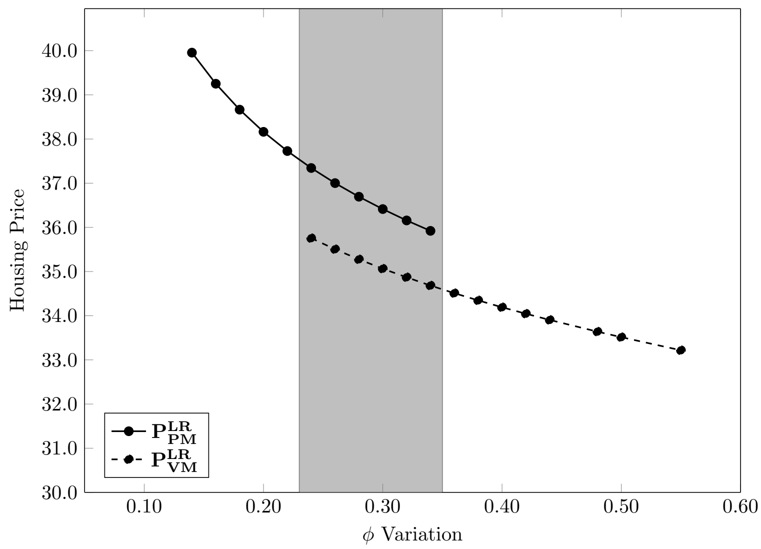


Figure 7: Luxury House Prices for the Rich Buyers.

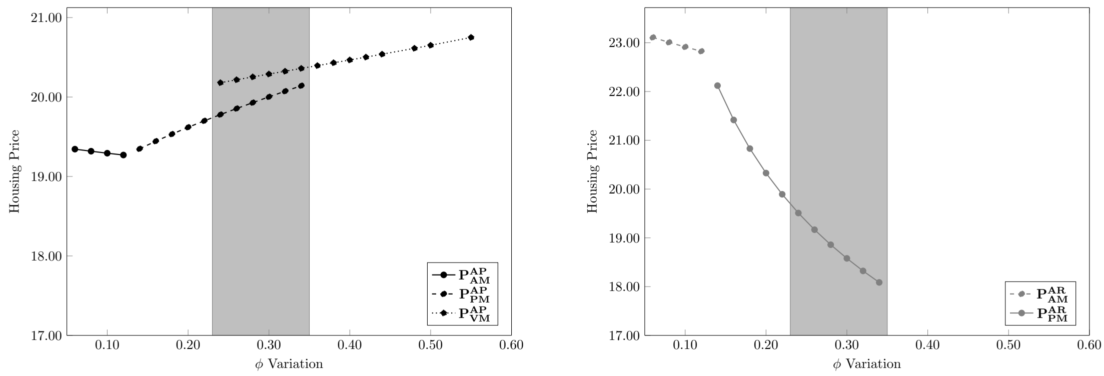
Notes. The horizontal axis depicts the proportion of rich buyers entering the market (ϕ). Throughout this exercise, income levels are fixed at the values used in the baseline scenario presented in Figures 3 and 4. The rest of the parameters are shown in Table 1.

2. *Rich buyers face lower prices in PM and VM equilibria than in AM, due to the increased supply of executive housing.*

4.3 Multiplicity

A distinctive empirical implication of equilibrium multiplicity in our housing market model is that small shifts in key economic fundamentals, such as slight variations in income distribution, an influx of rich families or minor policy interventions affecting buyer selectivity, can generate large and discontinuous changes in housing market outcomes.

Specifically, a modest increase in the purchasing power or selectivity of rich buyers might abruptly shift the market from a mixed equilibrium (PM) - characterised by relatively low luxury housing provision, long queues, and short average selling times - to a fully segmented equilibrium (VM), where luxury housing dominates, queues shorten for rich buyers, and average time-to-sell increases significantly.



(a) (b)

Figure 8: Affordable House Prices for the Poor Buyers (a) and Rich Buyers (b).

Notes. The horizontal axis depicts the proportion of rich buyers entering the market (ϕ). Throughout this exercise, income levels are fixed at the values used in the baseline scenario presented in Figures 3 and 4. The rest of the parameters are shown in Table 1.

Therefore, episodes, where modest shifts in income distribution, or marginal easing of credit conditions lead to unexpected large-scale changes in luxury housing provision, buyer selectivity, or sales timing, would constitute empirical evidence consistent with equilibrium switching as predicted by our theoretical framework. For instance, if a housing market initially lies in the PM equilibrium within the multiplicity region, a slight increase in inequality may push the market into the VM equilibrium.

Although current data limitations prevent direct empirical testing of this equilibrium-switching hypothesis within this paper, another promising approach involves exploring regional variations in equilibrium outcomes conditional on similar fundamentals.

In particular, our model predicts that multiplicity will manifest in observable regional differences across two key endogenous variables: (a) the share of sellers in possession of one unit of luxury executive house, η, and (b) the average time to sell houses in the market.

Specifically, under VM, η should be high because rich buyers exclusively purchase executive housing, inducing developers to supply more luxury properties. However, selective matching reduces the overall queue length for rich buyers, thereby increasing the average time to sell for sellers overall. Conversely, in PM, where rich buyers are willing to trade with both affordable and executive sellers, η is lower and the average time to sell is shorter.

Thus, even when regions have comparable levels of average income and inequality (e.g., similar Gini coefficients), strategic complementarities can drive them into different equilibria, reflected empirically as a positive correlation between the luxury housing share and average selling time.

It is important to note that fundamental parameters, such as the interest rate, are typically set at the national level and do not vary across regions. Therefore, observed differences along these margins would be strong evidence of multiple equilibria arising from endogenous housing market dynamics, rather than differences in underlying fundamentals.

Unfortunately, the available data for China, used in Section 5 to provide some supporting evidence consistent with our model, is currently limited and does not allow for an empirical evaluation of this prediction within the scope of this paper. Testing this hypothesis thoroughly remains an important direction for future empirical research.

While the underlying mechanisms may differ, similar phenomena have been explored in related works. For example, Stein (1995) demonstrates theoretically that the presence of multiple equilibria can cause small changes in fundamentals to trigger large, discontinuous jumps in housing prices.[14] Similarly, Leung and Tse (2017) show in a housing search-and-matching model that when speculative "flippers" can enter and exit the market en masse in response to even small interest rate shocks, the presence of multiple equilibria can lead to wide swings in prices and transaction volumes, without any underlying changes in fundamentals such as housing supply, preferences, or interest rates.

[14]In Stein's model, a fall in housing prices reduces the equity available for down payments, which depresses the ability of existing homeowners to move. This decline in demand further lowers prices, creating a feedback loop.

4.4 Role of Elastic Supply

Our primary objective in the development of the theoretical model was to highlight the impact of income inequality on housing affordability. To achieve this, we followed the standard approach in the search and matching literature by assuming a free entry of developers into the property market. This assumption allowed us to identify the significance of income inequality in explaining housing market affordability. However, it is worth noting that this assumption may appear restrictive under certain circumstances. Literature extensively discusses housing supply constraints arising from factors such as land scarcity, zoning laws and building permits.

Our model can be adapted to incorporate supply constraints and their impact on housing affordability alongside income inequality. One approach to achieving this is by adopting the notion of costly entry, similar to the labour search model, to address these constraints in a tractable way. Following Coles and Moghaddasi Kelishomi (2018), we assume that developers invest in housing if and only if it has positive value; i.e. when $x \leq D^i$, where x represents a non-negative entry cost drawn from an i.i.d distribution $F(.)$. Consequently, $n^i = F(D^i)$ describes the total number of new developments of type i, $i \in \{E, A\}$. Coles and Moghaddasi Kelishomi (2018) adopts a parsimonious functional form for $F(.)$, resulting in $n^i = (D^i)^\xi$, where ξ denotes the elasticity of new developments with respect to building value. Here, $\xi = \infty$ corresponds to the free entry of developers, while $\xi = 0$ implies a perfectly inelastic new housing supply. In general, smaller values of ξ indicate greater supply constraints, resulting in a less elastic housing supply in response to market dynamics induced by changes in income inequality.

