Waiting for Affordable Housing

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September 28, 2017

Motivation

- As many urban areas have shifted toward a knowledge-based economy, real estate prices and rents have continued to soar in many metropolitan areas for the past two decades.
- Many large cities in the U.S. and abroad – as San Francisco, Los Angeles, Boston, Washington D.C., Seattle, Toronto, Vancouver and London – have implemented a variety of policies aimed at increasing the supply of affordable housing and limiting future rent increases.
- New York City (NYC) has been at the center of the debate over affordable housing in the U.S. and serves as a laboratory to study the impact of affordable housing policies.
- NYC not only has the largest stock of publicly provided housing, but also imposes strong regulations on private housing markets.
- The purpose of this paper is to quantify the impact of these policies on the welfare of low- and moderate-income households.

Contributions

- We develop a new dynamic equilibrium model that captures the existence of three different types of rental markets (public, regulated, unregulated), as well as the dynamic incentives faced by households (income dynamics, long waiting list for public housing, long search time for regulated housing).
- We estimate the model using data from the New York City Housing Vacancy Survey in 2011.
- To explain why affordable housing policies are increasingly popular at the ballot box, we quantity the welfare gains associated with access to affordable housing.
- We also evaluate the impact of increasing the supply of affordable housing.

Public Housing: Excess Demand, Rationing, and Mismatch

- Low- and moderate-income households are eligible for public housing assistance if their income is below a threshold that depends on the number of children and the region.
- As a consequence there is typically a large number of eligible households in each metro area.
- Supply of public housing is often inadequately low to meet the potential demand.
- Rents are typically a fixed percentage of household income.
- Hence, there is no price mechanism which guarantees that markets clear, which results in excess demand and rationing in equilibrium.
- Housing authorities rarely evict ineligible households which creates mismatch in the allocation of public housing.

Public Housing in NYC

- More than 403,000 New Yorkers reside in NYCHA's 177,666 public housing apartments across the city's five boroughs.
- The NYCHA reported that 270,201 families were on the wait lists for conventional public housing.
- Little is know about the annual flows. The NYT reported on July 23, 2013 that "the queue moves slowly. The apartments are so coveted that few leave them. Only 5,400 to 5,800 open up annually."
- Another 235,000 residents receive subsidized rental assistance in private homes through the NYCHA-administered Section 8 program.
- In addition, 121,356 families were on the waiting list for Section 8 vouchers. This wait list has been closed since 2009. You can therefore treat Section 8 vouchers as a separate market.

Affordable Housing and Rent Stabilization

- Studying New York City is also interesting since it the only large city in the United States that has declare a "Housing Emergency" for the past few decades.
- Declaring a housing emergency allows NYC to regulate large parts of the rental market.
- As of 2011 over one million units were rent-stabilized in New York, representing roughly 47 percent of the rental housing stock.
- The large rental subsidies that are created by regulating large parts of the rental market also create mismatch in housing.

Voluntarily Rent Stabilized Housing

- Rent stabilization generally applies to buildings of six or more units built between February 1, 1947 and December 31, 1973, and to those units that have exited from the rent-control program.
- Approximately 8 percent of the city's stabilized units and nearly all stabilized units in buildings constructed after 1974 were voluntarily subjected to rent stabilization by their owners in exchange for tax incentives from the city.
- Under the 421-a program developers currently have to set aside 20 percent of new apartments for poor and working-class tenants to receive tax abatements lasting 35 years.

Involuntarily Rent Stabilized Housing

- Involuntarily stabilized units, representing 92 percent of the stabilized stock, are regulated based on a "housing emergency" declared by the city in 1974 and renewed every three years since.
- Under New York States Rent Stabilization Law, the city may declare a housing emergency whenever the city's rental vacancy rate drops below five percent.
- This law was most recently renewed in June 2015 and affects units with a maximum rent of $2700.
- Rent stabilization sets maximum rates for annual rent increases. It also entitles tenants to have their leases renewed.

Data

- We turn to NYC Housing Vacancy Survey (NYCHVS) in 2011 to characterize the housing markets of NYC.
- The advantage of this data set is that it matches household with units, i.e. it contains detailed information about household characteristics and housing characteristics.
- We have adopted three sample restrictions:
  1. We drop households that receive Section 8 vouchers since the wait list for these vouchers has been closed since 2009.
  2. We drop households whose average incomes exceed 200% of median income level.
  3. We also drop all households not living in Manhattan since housing programs are administered at the borough level in NYC.
- As a sensitivity analysis we also estimate the model for the 5 boroughs of NYC.

Descriptive Statistics

housing type	market share	rent	number of years	income	female head	kids	working family
Public	0.10	—	16.18	32930	0.73	0.92	0.70
Regulated	0.58	1317	9.49	54739	0.53	0.38	0.83
Unregulated	0.33	2640	3.85	71045	0.54	0.17	0.87

The Model

- We consider a local housing market with three housing options: public housing (p), rent-regulated housing (r), and unregulated or market housing (m).
- The exogenous housing supply in public and rent regulated housing are given by k_p and k_r.
- Time is discrete, $t = 0, ..., \infty$.
- Households are infinitely lived and forward looking.
- Households have a common discount factor β and maximize lifetime expected utility.
- Households differ by income y which evolves according to a stochastic law of motion that can be described by a stationary Markov process with transition density $f(y'|y)$.
- We assume that the logarithm of income for each household follows an AR(1) process.

