Urban Economics

Lecture 4: Urban Planning and Land-Use Controls

Spring 2024
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Outline

Next, we analyze the effects of market failures and the effects of policies designed to correct for these market failures

We first focus on market failures that are related to and cause urban sprawl, i.e. the spatial expansion of urban areas

- This analysis is conducted using the monocentric city model and it follows Brueckner's Chapter 4

We then move on to economics of urban planning more generally with a focus on housing supply and affordability

- We use urban planning as an umbrella term for different types of land use policies and regulations concerning e.g. building height

Market failure

A market failure arises when the decentralized activities of economic actors fail to achieve the optimal outcome from society's point of view

- A polluting factory does not take into the account the damage that pollution creates, and thus, pollutes too much
- Similarly, an individual driver does not consider the detrimental effect that driving has on local air quality or the time cost s/he exerts to other drivers during rush hour
- Both are examples of negative externalities (or spillovers)

Are there market failures in the economic process that determines the spatial size of cities?

Sprawl

Market failure related to open-space amenities and biodiversity loss

What if people enjoy open-space benefits from farmland or if urban expansion leads to environmental problems such as biodiversity losses?

In our model, the landowner rents the land to a developer whenever the developer outbids the farmer, i.e. $r > r_A$

- More generally, alternative land use can be a forest or some other natural state, which we lose if the urban area expands
- Following the textbook, we'll continue to assume that agriculture is the alternative land use, but keep in mind the more general interpretation

Market failure related to open-space amenities and biodiversity loss

However, the society represented by a "social planner" would want the landowner to consider the benefits of open-space and nature *b* in the decision-making

- The social planner would want the land converted into urban use only if urban rent would compensate for both the lost agriculture-rent and the lost open-space benefit, i.e. $r > r_A + b$
- From the society's point of view, the boundary of the city should be set at distance x where $r = r_A + b$

Socially optimal city in the presence of an open-space amenity

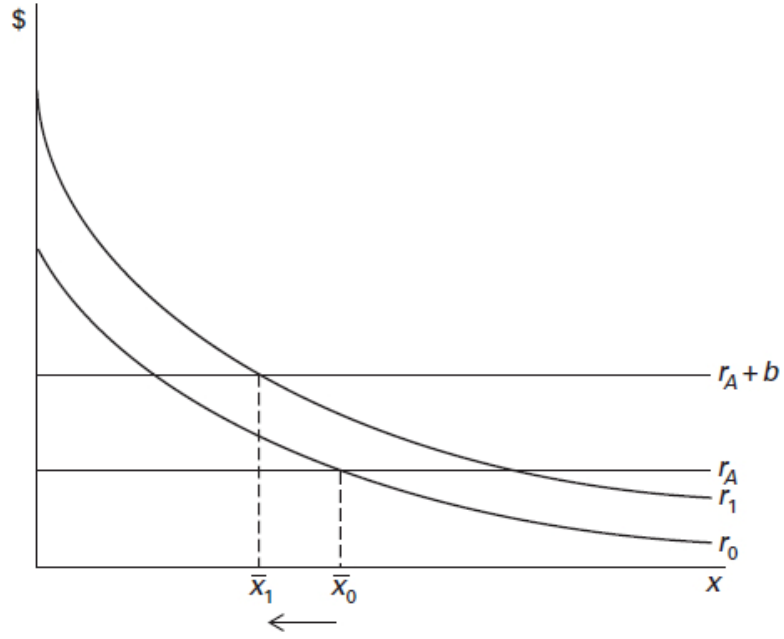


Figure 4.1

Open space externality.

The socially optimal city would emerge if the agricultural rent would be $r_A + b$, instead of r_A

This situation is depicted in the figure and is the same as analyzed before

In the presence of an open-space amenity, the socially optimal city is spatially smaller than the city generated by the free-market equilibrium

How to reach the socially optimal size?