Following the discussion in the preceding sections, it becomes evident that the introduction of new housing restrictions will amplify the effects of income inequality and equilibrium thresholds while maintaining the nature of market equilibrium. In the absence of housing supply restriction (i.e., the free entry case), developers continue to enter the market until the value of D^i is driven to zero. With costly entry, the total number of new developments of type i is determined by $n^i = (D^i)^\xi$, where D^i is defined in equation 1. When higher income inequality implies that building luxury housing is more profitable for developers, $S^E > S^A$, the new constraint implies that although the overall housing supply will be more limited compared to the free entry case, there will be relatively greater provision of luxury properties than affordable housing.

While the introduction of housing supply constraints through costly entry adds a new dimension to our model, it is important to note that these constraints do not fundamentally alter our model's key predictions. The main insights regarding the impact of income inequality on housing affordability, the existence of different market equilibria (affordable, pooled, and vertical), and the role of composition and sorting externalities remain valid even in the presence of supply constraints.

4.5 Robustness Check

To assess the robustness of our model's main predictions, we perform a series of sensitivity analyses by varying key parameter values, including ω, c^E, e^f, c^A, and r. These adjustments allow us to examine the effects of income inequality over a wider range of income distributions.

In the robustness checks, we perform mean-preserving income spread exercises by varying poor buyers' income (y^{AP}) from 70 to 170 , and rich buyers' income (y^{ER}) from 106 to 211.67. This generates a range of relative inequality levels, y^{ER}/y^{AR} varying from 1.01 to 2.19. The results of these robustness checks are presented in Appendix E, Figures A4-A13.

Across these scenarios, we find that the core results presented in Section (4.1) remain robust. In particular:

- The patterns of equilibrium transaction prices for both executive and affordable housing remain consistent with those reported in Figures (3), (4), (7)and (8).

- The behaviour of key state variables, namely, η (the share of executive sellers), λ (the share of rich buyers), and q (the buyer-to-seller ratio), aligns with the patterns reported in Table 2.

Thus, the qualitative insights of the model, in particular, the dynamics of equilibrium transitions, the adverse effects of rising inequality on poor buyers' affordability, and the increasing segmentation of the market, are robust to reasonable variations in model parameters.

4.6 Price-Income Ratio

While our primary focus thus far has been on the response of housing prices to changes in income inequality, we now turn to a related metric: the price-income ratio, commonly used to assess housing affordability. Although our model does not explicitly target this measure, it can be indirectly inferred from the simulation results.

We find that the price-income ratio's response to changes in income inequality varies with income's price elasticity. Different elasticity regimes lead to distinct affordability outcomes, either improving or deteriorating as inequality increases.

In parameter settings where the VM equilibrium arises at relatively low levels of inequality, the price elasticity of income is high. In these cases, prices of affordable housing (p^{AP}) fall faster than the decline in poor buyers' income, leading to a lower price-to-income ratio and, consequently, improved affordability for poor buyers. (See Appendix Table A4 for an example.)

In contrast, when VM emerges only at higher levels of inequality, price elasticity becomes low or inelastic. In these cases, affordable house prices decline more slowly than incomes, resulting in a rising price-to-income ratio and worsening affordability for poor buyers. (See Appendix Table A2 and A3 for supporting data.)

We also identify parameter settings that yield unit elasticity, where the price-to-income ratio remains constant as inequality changes. These findings help explain the mixed empirical results in the literature: depending on market structure and parameter selection, rising inequality may improve, reduce, or have no effect on affordability. Thus, the impact of inequality on the price-to-income ratio is inherently sensitive to the underlying equilibrium dynamics and market frictions captured in the model.

5 Empirical evidences: China's Property Market

In this section, we assess the relevance of our theoretical model and demonstrate how its predictions improve our understanding of housing market dynamics. We previously discussed one empirical implication of our model related to equilibrium multiplicity in Section 4.3. Here, we use data from China as an illustrative example to show how the model accounts for salient features of the Chinese housing market.

China represents an ideal case study for our model due to two key characteristics of its housing market. First, China's housing market is known for its elastic supply of newly built houses, which aligns with our model's assumption of an elastic housing market. This elasticity allows the housing market to respond to changes in demand and income distribution by adjusting the composition of affordable and executive houses. However, it is important to note that our model's insights, particularly those related to the vertical matching equilibrium, are also applicable to markets with inelastic supply due to building constraints, as they are consistent with the literature on spatial sorting and superstar cities (see, for example: Gyourko et al., 2013; Couture and Handbury, 2022). Second, China has experienced a significant oversupply of housing in recent years, with many cities having a large amount of excess supply relative to the demand for residential houses. This feature makes China a particularly suitable example to illustrate our model's predictions, as the observed housing market dynamics cannot be fully explained by the conventional supply-demand framework. By focusing on China, we can effectively demonstrate how our model's mechanisms, particularly the strategic complementarity in the search-and-matching market, can provide valuable insights into the relationship between income inequality and housing affordability in a real-world context.

We discuss the empirical relevance of our model across three dimensions: (1) the role of excess housing supply, (2) the positive correlation between income inequality and the luxury-affordable housing ratio, and (3) the growing price dispersion between luxury and affordable housing.

While existing literature has largely focused on housing supply constraints and rapid demand growth as primary drivers of property market bubbles (see, for example: Hanink et al., 2012; Lichtenberg and Ding, 2009; Zheng and Kahn, 2008; Zhang, 2016), our model offers an alternative and complementary explanation within the context of elastic housing supply.

A key empirical observation is that declining housing affordability in China cannot be solely attributed to supply shortages. Indeed, housing affordability has deteriorated in recent years in cities with persistent *excess supply*. Wu et al. (2016) document this phenomenon across 35 major Chinese cities, 22 of which faced an oversupply of new housing relative to household formation. In Chongqing, for example, new housing supply exceeded net household formation by over 90%, yet prices increased at an annual compound rate of 9.2%. Similar trends were observed in Beijing and at least 21 other cities (see Appendix Table A5).

Our model explains this pattern as a consequence of rising income inequality shifting the market composition toward executive housing. Rising income inequality makes investment in executive dwellings more profitable. This results in a larger proportion of the executive houses in the market. As the executive house seller only trades with richer buyers, a market associated with a larger proportion of executive houses will suffer a longer time on the market. The entry of executive house sellers raises the matching rate between rich buyers and their desirable executive houses. Consequently, the rich buyers become pickier and, eventually, the vertical housing equilibrium in which they only trade with executive house sellers, is obtained.

The central mechanism driving these results is strategic complementarity within the search-and-matching process. As a result, small changes in income distribution can generate big adjustments in the housing market evolution, observed by changes in the composition of affordable houses and executive houses. The observed trends in China's housing market are consistent with such a mechanism. Figure 9 shows the income inequality, measured by the 20:80 income ratio, i.e. the income ratio of the top 20%-quantile to the second bottom 20%-quantile of the population, in China between 2000 and 2016. The top 20% richest Chinese earned up to 2.5 times more than the second bottom 20%-quantile of the population in 2000. The inequality peaked in 2005 and reached its highest value at 3.4 and has been on the rise again since 2015. Over the same period, the property market experienced a steady rise in the supply of newly completed executive and luxury

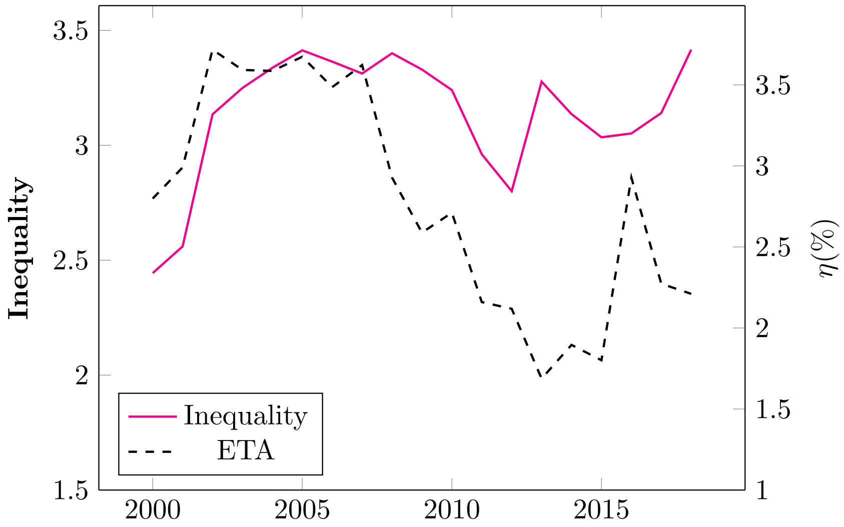


Figure 9: Market Transition in China's Housing Market.