Flow Utilities

Unregulated Private Housing:

$$u_m(y) = \alpha^{\alpha}\,(1-\alpha)^{1-\alpha}\,y\,p_m^{-\alpha}$$

Public Housing:

$$u_p(y, h_p) = [(1-\tau)y]^{(1-\alpha)}\,h_p^{\alpha}$$

Rent-stabilized Housing:

$$u_r(y, h_r) = [y - p_r h_r]^{(1-\alpha)}\,h_r^{\alpha}$$

Rent Stabilized Housing

- The price per unit of housing services for rent stabilized housing is significantly lower than the price for market housing $p_r < p_m$.
- Each period, there is a positive probability q_r that a household receives an offer to move into a rent regulated unit of quality h_r, $r = 1, .., R$.
- For simplicity, I will develop the theory under the assumption of $R = 1$.
- We estimate the more general model with housing heterogeneity.
- The probability of receiving an offer to move into a stabilized housing unit is endogenous and depends on the voluntary outflow from regulated housing.

Public Housing

- Eligibility is determined by an income cut-off, denoted by $\bar{y}$.
- The priority score of a household is a monotonic function of the time spent on the wait list.
- More formally, let w denote the time that a household has been on the wait list.
- Let $p(w)$ denote the probability that a household that has been on the wait list for w periods will receive an offer to move into public housing.
- The housing authority makes take it or leave it offers, i.e if the household rejects an offer, it will go the end of the wait list, i.e. $w = 0$.
- The outflow of public housing is voluntary, i.e. the housing authority does not evict households from public housing.
- The distribution of priority scores is endogenous.

States and Conditional Value Functions

- The state variables are the wait time, w, and income, y.
- Define the conditional value functions associated with the three choices:

$$
\begin{aligned}
v_p(y) &= u_p(y) + \beta \int V_p(y')\, f(y'|y)\, dy' \\
v_m(y,w) &= u_m(y) + \beta \int V_m(y',w')\; f(y'\omega'|y\omega)\, dy' d\omega' \\
v_r(y,w) &= u_r(y) + \beta \int V_r(y',w')\, f(y'\omega'|y\omega)\, dy' d\omega'
\end{aligned}
$$

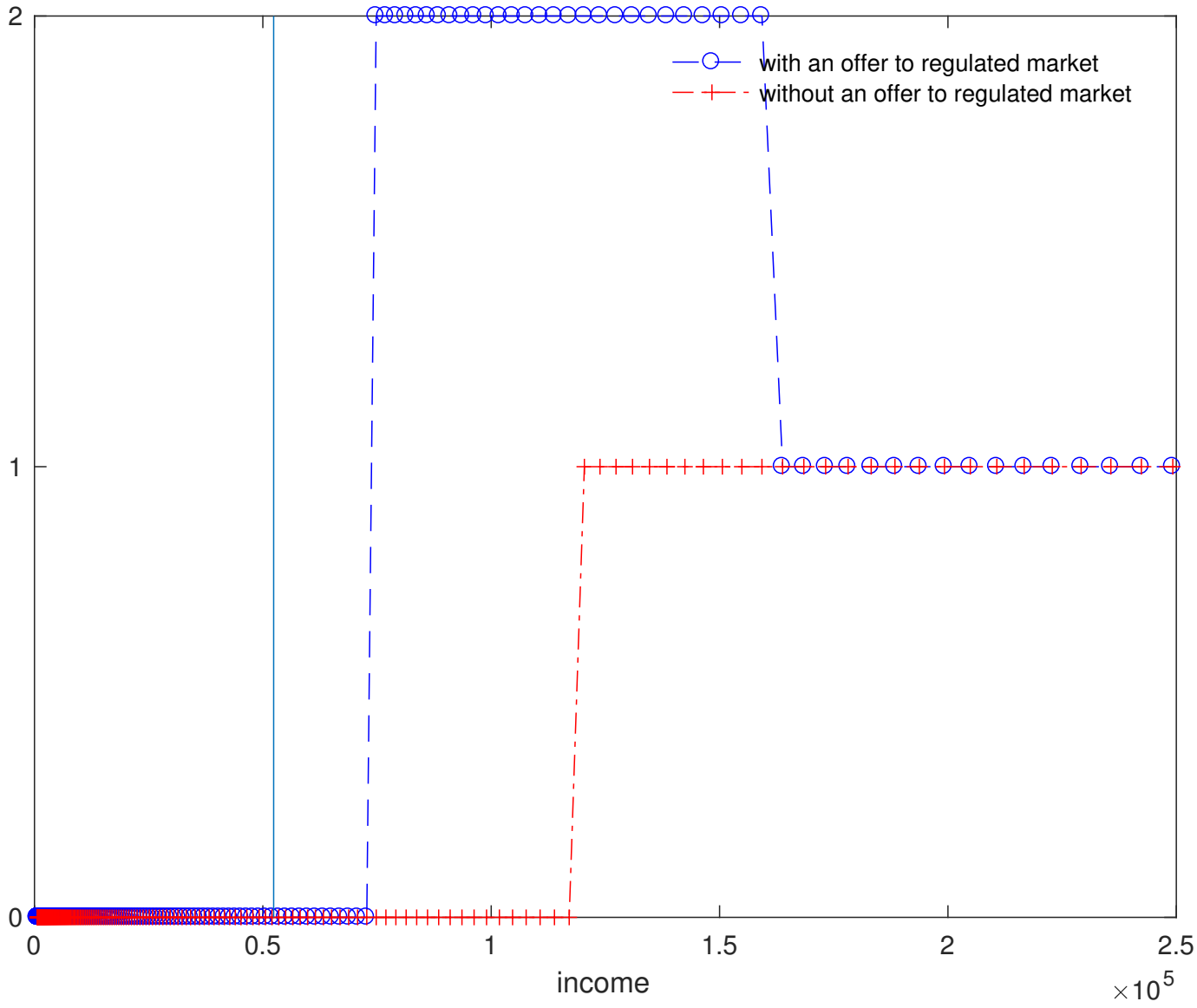
Bellman Equations

The value function for a household with characteristics (w, y) that rents in the regulated market is given by:

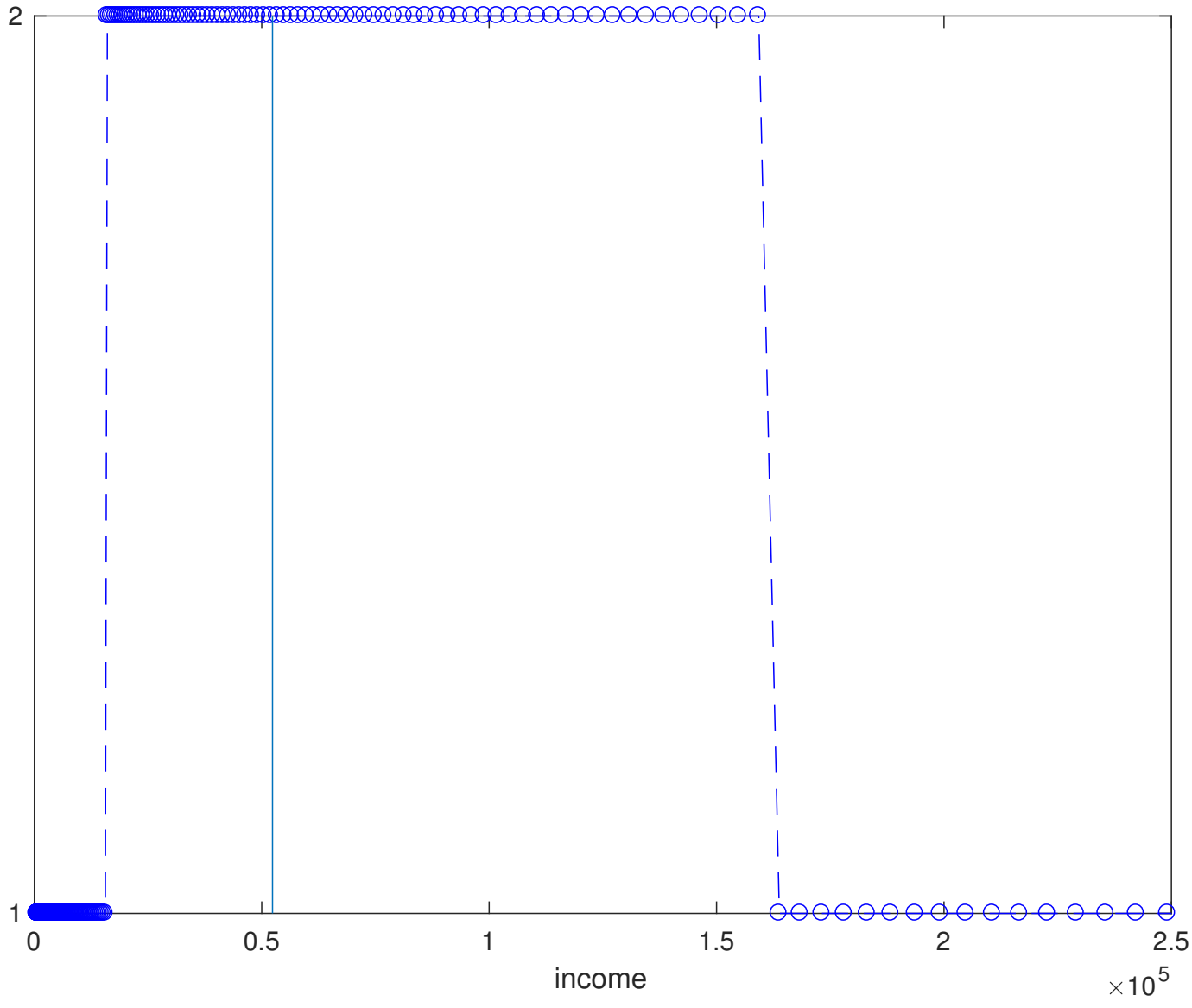
$$\begin{aligned} V_r(y,w) &= p(w)\, 1\{y \leq \bar{y}\}\ \max\{v_p(y), v_m(y,0), v_r(y,0)\} \\ &+ (1-p(w))1\{y \leq \bar{y}\} \max\{v_m(y,w+1), v_r(y,w+1)\} \\ &+ 1\{y > \bar{y}\}\ \max\{v_m(y,0), v_r(y,0)\} \end{aligned}$$

Once we have computed the value function, we can characterize the optimal decision rules.