Note: The executive houses ratio, η (ETA) on the right axis, measures the share of newly completed luxury houses and villas in total units of newly completed houses each year. The inequality measure, on the left axis, is the 20/40 ratio, i.e. the income ratio of the top 20%-quantile to the second bottom 20%-quantile of the population. This is because the households at the bottom of the income distribution are the least likely to purchase houses. The correlation coefficient between the variables is about 30%. Source: China Statistics Yearbooks 2001 to 2019; China Real Estate Statistics Yearbooks 2001 to 2019.

houses. The two series are highly correlated with a correlation coefficient of 0.82. To the best of our knowledge, our model is the first to explain the co-movement of income inequality and the supply of executive houses.

Furthermore, as the market evolves from the PM to VM, our model predicts an increasing price dispersion between affordable and executive housing (see Figures 3 and 4). This prediction is consistent with observed trends in Chinese housing market. We compiled data on average transaction prices for villas and luxury houses and affordable houses which is smaller than $90m^2$. Figure 10 illustrates the divergent price trajectories across these property types. As our model predicted, the transition from PM to VM has co-incided with growing market polarisation and an expanding gap in unit prices. Taken together with the trends in Figure 9, these findings corroborate our model's predictions

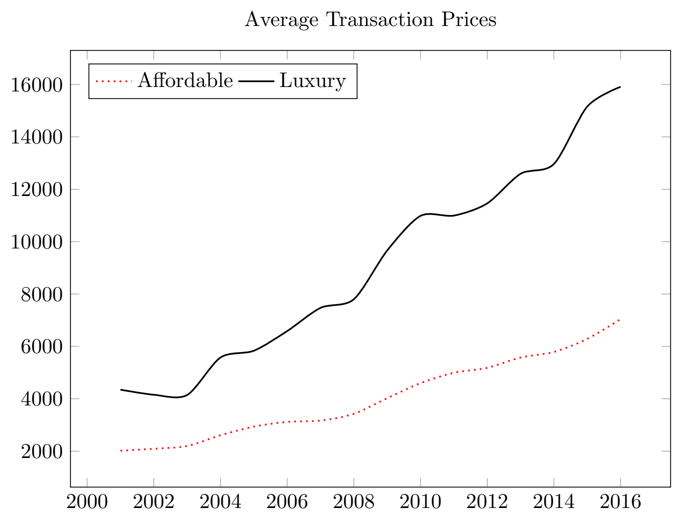


Figure 10: Price Dispersion in China's Housing Market.

Note: The solid line in the figure represents the average transaction price of villas and luxury houses, while the dashed line corresponds to affordable houses. The unit for these transaction prices are RMB/m^2. Source: China Real Estate Statistics Yearbooks 2002 to 2017.

regarding the evolution of market structure and pricing dynamics.

6 Policy Implication

The policy recommendations discussed in this section are directly informed by the key mechanisms identified in our model. Our search-and-matching framework predicts the possibility of multiple housing market equilibria, driven by strategic complementarities between the selectivity of rich buyers and the entry decisions of luxury housing developers. This feature implies that small changes in fundamentals, such as marginal shifts in income distribution, credit availability, or expectations, can lead to large, discontinuous changes in housing outcomes. The concern is not only affordability itself, but also the risk of the market tipping into a high-price, low-accessibility equilibrium, even when fundamentals remain broadly unchanged.

In such a setting, policy plays a dual role: (1) altering the structure of incentives to favour more inclusive outcomes, and (2) helping coordinate the market onto a more desirable equilibrium.

1. Managing inequality to stabilise market structure. Addressing income inequality remains essential. Progressive taxation and redistribution policies can reduce the underlying disparities that drive the economy toward luxury-dominated equilibria. By narrowing the income gap, these policies weaken the composition effect, making affordable equilibria more sustainable. Redistributive measures might include cash transfers, housing subsidies, and public investments in services that disproportionately benefit lower-income households.

2. Targeted demand-side taxes. Luxury-targeted transaction taxes (e.g., higher stamp duties on high-value properties) can further temper the incentives that lead to overinvestment in executive housing. By reducing the relative return to luxury development and discouraging speculative demand at the top end of the market, such policies can push the economy away from the vertical equilibrium and toward one with broader accessibility.

3. Expanding the affordable supply. Supply-side tools like requiring a share of affordable units in new developments, can directly counterbalance the strategic shift toward executive housing. These policies increase the baseline availability of affordable homes, helping to pin the economy within a region where the affordable equilibrium remains self-sustaining.

4. Expectation management and policy signalling. Perhaps most critically, multiplicity implies a role for expectation coordination. In a market prone to self-fulfilling dynamics, credible and transparent government commitments can serve as focal points that guide expectations. For instance, announcing a phased implementation of redistributive housing taxes or long-term affordable housing targets can reassure market participants that the policy environment will support and stabilise an affordable equilibrium.

7 Conclusion

In this paper, we investigate the relationship between rising income inequality and housing affordability, employing a general equilibrium search model with transferable utility and two-sided heterogeneity.

The model delivers several key insights. First, a mean-preserving increase in income inequality leads the market to transition from affordable matching to pooled or vertical matching equilibria, passing through a region of multiple equilibria where small shifts in fundamentals can cause large changes in outcomes. As inequality rises, the share of executive housing increases, the buyer-to-seller ratio worsens for poor buyers, and time on the market rises, reflecting reduced liquidity and growing segmentation.

Second, an increase in the proportion of rich buyers generates a composition externality: poor buyers face higher prices even without any change in their own incomes, while rich buyers benefit from lower prices due to greater executive housing supply. Thus, shifts in buyer composition alone can worsen affordability for lower-income households.

Third, the model highlights the possibility of equilibrium multiplicity. Minor changes in fundamentals, such as small increases in income inequality or buyer selectivity, can induce discontinuous shifts in housing market outcomes, providing a theoretical foundation for sudden jumps in housing market outcome that are not easily explained by gradual changes in fundamentals.

Although our empirical analysis remains preliminary, evidence from Chinese cities is broadly consistent with the model's predictions. Cities with a larger share of high-end housing tend to exhibit longer average selling times, suggesting that equilibrium shifts and market segmentation are observable in practice.

Our paper opens up several avenues for future research. One potential extension could be to incorporate credit constraints and mortgage markets into our framework, as these factors have been shown to play a significant role in shaping housing market dynamics (e.g., Kösem, 2021). Another direction could be to explore the welfare implications of different housing market policies, such as subsidies for affordable housing construction or zoning regulations, in the presence of income inequality and search frictions. Finally, our model could be adapted to study the interaction between income inequality and housing affordability in the context of urban spatial structure, examining how these factors influence the location choices of households and firms within cities. These extensions would further enrich our understanding of the complex relationships between income inequality, housing markets, and urban economics.

Acknowledgments

We thank Melvyn Coles, Thijs Van Rens, Roger Farmers, Jan Eeckhout and Chris Wilson for their valuable comments. We have benefited from participants at the workshops in Bristol, SaM 2018 annual conference at the University of Cambridge and seminar participants at the University of Warwick, University of Naples Federico II, University of Essex, Peking University and Loughborough University. Declarations of interest: none.

References

Albrecht, James, Axel Anderson, Eric Smith, and Susan Vroman, "Opportunistic matching in the housing market," *International Economic Review*, 2007, *48* (2), 641–664.

_ , Pieter A Gautier, and Susan Vroman, "Directed search in the housing market," *Review of Economic Dynamics*, 2016, *19*, 218–231.

Alvaredo, Facundo, Thomas Piketty, Emmanuel Saez, and Gabriel Zucman, "Distributional national accounts," 2018.

Bertaut, Carol C, "Equity prices, household wealth, and consumption growth in foreign industrial countries: wealth effects in the 1990s," *FRB International Finance Discussion Paper*, 2002, (724).