Policy Function: Public Housing



Policy Function: Regulated Housing with $w = 5$



Equilibrium

A **stationary equilibrium** with rationing for this model consists of the following:

- a) offer probabilities $p(w)$ and q_r,
- b) distributions $g_p(y)$, $g_m(w), g_r(w)$, $g_m(y|w)$, and $g_r(y|w)$, and
- c) value functions $V_p(y)$, $V_m(y, w)$ and $V_r(y, w)$,

such that:

1. Households behave optimally and value functions satisfy the equations above.
2. The housing authority behaves according the administrative rules described above.
3. The densities are is consistent with the laws of motion and optimal household behavior.
4. $p(w)$ satisfies the market clearing condition for public housing:

$$OF_p = IF_p$$

5. q_r satisfies the market clearing condition for rent regulated housing:

$$OF_r = IF_r$$

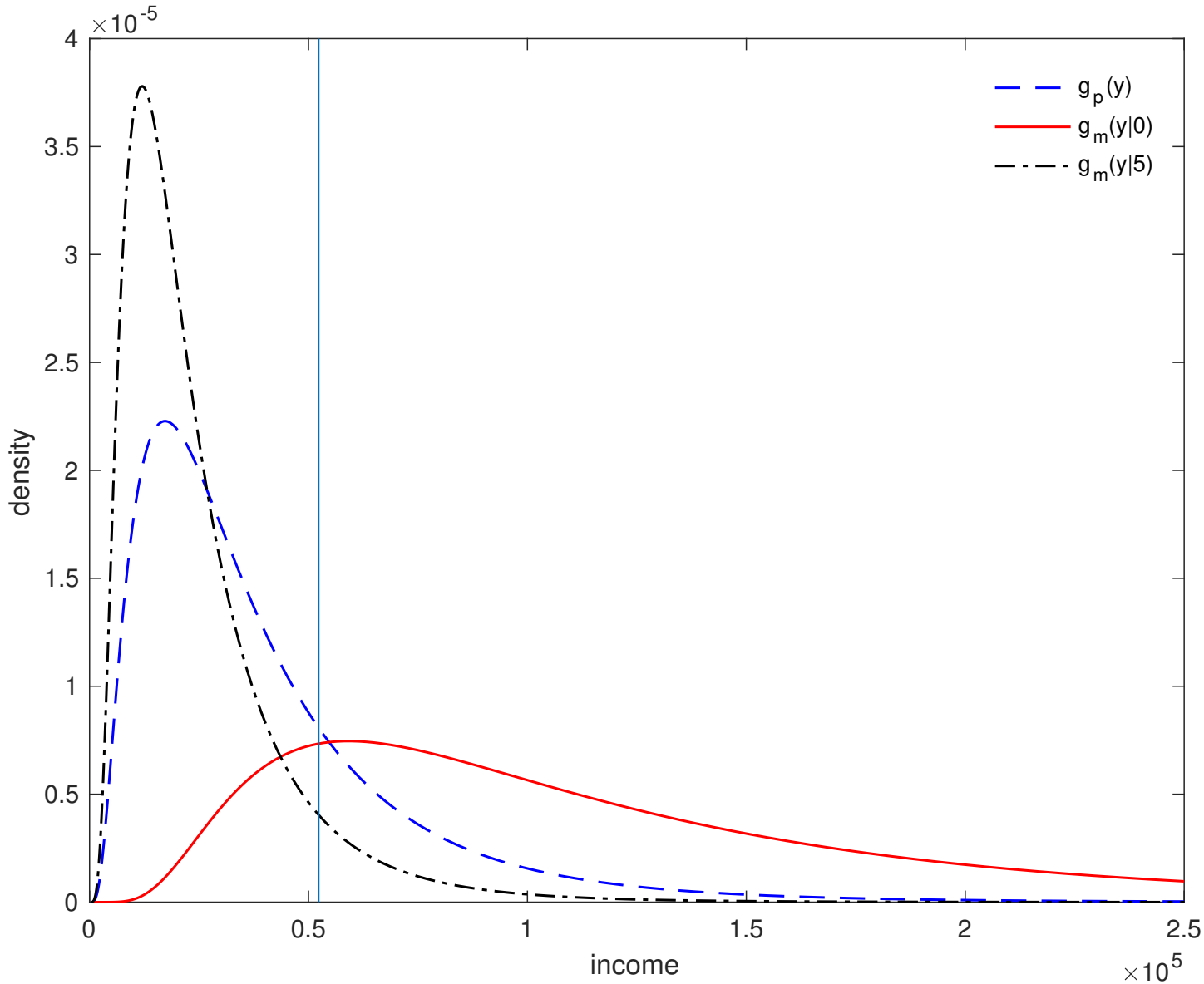
Characterizing Stationary Equilibria

- Any stationary equilibrium equilibrium must have the property that there exists a value $\bar{w} < \infty$ such that:
  a) $p(\bar{w} + 1) = 1$,
  b) $0 \leq p(\bar{w}) \leq 1$
  c) $p(\bar{w} - j) = 0$ for all $j \geq 1$
- The equilibrium thus has the property that everybody in the highest priority group obtains an offer to move into public housing.
- In addition, a fraction of the households with the second highest priority also gets an offer.
- Those household in the second highest priority group who do not get an offer will obtain an offer in the next period.

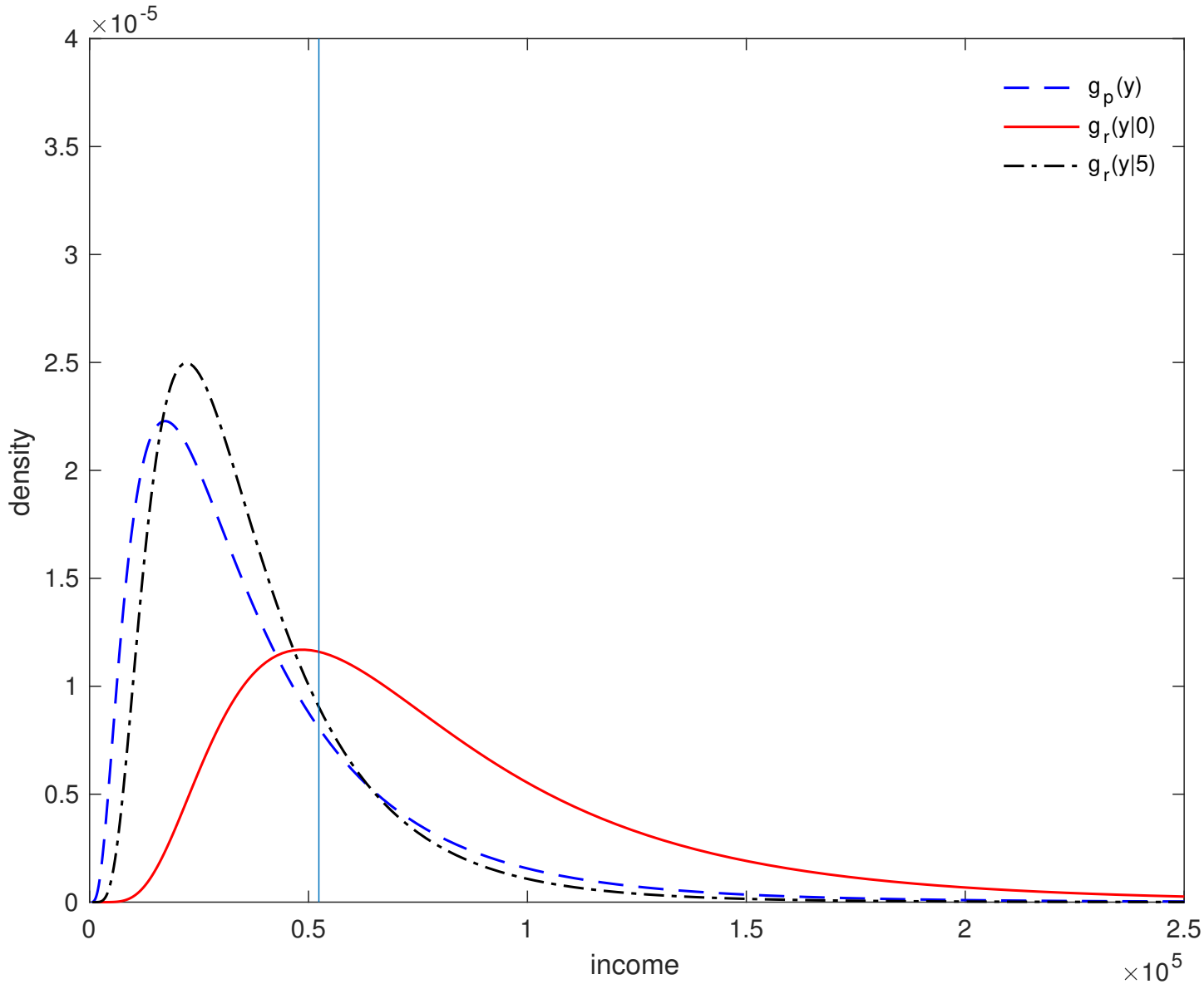
Queuing and Effective Demand

- The discreteness of the priority score effectively partitions the demand for public housing into a finite number of cohorts $(\bar{w} + 2)$.
- We need to smooth out the flow of households into public housing and equate the inflow with the voluntary flow of households out of public housing
- We accomplish that by randomizing among households with the second highest priority score, $p(\bar{\omega})$.

Stationary Distributions: Public and Private Housing



Stationary Distributions: Rent Stabilized Housing



Extensions

- We control for additional sources of observed heterogeneity such as race, family size and gender of household head.
- We also allow for differences in preferences among these households.
- We use discrete types to capture these differences.
- We have estimated models that allow for different wait lists by family size.

Identification I

- We follow Sieg, Smith, Banzhaf and Walsh (2002) and estimate hedonic regressions to decompose rents into a price and quality component.
- This identifies the relative price of stabilized housing.
- It also allows us to approximate the quality distribution of rent stabilized units.
- The time that households spent in public housing is increasing in the quality of the public housing unit. We observe this outcome in the data.

Identification II

- The mean and the variance of income is identified of the observed income distributions in the data.
- The autocorrelation parameter of the income process is identified of the persistence of housing choices measured by time spent in each housing type.
- The utility parameter α is identified by the observed housing shares.

Estimation

- The arguments for identification are constructive.
- We can estimate the parameters of our model using a methods of moments estimator.
- We use the following moments in estimation:
  - fraction of each housing choice and type,
  - average time in unit by housing choice and type,
  - average income by housing choice and type,
  - variance of income by housing choice and type,
  - housing expenditure shares by housing choice and type.

Estimated Parameters

	Baseline	1 Type	1 Queue		2 Queue	
	all	all	female	male	female	male
α	0.45 (0.01)	0.46 (0.01)	0.50 (0.02)	0.43 (0.01)	0.47 (0.01)	0.44 (0.01)
μ_y	10.62 (0.03)	10.64 (0.02)	10.59 (0.03)	10.69 (0.03)	10.56 (0.03)	10.70 (0.06)
σ	0.54 (0.02)	0.53 (0.02)	0.50 (0.01)	0.58 (0.03)	0.49 (0.01)	0.59 (0.06)
ρ	0.76 (0.02)	0.76 (0.03)	0.77 (0.03)	0.72 (0.04)	0.80 (0.02)	0.69 (0.02)
h_p	26,552 (515)	25,902 (866)	25,985 (670)		24,189 (2296)	29,841 (1278)
h_1	32,240 (673)	26,795 (604)	27,110 (620)		26,527 (618)	
h_2		37,980 (1087)	37,605 (918)		37,072 (440)	

Standard errors are in parenthesis.