Bertrand, Marianne and Adair Morse, "Trickle-down consumption," *Review of Economics and Statistics*, 2016, *98* (5), 863–879.

Burdett, Kenneth and Melvyn G Coles, "Long-term partnership formation: Marriage and employment," *The Economic Journal*, 1999, *109* (456), 307–334.

Carrillo, Paul Ernesto, *An equilibrium search model for buyers and sellers and an empirical application for the real estate market*, University of Virginia, 2006.

Case, Karl E, John M Quigley, and Robert J Shiller, "Comparing wealth effects: the stock market versus the housing market," *The BE Journal of Macroeconomics*, 2005, *5* (1).

Chen, Jie, Mingzhi Hu, and Zhenguo Lin, "Does housing unaffordability crowd out elites in Chinese superstar cities?," *Journal of Housing Economics*, 2019, *45*, 101571.

Christian, Fitzenberger Bernad Dustmann and Markus Zimmermann, "Housing expenditure and income inequality," *Economic Journal*, 2021, *132*, 1709–1736.

Coles, Melvyn G and Ali Moghaddasi Kelishomi, "Do job destruction shocks matter in the theory of unemployment," *American Economic Journal: Macroeconomics*, 2018, *10* (3), 118–136.

Couture, Victor and Jessie Handbury, "Spatial Sorting within Cities," *NBER working paper*, 2022.

Diamond, Rebecca and Cecile Gaubert, "Spatial sorting and inequality," *Annual Review of Economics*, 2022, *14*, 795–819.

Earnhart, Dietrich, "Combining revealed and stated data to examine housing decisions using discrete choice analysis," *Journal of Urban Economics*, 2002, *51* (1), 143–169.

Genesove, David and Lu Han, "Search and matching in the housing market," *Journal of urban economics*, 2012, *72* (1), 31–45.

Goodman, Allen C, "Estimating equilibrium housing demand for "stayers"," *Journal of Urban Economics*, 2002, *51* (1), 1–24.

Gyourko, Joseph, Christopher Mayer, and Todd Sinai, "Superstar cities," *American Economic Journal: Economic Policy*, 2013, *5* (4), 167–199.

Han, Lu and William C Strange, "The microstructure of housing markets: Search, bargaining, and brokerage," *Handbook of regional and urban economics*, 2015, *5*, 813–886.

Hanink, Dean M, Robert G Cromley, and Avraham Y Ebenstein, "Spatial variation in the determinants of house prices and apartment rents in China," *The Journal of Real Estate Finance and Economics*, 2012, *45* (2), 347–363.

Hilber, Christian AL and Wouter Vermeulen, "The impact of supply constraints on house prices in England," *The Economic Journal*, 2016, *126* (591), 358–405.

Hongyu, Liu, Yun W Park, Zheng Siqi et al., "The interaction between housing investment and economic growth in China," *International real estate review*, 2002, *5* (1), 40–60.

Kösem, Sevim, "Income Inequality, Mortgage Debt and House Prices," *Working Paper*, 2021.

Leung, Charles Ka Yui and Chung-Yi Tse, "Flipping in the housing market," *Journal of Economic Dynamics and Control*, 2017, *76*, 232–263.

Lichtenberg, Erik and Chengri Ding, "Local officials as land developers: Urban spatial expansion in China," *Journal of Urban Economics*, 2009, *66* (1), 57–64.

Määttänen, Niku and Marko Terviö, "Income distribution and housing prices: An assignment model approach," *Journal of Economic Theory*, 2014, *151*, 381–410.

Matlack, Janna L and Jacob L Vigdor, "Do rising tides lift all prices? Income inequality and housing affordability," *Journal of Housing Economics*, 2008, *17* (3), 212–224.

Moen, Espen R, Plamen T Nenov, and Florian Sniekers, "Buying first or selling first in housing markets," *Journal of the European Economic Association*, 2021, *19* (1), 38–81.

Monika, Schneider Marting Piazzesi and Johannes Stroebel, "Segmented housing search," *American Economic Review*, 2020, *110*, 720–759.

Muellbauer, John and Anthony Murphy, "Booms and busts in the UK housing market," *The Economic Journal*, 1997, *107* (445), 1701–1727.

Nieuwerburgh, Stijn Van and Pierre-Olivier Weill, "Why has house price dispersion gone up?," *The Review of Economic Studies*, 2010, *77* (4), 1567–1606.

Rosen, Sherwin, "Hedonic prices and implicit markets: product differentiation in pure competition," *Journal of political economy*, 1974, *82* (1), 34–55.

Schulz, Rainer, Verity Watson, and Martin Wersing, "Teleworking and housing demand," *Regional Science and Urban Economics*, 2023, *101*, 103915.

Stein, Jeremy C, "Prices and trading volume in the housing market: A model with down-payment effects," *The Quarterly Journal of Economics*, 1995, *110* (2), 379–406.

Wang, Shing-Yi, "State misallocation and housing prices: theory and evidence from China," *American Economic Review*, 2011, *101* (5), 2081–2107.

Wheaton, William C, "Vacancy, search, and prices in a housing market matching model," *Journal of political Economy*, 1990, *98* (6), 1270–1292.

Wu, Jing, Joseph Gyourko, and Yongheng Deng, "Evaluating the risk of Chinese housing markets: What we know and what we need to know," *China Economic Review*, 2016, *39*, 91–114.

Zhang, Chuanchuan, Shen Jia, and Rudai Yang, "Housing affordability and housing vacancy in China: The role of income inequality," *Journal of Housing Economics*, 2016, *33*, 4–14.

Zhang, Fudong, "Inequality and house prices," Technical Report, University of Michigan working paper 2016.

Zheng, Siqi and Matthew E Kahn, "Land and residential property markets in a booming economy: New evidence from Beijing," *Journal of Urban Economics*, 2008, *63* (2), 743–757.

Zhu, Yu, Randall Wright, and Damien Gaumont, "Modeling house prices," in "2017 Meeting Papers" number 744 Society for Economic Dynamics 2017.

Appendices

A Affordable Matching Equilibrium (AM)

In the Affordable Matching Equilibrium (AM) only A-type sellers enter the market and trade with both P-type and R-type buyers. Hence, the value function of a j-type buyer, where $j \in \{R, P\}$, can be defined as

$$B^j = \frac{w + \theta(q)/q(y^{Aj} - p^{Aj})}{r + \theta(q)/q}$$

Following the free-entry condition of developers, normal economic profit in equilibrium implies that

$$S^A = \frac{c^A}{\alpha}$$

Inserting the above expressions into the bargaining condition to derive the equilibrium prices in the AM as the following

$$p^{Aj} = \frac{ry^{Aj} - w}{2r + \theta(q)/q} + \frac{r + \theta(q)/q}{\alpha} \frac{c^A}{2r + \theta(q)/q}$$

Substituting the equilibrium prices in seller's value function at a free entry equilibrium, i.e.

$$\frac{-v + \theta(q)[\lambda p^{AR} + (1 - \lambda)p^{AP}]}{r + \theta(q)/q} = \frac{c^A}{\alpha}$$

which ties down the value of q. As the AM implies that $\eta = 0$, hence buyers of either type match at the same rate which leads to $\lambda = \phi$ and solve the equilibrium.