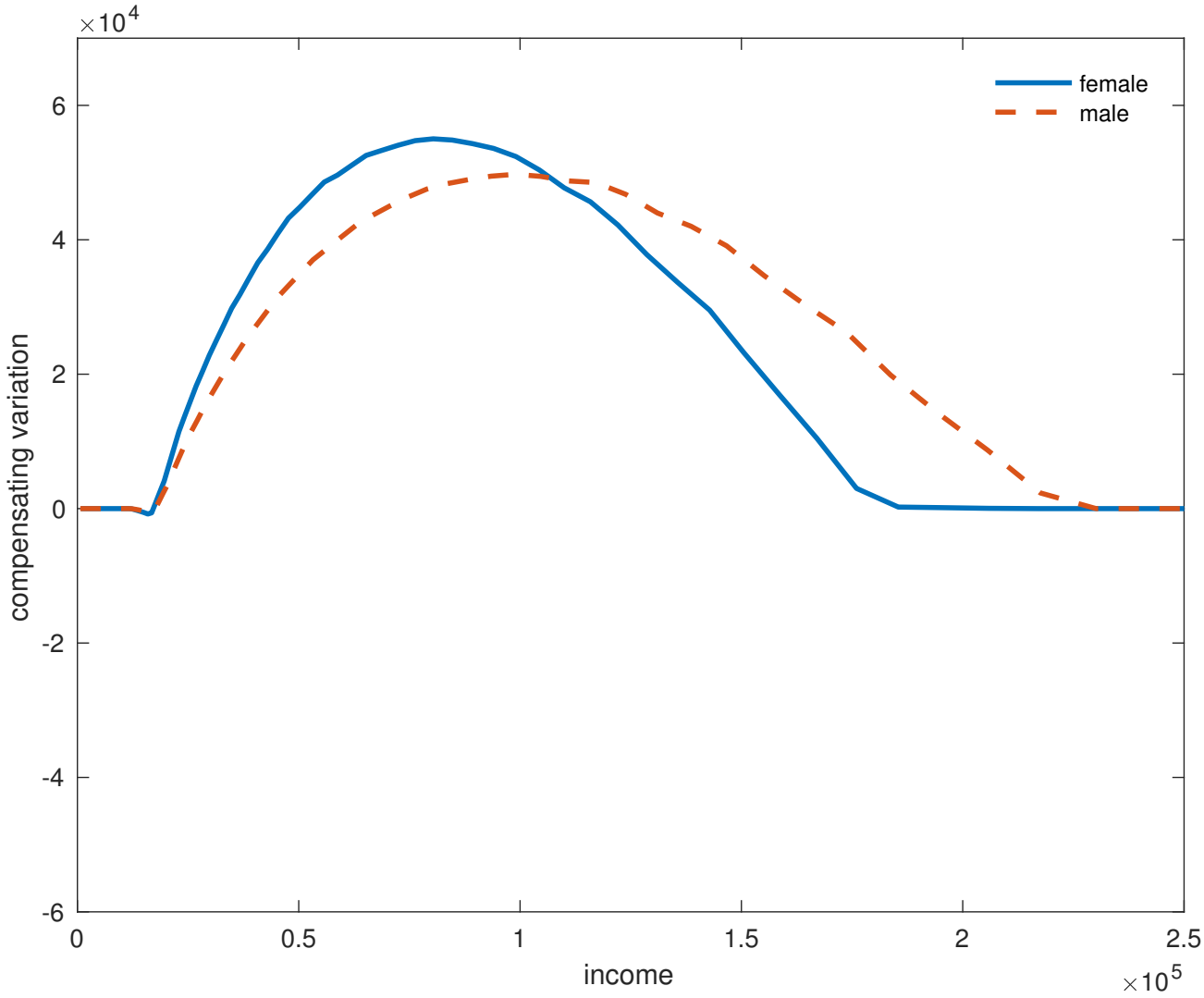
Properties of Equilibrium

		Baseline	1 Type	2 Type - 1 Queue	2 Type - 2 Queue	
wait	$\bar{w}$	18	17	17	19	18
times	$p(\bar{w})$	0.82	0.53	0.96	0.75	0.72
search	q_1	0.25	0.13	0.14	0.14	
frictions	q_2		0.10	0.11	0.11	

Model Fit

	housing	percent		years		income		market rent	
				Baseline					
	Public	9.90	9.90	16.18	16.37	32930	33914	—	—
	Regulated	57.20	57.20	9.49	9.20	54739	55615	1317	1309
	Market	32.90	32.90	3.85	4.22	71045	70262	2640	2642
				2 Type - 1 Queue					
	Public	6.55	6.55	15.39	16.75	28796	33732	—	—
female	Regulated1	12.55	13.15	10.03	8.90	45516	43625	1048	1101
	Regulated2	14.90	14.79	10.41	10.41	55184	59342	1484	1527
	Market	16.00	15.51	3.70	4.19	69970	65844	2555	2729
	Public	2.95	2.95	18.34	13.41	44298	36075	—	—
male	Regulated1	16.55	15.95	8.37	8.54	53550	50321	1093	1101
	Regulated2	13.45	13.56	8.99	8.59	66288	66296	1695	1527
	Market	17.05	17.55	4.04	4.22	72300	74908	2743	2673
				2 Type - 2 Queue					
	Public	6.55	6.55	15.39	16.02	28796	30942	—	—
female	Regulated1	12.55	13.20	10.03	8.67	45516	44186	1048	1077
	Regulated2	14.90	14.38	10.41	10.29	55184	59558	1484	1506
	Market	16.00	15.87	3.70	4.21	69970	67341	2555	2654
	Public	2.95	2.95	18.34	18.99	44298	42304	—	—
male	Regulated1	16.55	15.90	8.37	7.90	53550	48874	1093	1077
	Regulated2	13.45	13.97	8.99	8.71	66288	64866	1695	1506
	Market	17.05	17.18	4.04	3.95	72300	74827	2743	2743