B Pooled Matching Equilibrium (PM)

In the pooled matching equilibrium (PM), the $\{AP, AR, ER\}$ pairs are trading in the market. R-type buyers and A-type sellers trade with any one they randomly meet in the market. The value functions for buyers and sellers are defined as

$$B^R = \frac{\omega + \theta(q)/q[\eta(y^{ER} - p^{ER}) + (1 - \eta)(y^{AR} - p^{AR})]}{r + \theta(q)/q} \tag{B.1}$$

$$B^P = \frac{\omega + \theta(q)/q(1-\eta)(y^{AP} - p^{AP})}{r + \theta(q)/q(1-\eta)} \tag{B.2}$$

$$S^E = \frac{-v + \theta(q)\lambda p^{ER}}{r + \theta(q)\lambda} \tag{B.3}$$

$$S^A = \frac{-v + \theta(q)[\lambda p^{AR} + (1-\lambda)p^{AP}]}{r + \theta(q)} \tag{B.4}$$

These value functions describe agents' decision rules in the PM equilibrium. Take the value function for the rich buyer, B^R, as an example. The present value of a searching buyer of R-type is equal to the sum of the value of renting, ω, plus the expected values from purchasing an E-type house $\theta(q)/q\eta(y^{ER} - p^{ER})$ and an A-type house, $\theta(q)/q(1-\eta)(y^{AR} - p^{AR})$, whereas $r + \theta(q)/q$ is the effective discount factor. Free entry of developers implies:

$$S^E = \frac{c^E}{\alpha}, \quad S^A = \frac{c^A}{\alpha}.$$

With the Nash Bargaining solution (4) we can solve analytically for the equilibrium transaction prices. For example, as

$$p^{ER} = \frac{1}{2}\left[y^{ER} + \frac{c^E}{\alpha} - B^R\right], \quad \text{and} \quad p^{AR} = \frac{1}{2}\left[y^{AR} + \frac{c^A}{\alpha} - B^R\right]$$

Inserting the expression of B^R from (B.1) into the above equations and subtract one from another to find

$$p^{ER} - p^{AR} = \frac{1}{2}\left[y^{ER} - y^{AR} + \frac{c^E - c^A}{\alpha}\right] \tag{B.5}$$

which leads to the solutions of the equilibrium prices of the E-type and A-type properties in the PM equilibrium as follows:

$$p^{AR} = \frac{ry^{AR} - w + [r + \frac{\theta(q)}{q}]\frac{c^A}{\alpha}}{2r + \frac{\theta(q)}{q}} - \frac{\frac{\theta(q)}{q}\eta}{2r + \frac{\theta(q)}{q}}\frac{1}{2}(y^{ER} - y^{AR} - \frac{c^E - c^A}{\alpha})$$

$$p^{ER} = \frac{ry^{AR} - w + [r + \frac{\theta(q)}{q}]\frac{c^A}{\alpha}}{2r + \frac{\theta(q)}{q}} + \frac{2r + \frac{\theta(q)}{q}(1-\eta)}{2r + \frac{\theta(q)}{q}}\frac{1}{2}(y^{ER} - y^{AR} - \frac{c^E - c^A}{\alpha}) + \frac{c^E - c^A}{\alpha}$$

Following the similar procedure, one can obtain

$$p^{AP} = \frac{ry^{AP} - w + \frac{r + \theta(q)/q(1-\eta)}{\alpha}c^A}{2r + \frac{\theta(q)}{q}(1-\eta)}$$

These equilibrium transaction prices leads to some interesting insights into the mechanism through which the terms of trade determines the splitting of the surplus among buyers and sellers. We summarise our finding in the following proposition

Proposition 5. *The equilibrium price of a property is determined by its valuation to the buyers and its opportunity cost and search cost to the seller. The first two drive up the price whilst the last factor pushes the price down.*

By substituting the prices into the two free entry conditions we are able to pin down the endogenous variables λ, ϕ, and q, which solve the PM equilibrium.

$$\frac{\phi}{1-\phi} = \frac{\lambda}{1-\lambda}\frac{1}{(1-\eta)} \tag{B.6}$$

These three equations jointly pin down q, λ, and η hence close the model in the PM equilibrium.

C Vertical Matching Equilibrium (VM)

In the vertical matching (VM) equilibrium the R-type buyers only trade with E-type sellers and reject trading with A-type sellers, hence the A-type sellers only trade with the P-type buyers. In such an equilibrium the value function for a R-type buyer can be written recursively as

$$B^R = \frac{w + \theta(q)/q\eta(y^{ER} - p^{ER})}{r + \theta(q)/q\eta}$$

Inserting this expression of B^R into the Nash bargaining solution

$$p^{ER} = y^{ER} - B^R + \frac{c^E}{\alpha}$$

which solves for the equilibrium transaction price of the *(E,R)*-pairs

$$p^{ER} = \frac{ry^{ER} - w}{2r + \theta(q)/q\eta} + \frac{r + \theta(q)/q\eta}{2r + \theta(q)/q\eta}\frac{c^E}{\alpha}$$

Following a similar procedures, we can drive the equilibrium transaction price of the *(A,P)*-pairs as

$$p^{AP} = \frac{ry^{AP} - w}{2r + \theta(q)/q(1-\eta)} + \frac{r + \theta(q)/q(1-\eta)}{2r + \theta(q)/q(1-\eta)}\frac{c^A}{\alpha}$$

By substituting these two prices into the seller value functions and utilising the free entry conditions we get the following expressions:

$$\begin{aligned}\frac{-v+\theta(q)\lambda p^{GH}}{r+\theta(q)\lambda} &= \frac{c^G}{\alpha}\\ \frac{-v+\theta(q)(1-\lambda)p^{BL}}{r+\theta(q)} &= \frac{c^B}{\alpha}\end{aligned}$$

which together with the steady-state condition

$$\frac{\phi}{1-\phi} = \frac{\lambda}{1-\lambda}\frac{\eta}{(1-\eta)}$$

can uniquely pin down the values of q, η, and λ in the VM equilibrium.

D Externality of Inequality

Section 4 analysed the impact of inequality on the housing market by creating a mean-preserved income spread. As incomes for both rich and poor buyers changed, it became challenging to pin down the externality of making the rich buyers richer. In this section, we only increase the rich buyers' willingness to pay, y^{ER}, whilst keeping the poor buyers' income y^{AP} constant. Although average incomes also increase, as a result, it allows us to understand the impact of richer buyers' income on the poor buyers' affordability. As Figures (A1) to (A3) show, the adjustments in the transaction prices have shown similar trends to our mean-preserve income spread exercises, as summarised in the Proposition (3). Compared with the Figure (4) panel A, although p^{AP} has shown an increasing trend in VM, this is because there is no income effect in this exercise, but the composition effect is dominant for the affordable housing market for the poor buyers in the VM. Consequently, the poor buyers face a less affordable market. The rest of the state variables are summarised in Table A1.

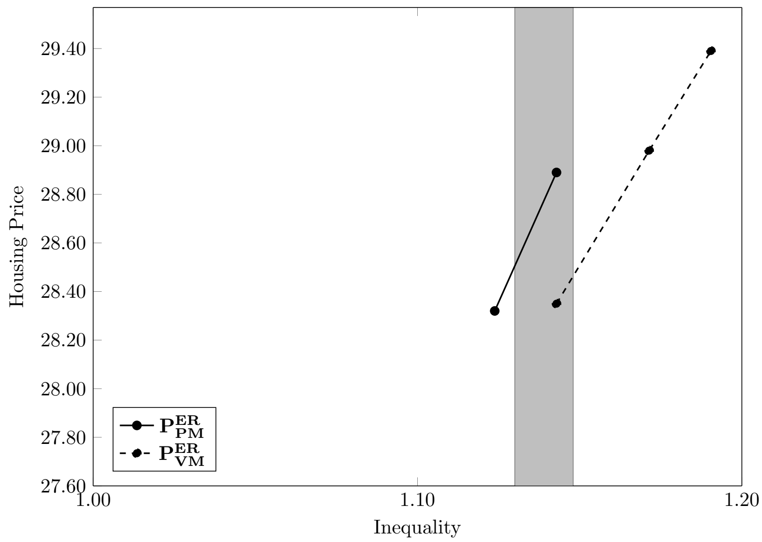
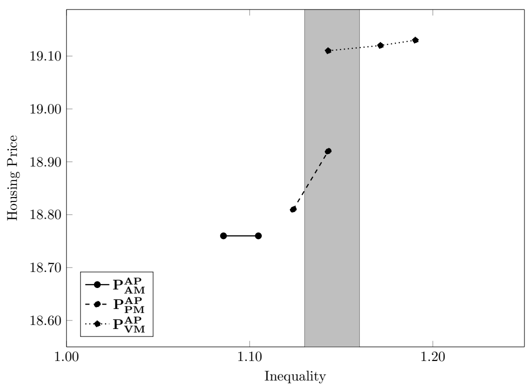
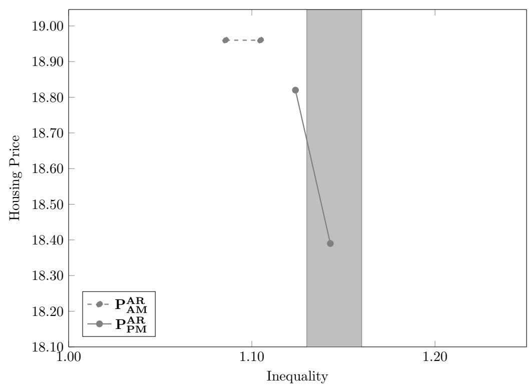


Figure A1: Equilibrium Transaction Prices of Executive Houses.

Notes. The horizontal axis depicts the income inequality measured as $\frac{y^{ER}}{y^{AP}}$. Throughout the exercise, we set $y^{AR} = 106$ and the proportion of rich buyers entering the market at $\phi = 0.3$. The rest of the parameters are shown in Table 1 and A1.



(a) Panel A



(b) Panel B

Figure A2: Affordable House Prices for the Poor Buyers (a) and Rich Buyers (b).

Notes. The horizontal axis depicts the income inequality measured as $\frac{y^{ER}}{y^{AP}}$. Throughout the exercise, we set $y^{AR} = 106$ and the proportion of rich buyers entering the market at $\phi = 0.3$. The rest of the parameters are shown in Table 1 and A1.

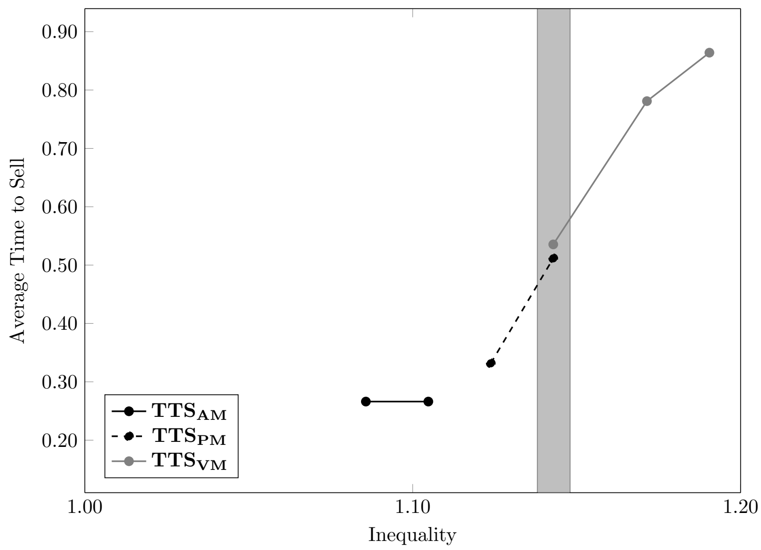


Figure A3: Equilibrium Transaction Prices of Executive Houses.

Notes. The horizontal axis depicts the income inequality measured as $\frac{y^{ER}}{y^{AP}}$. Throughout the exercise, we set $y^{AR} = 106$ and the proportion of rich buyers entering the market at $\phi = 0.3$. The rest of the parameters are shown in Table 1 and A1.

Table A1: The Impact of Making Rich Buyers Richer.

	y^{BL}	y^{GH}	inequality	η	λ	q
AM	105	114	1.086	0	0.30	22.06
AM	105	116	1.105	0	0.30	22.06
PM	105	118	1.124	0.10	0.28	22.44
PM	105	120	1.143	0.29	0.23	23.19
VM	105	120	1.143	0.53	0.27	22.83
VM	105	123	1.171	0.57	0.24	20.47
VM	105	125	1.190	0.59	0.23	19.13

Notes. The parameter values used to generate the table are: $y^{AR} = 106$, $y^{AP} = 105$, $\phi = 0.3$. The rest of the parameters are shown in Table 1. The grey band indicates the possibility of multiple equilibria.

In this exercise, by increasing y^{ER}, the affordability of poor buyers has worsened due to externalities arising from the composition effects and queue length effects. In the *PM* equilibrium, the higher profit margin from y^{ER} increases η, leading to the composition effect that results in a lower proportion of affordable houses in the market and consequently higher transaction prices. At the same time, as the *EP* pairs do not trade, more and more executive sellers in the market imply a longer search spell for the poor, hence they are paying higher prices. Note that in the *VM* equilibrium, although the queue length decreases with y^{ER}, the stronger composition effect still leads to an increase in the equilibrium price paid by poor buyers as the income of rich buyers rises. This observation supports the claim that making rich buyers richer has externalities that negatively impact the affordability of poor buyers through the composition effect in the market.

E Robustness

E.1 Changes in the value of renting ω.

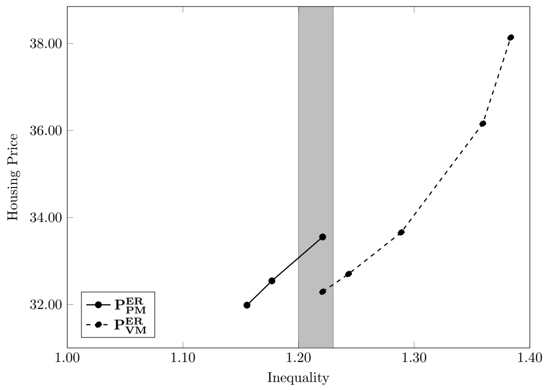
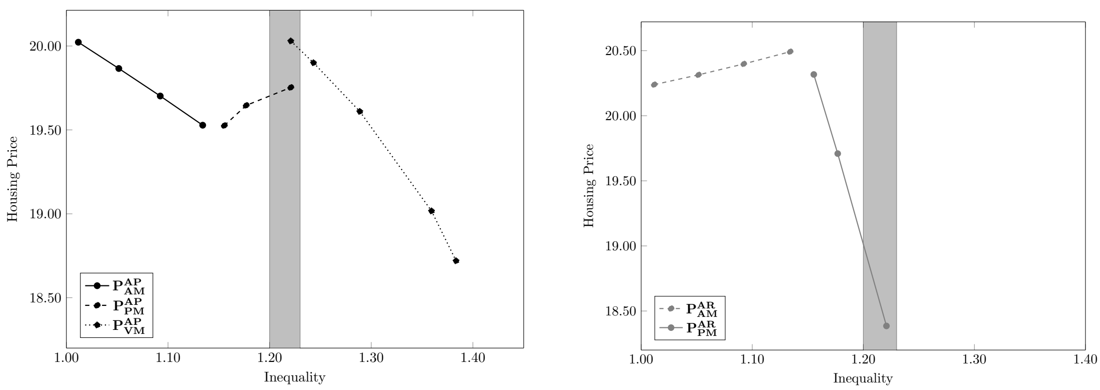


Figure A4: Robustness: $w = 8$. Equilibrium Transaction Prices of Executive Houses.



(a) Panel A

(b) Panel B

Figure A5: Robustness: $w = 8$.Affordable House Prices for the Poor Buyers (a) and Rich Buyers (b).

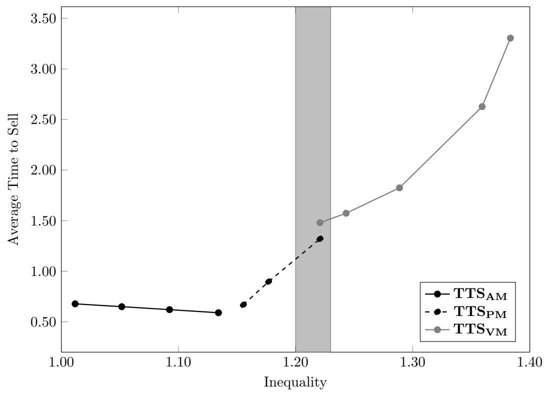


Figure A6: Robustness: $w = 8$. Average Time to Sell a House in the Market.