Difference in Welfare between Rent Stabilized (High Quality) and Private Housing



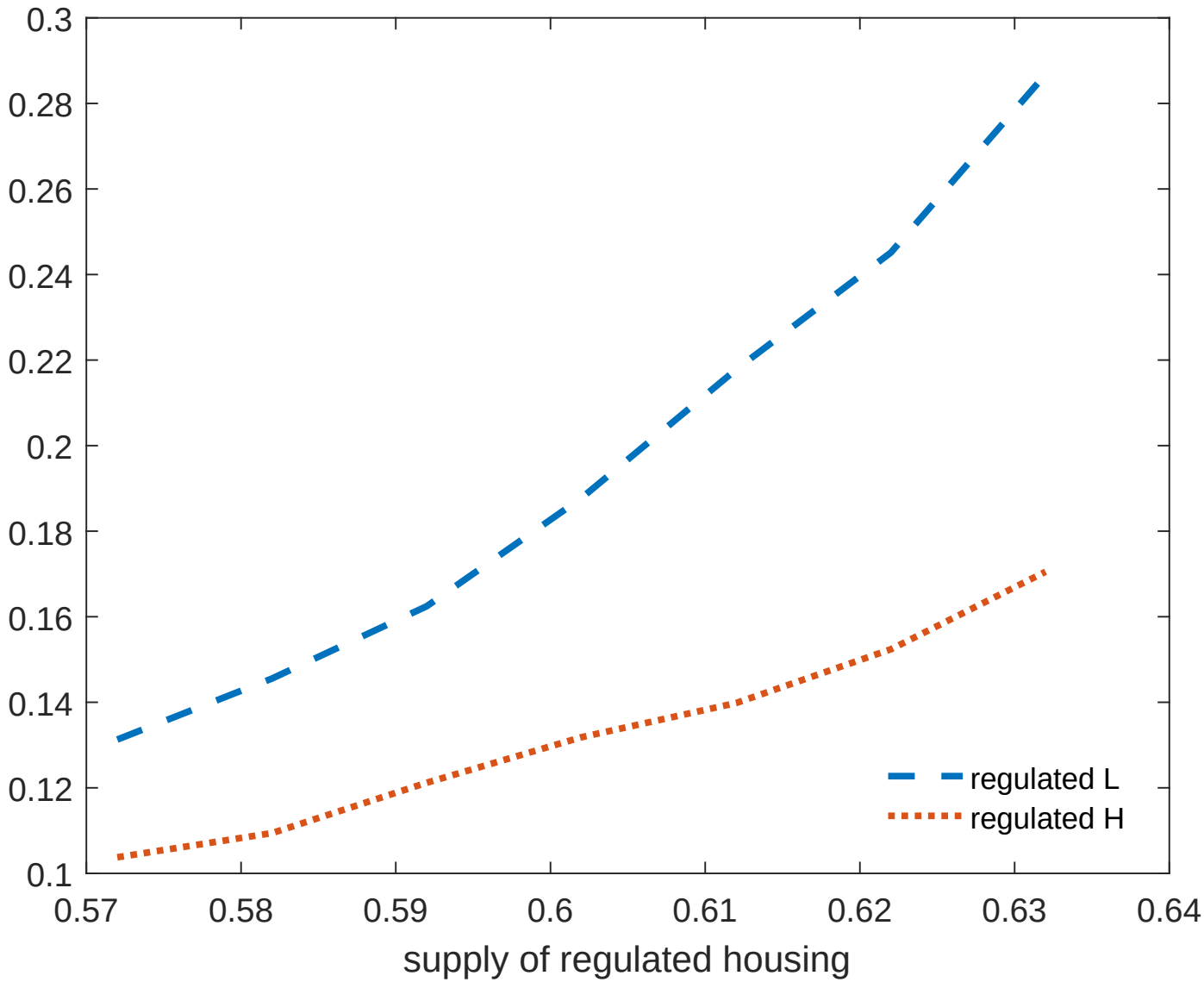
Policy Analysis

- The popularity of affordable policies is in stark contrast to long term trends in the supply of affordable housing in NYC.
- Landlords have long been allowed to deregulate vacant apartments if the legal rent for a new renter exceeds a threshold, currently $2,700 a month.
- Between 1993 and 2015 more than 139,000 apartments have been converted to market rates through vacancy decontrol which has led to a significant decline in the supply of affordable housing (WSJ, 2015).
- Local politicians and policy makers have struggled with the voters' demands to reverse this trend.

Policy Analysis

- As a candidate, the current mayor of NYC, Bill de Blasio, successfully ran on a platform that promised significant increases in the provision of affordable housing.
- Once in office, he proposed and city council recently adopted a 10-year plan to build and retain 200,000 affordable housing units in the NYC area through various rezoning laws.
- We can use our model to simulate the effects of these types of policy changes on renters' welfare.
- Using our model with two affordable housing types and one public housing queue, we increase the supply of affordable housing by up to 10 percent.
- We consider the impact of this policy change on the probability of finding an affordable housing unit, the wait time for public housing, as well as the distribution of renters' welfare in the economy.