Table A2: Robustness check where $\omega = 8$. The grey band indicates the possibility of multiple equilibria.

	y^{AP}	y^{ER}	relative inequality	η	λ	q	p^{AP}	p^{AR}	p^{ER}	$(P/I)^{AP}$	$(P/I)^{AR}$	$(P/I)^{ER}$
AM	90.300	106.000	1.174	0.300		2.336	20.080	21.544		0.222	0.203	
AM	90.000	106.670	1.185	0.300		2.357	20.059	21.556		0.223	0.203	
AM	87.000	113.670	1.307	0.300		2.579	19.844	21.688		0.228	0.205	
AM	84.000	120.670	1.437	0.300		2.846	19.616	21.837		0.234	0.206	
PM	83.000	123.000	1.482	0.050	0.290	3.002	19.610	21.723	33.723	0.236	0.205	0.274
PM	80.000	130.000	1.625	0.376	0.211	3.962	19.941	19.911	35.411	0.249	0.188	0.272
PM	78.000	134.670	1.727	0.507	0.175	4.822	20.002	18.579	36.414	0.256	0.175	0.270
VM	78.000	134.670	1.727	0.625	0.205	4.481	20.289		35.064	0.260		0.260
PM	77.500	135.830	1.753	0.534	0.166	5.087	19.999	18.245	36.660	0.258	0.172	0.270
VM	77.500	135.830	1.753	0.635	0.198	4.639	20.229		35.260	0.261		0.260
VM	77.000	137.000	1.779	0.646	0.190	4.816	20.117		35.468	0.261		0.259
VM	75.000	141.670	1.889	0.694	0.159	5.820	19.897		36.422	0.265		0.257
VM	73.000	146.330	2.005	0.753	0.123	7.790	19.573		37.739	0.268		0.258
VM	71.000	151.000	2.127	0.832	0.080	13.289	19.148		40.070	0.270		0.265
VM	70.000	153.340	2.191	0.884	0.053	22.360	18.860		42.433	0.269		0.277

E.2 Changes in the construction cost c^E.

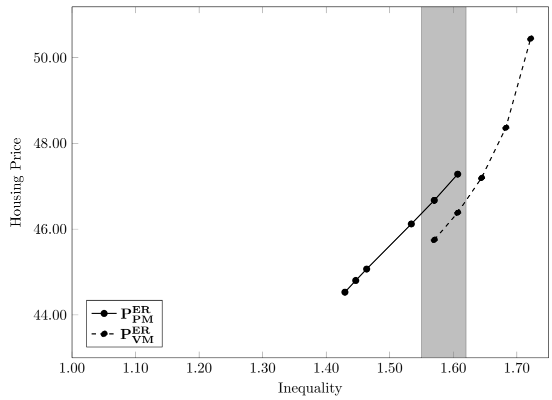
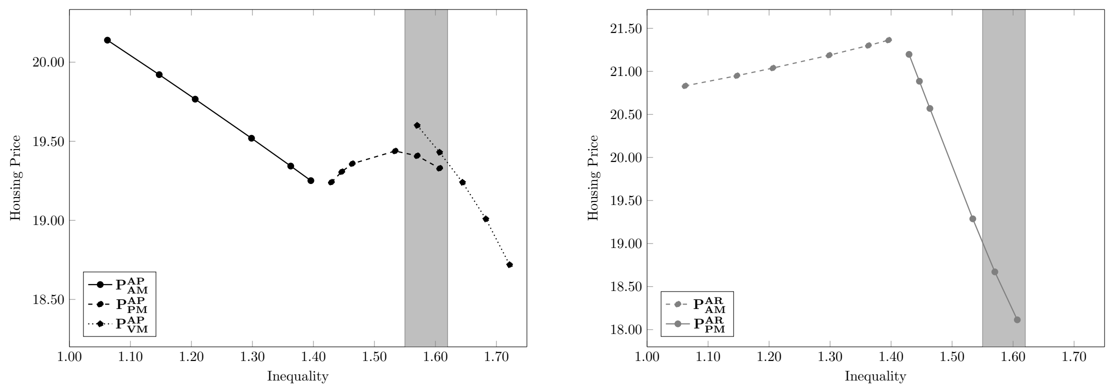


Figure A7: Robustness: $c^E = 36$. Equilibrium Transaction Prices of Executive Houses.



(a) Panel A

(b) Panel B

Figure A8: Robustness: $c^E = 36$. Affordable House Prices for the Poor Buyers (a) and Rich Buyers (b).

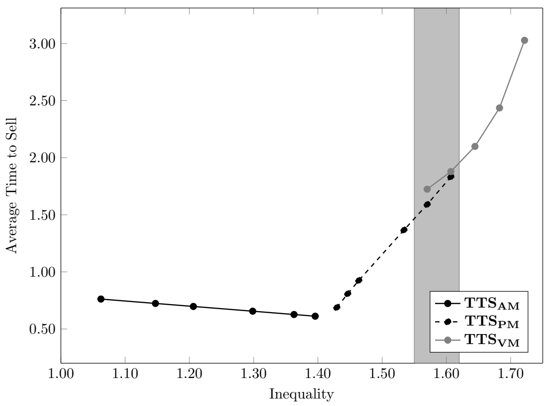


Figure A9: Robustness: $c^E = 36$. Average Time to Sell a House in the Market.

Table A3: Robustness Check Where $c^E = 36$

	y^{AP}	y^{ER}	relative inequality	η	λ	q	p^{AP}	p^{AR}	p^{ER}	$(P/I)^{AP}$	$(P/I)^{AR}$	$(P/I)^{ER}$
AM	123.000	130.667	1.062			2.691	20.139	20.831		0.164	0.160	
AM	120.000	137.667	1.147			2.983	19.921	20.949		0.166	0.161	
AM	118.000	142.333	1.206			3.214	19.766	21.038		0.168	0.162	
AM	115.000	149.333	1.299			3.634	19.519	21.187		0.170	0.163	
AM	113.000	154.000	1.363			3.978	19.343	21.300		0.171	0.164	
AM	112.000	156.333	1.396			4.174	19.251	21.362		0.172	0.164	
PM	111.000	158.667	1.429	0.071	0.284	4.583	19.241	21.197	44.530	0.173	0.163	0.281
PM	110.500	159.833	1.446	0.160	0.265	4.980	19.307	20.885	44.802	0.175	0.161	0.280
PM	110.000	161.000	1.464	0.236	0.247	5.402	19.358	20.569	45.069	0.176	0.158	0.280
PM	108.000	165.667	1.534	0.460	0.188	7.464	19.438	19.287	46.120	0.180	0.148	0.278
PM	107.000	168.000	1.570	0.546	0.163	8.940	19.408	18.671	46.671	0.181	0.144	0.278
PM	106.000	170.333	1.607	0.624	0.139	11.014	19.329	18.114	47.281	0.182	0.139	0.278
VM	107.000	168.000	1.570	0.659	0.181	8.650	19.600		45.750	0.183		0.272
VM	106.000	170.333	1.607	0.697	0.157	10.197	19.430		46.383	0.183		0.272
VM	105.000	172.667	1.644	0.742	0.130	12.789	19.240		47.193	0.183		0.273
VM	104.000	175.000	1.683	0.795	0.099	17.955	19.009		48.362	0.183		0.276
VM	103.000	177.330	1.722	0.864	0.063	32.627	18.719		50.437	0.182		0.284

E.3 Changes in the construction cost c^A and matching efficiency e^f.

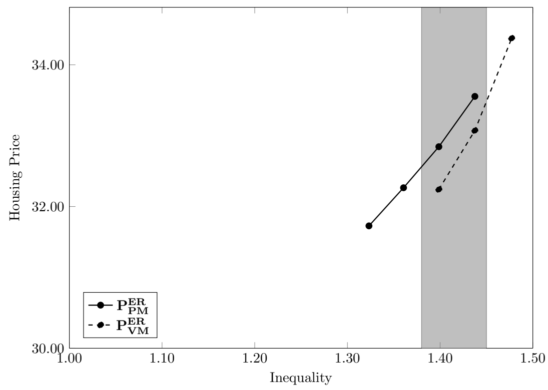
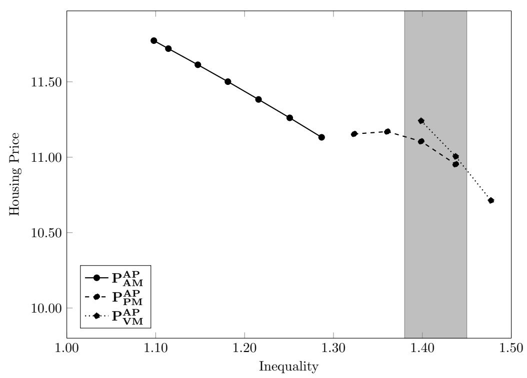
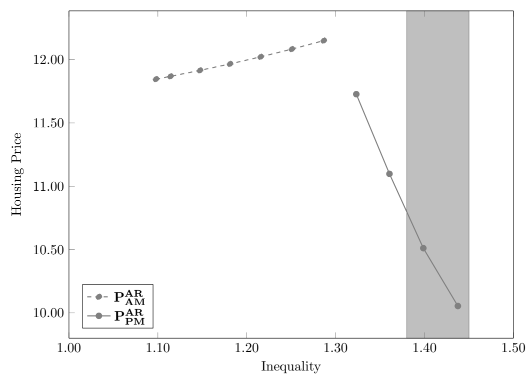


Figure A10: Robustness: $c^A = 10, e^f = 0.65$. Equilibrium Transaction Prices of Executive Houses.