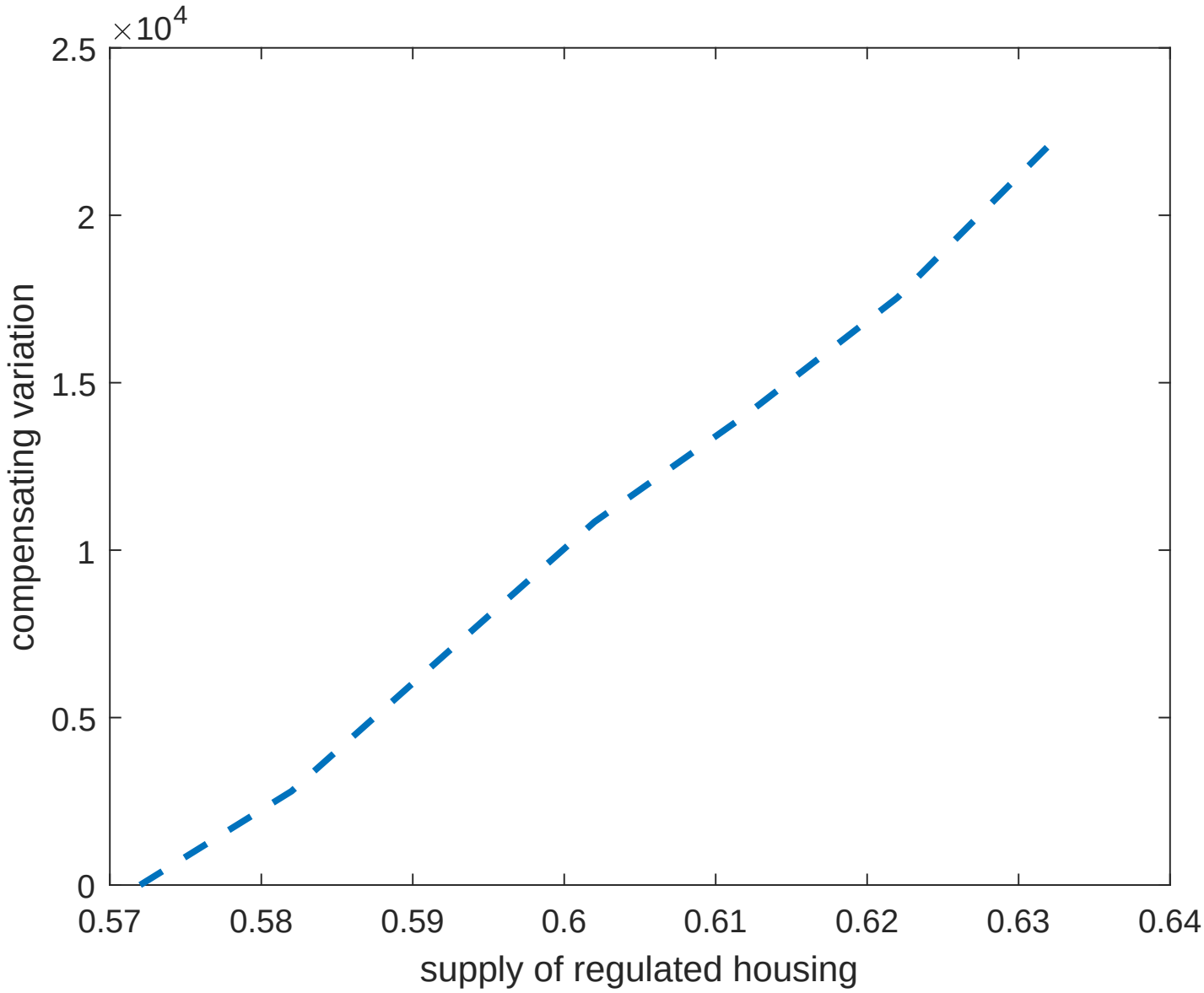
Offer Probability (p_r)



Findings

- The probability of finding a low-quality unit increases from 14 to 28 percent, while the probability of finding a high-quality unit increases from 10 to 16 percent.
- Wait times for public housing also decrease by up to 1.5 years.
- The reduced waiting and search times are associated with a more efficient allocation of public and rent stabilized housing in equilibrium.
- Households are more likely to move out of affordable units when they receive positive income shocks.
- Hence, those units can be reallocated faster to more needy households.
- As a consequence, the time spent in public or regulated housing decreases significantly.
- Similarly, household in the unregulated market also spend less time in the unit because of the reduced wait and search times for affordable housing.

Change in Welfare



Sensitivity Analysis

- In the baseline model we assume that the housing supply for unregulated housing is perfectly elastic.
- Alternatively, we can use an aggregate housing supply function given by $H_m^s(p_m) = I\,[p_m]^\epsilon$.
- Here we focus on the case when $\epsilon = 0.5$.
- A ten percent increase in regulated housing reduces the demand for unregulated housing.
- As a consequence, the rental price for unregulated housing drops by 6 percent.
- As private housing gets cheaper, it becomes more attractive.
- As a consequence, the reduction in waiting and search times are even steeper than in the baseline model.
- But, overall, we obtain the same qualitative and quantitative results.

Conclusions

- We have developed a new dynamic model that captures search frictions and queuing in the market for affordable housing for low- and moderate-income households.
- We have shown how to identify and estimate the structural parameters of the model.
- We have characterized the distribution of welfare that arises in our model and shown that access to low (high) quality affordable housing can increase welfare by as much as \$20,000 (\$55,000).
- As consequence, our model provides a compelling explanation why affordable housing policies have been popular with the vast majority of urban renters in NYC.
- We find that a ten percent increase in the supply of affordable improves welfare for all renters as the wait and search times decrease.