(a) Panel A



(b) Panel B

Figure A11: Robustness: $c^A = 10, e^f = 0.65$. Affordable House Prices for the Poor Buyers (a) and Rich Buyers (b).

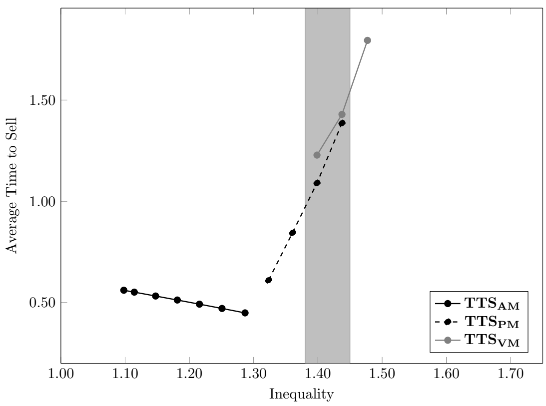


Figure A12: Robustness: $c^A = 10, e^f = 0.65$. Average Time to Sell a House in the Market.

Table A4: Robustness Check: $c^A = 10, e^f = 0.65$. The grey band indicates the possibility of multiple equilibria.

	y^{AP}	y^{ER}	relative inequality	η	λ	q	p^{AP}	p^{AR}	p^{ER}	$(P/I)^{AP}$	$(P/I)^{AR}$	$(P/I)^{ER}$
AM	105.500	115.833	1.098	0.300		4.966	11.773	11.846		0.112	0.112	
AM	105.000	117.000	1.114	0.300		5.136	11.720	11.868		0.112	0.112	
AM	104.000	119.333	1.147	0.300		5.513	11.613	11.915		0.112	0.112	
AM	103.000	121.667	1.181	0.300		5.947	11.501	11.966		0.112	0.113	
AM	102.000	124.000	1.216	0.300		6.451	11.383	12.022		0.112	0.113	
AM	101.000	126.330	1.251	0.300		7.044	11.261	12.083		0.111	0.114	
AM	100.000	128.667	1.287	0.300		7.748	11.132	12.150		0.111	0.115	
PM	99.000	131.000	1.323	0.176	0.261	9.411	11.154	11.727	31.727	0.113	0.111	0.242
PM	98.000	133.333	1.361	0.365	0.214	11.995	11.170	11.098	32.265	0.114	0.105	0.242
PM	97.000	135.667	1.399	0.515	0.172	15.907	11.105	10.511	32.844	0.114	0.099	0.242
VM	97.000	135.667	1.399	0.650	0.187	15.743	11.241		32.241	0.116		0.238
PM	96.000	138.000	1.438	0.650	0.131	22.953	10.953	10.054	33.554	0.114	0.095	0.243
VM	96.000	138.000	1.438	0.719	0.144	21.616	11.005		33.072	0.115		0.240
VM	95.000	140.333	1.477	0.807	0.093	38.255	10.713		34.374	0.113		0.245

E.4 Equilibrium pattern when the model approaches to frictionless case $r \to 0$.

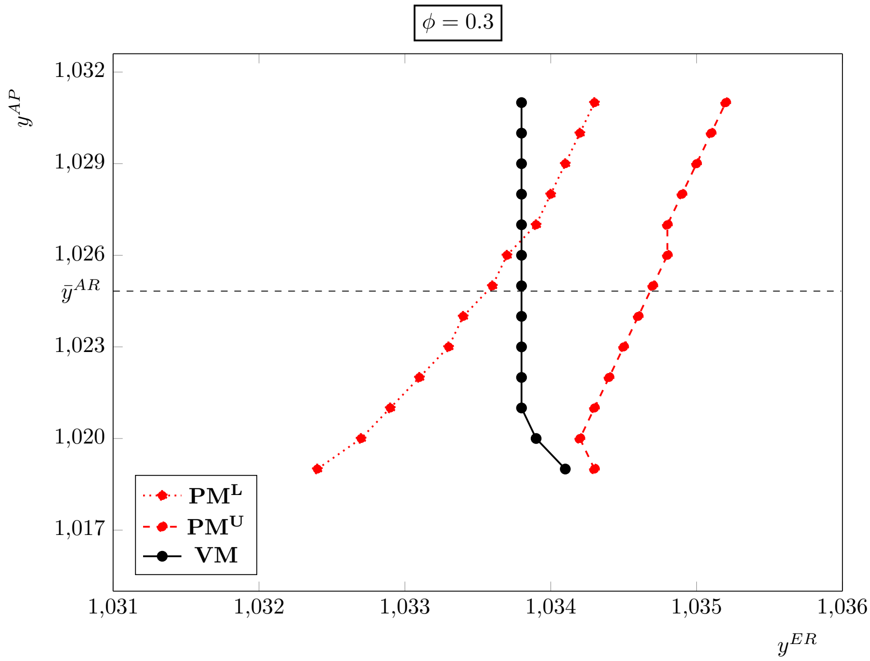


Figure A13: Robustness: $r = 0.005$. The Equilibrium Pattern.

To test our model's predictions in the limiting case of a frictionless market, we set the discount rate r as close to zero as possible. In a search market, e.g defined by equation(2), letting $r \to 0$ implies that $\frac{\theta(q)}{r} \to \infty$; that is, the contact rate between buyers and sellers becomes arbitrarily high, and the model converges to a frictionless environment.

Figure(A13) shows the market equilibria in this limiting case. Compared with the baseline equilibria shown in Figure(6), we observe that using $r = 0.005$ the regions corresponding to the pooled matching equilibrium (between PM^L and PM^U) and the area of multiple equilibria (between the curves VM and PM^U) become extremely narrow relative to the income range of y^{ER}. For instance, when $y^{AP} = 1023$, a small increase in y^{ER} from 1033.2 to 1034.5 leads to a discrete shift in equilibrium from AM to VM. Further reductions in r effectively eliminate the PM and multiplicity regions entirely.

In the frictionless limit, the model yields only two pure-strategy Nash equilibria: AM and VM. However, our central mechanism still holds—rising inequality shifts the equilibrium from AM to VM, making the housing market less affordable for poor buyers and more accessible to rich buyers.

Table A5: Real house price appreciation vs supply-demand ratio, 2006–2014 28 major cities in China

	Real Price Growth %	Supply-demand ratio %
Beijing	226.4	87.27
Shanghai	158.8	70.04
ShenZhen	207.1	72.77
Guangzhou	164.2	92.74
Changchun	84.3	111.21
Changsha	92.5	118.64
Chengdu	143.8	230.41
Chongqing	156.9	192.78
Dalian	115.8	115.39
Fuzhou	218.6	118.58
Guiyang	121.7	162.09
Harbin	91.0	159.93
Hefei	215.9	124.51
Hohhot	206.5	178.38
Kunming	147.4	120.47
Lanzhou	109.6	143.4
Nanning	87.4	115.42
Qingdao	185.3	143.95
Shenyang	64.4	153.87
Shijiazhuang	146.2	112.85
Taiyuan	86.6	148.1
Tianjin	141.4	131.51
Wuhan	157.6	129.02
Xiamen	322.3	115.12
Xian	106	129.72
Xining	55.4	131.57
Yinchuan	51.6	192.66
Zhengzhou	131.1	190.76

*Notes.*Data source: Wu et al. (2016). The citywide average real price growth is calculated based on the "average selling prices of newly-built homes" in 35 major Chinese cities from 2004-2014. The supply and demand were measured by thousand units.