One way is to use the price system in the form of a tax on developed land (development tax)

- Suppose that the landowner must pay a tax of b to the government on each hectare of developed land that s/he rents to a developer
- Then the net after-tax income for the landowner from developed land would be $r - b$
- The landowner would switch land to urban use only if $r - b \geq r_A$
- At the edge of the city, we have $r - b = r_A$ or $r = r_A + b$, which is the condition that determines the edge of the socially optimal city

Market failure related to traffic congestion

Congestion externality arises because the presence of a single extra car on a congested road slows down all the other drivers

- Since these congestion costs are borne by other drivers, no individual driver has an incentive to take them into account
- The total social cost of an extra car entering the road is the private cost incurred by the extra driver plus the externality damage done to other drivers in the form of higher time costs
- Each driver's extra cost may be small, but summing these costs over all affected drivers may produce a non-negligible total impact

Congestion charge

One solution is to charge the commuters a congestion toll or charge that is equal to the monetary value of the congestion costs they impose on others

Let's assume that such a congestion toll is introduced

What implications does this have for the urban spatial structure?

The result is that the city shrinks

- Because commuting costs increase, urban residents choose to make shorter trips and prefer living closer to the CBD
- This same result was obtained earlier when analyzing the effects of increasing commuting costs

Socially optimal city in the presence of congestion

Again, the city that emerged as the free-market equilibrium was too large, taking-up too much space leading to long commutes

Socially optimal city takes-up less space and people commute shorter distances on average

Traffic may exert other types of externalities, such as pollution, and the congestion toll may serve as a (partial) solution to this problem as well

- But in general, you would want to target each externality directly

We will analyze congestion tolls more carefully later

Urban growth boundary (UGB)

Both the development tax and the congestion charge led to a decrease in the cities' geographic size

An alternative instrument to achieve this is an urban growth boundary (UGB)

- Instead of addressing the root cause of sprawl (like open-space or congestion externality), it addresses the symptom (excessive spatial expansion) by directly restricting land use
- In terms of the model, UGB imposes an upper limit on the distance to city's edge

Effects of UGB

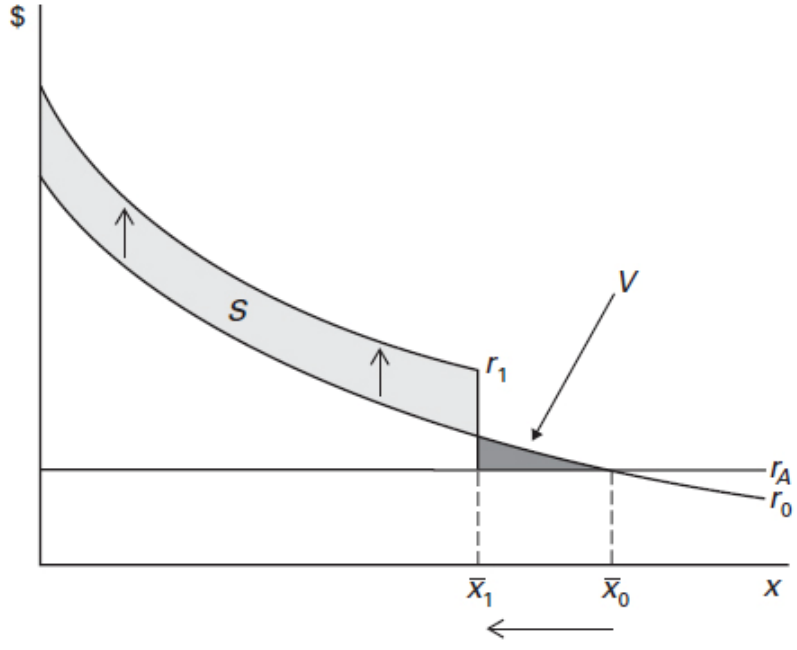


Figure 4.2

UGB enriches landowners.

If the UGB is set as in the figure, it will have the same effect on urban structure as a development tax (when the tax is set so that the spatial size of city is the same)

Urban land rent will increase as the now geographically smaller city has to fit its population into a smaller area

UGB vs. congestion toll

UGB reaches the same goal as the development tax as they both target the open-space externality

However, it will not reach the same goal when the underlying problem is traffic congestion

- The UGB will decrease city size, but it will densify the city throughout, not cause a clear population shift toward the CBD
- The congestion toll achieves this by directly targeting commuting costs

Political economy of UGB

Sometimes it is argued that the motive for UGB's is not to address market failures, but instead increase land prices

According to this view, urban landowners have an incentive to restrict housing supply and they have political influence

- This will drive-up the price of land conferring capital gains to landowners, while increasing housing costs for renters

In the model, the landowners live outside the city (absentee landlords)

- This is of course unrealistic, but the basic message of the analysis does not change if the landowners live in the city themselves (e.g. as homeowners)

Political economy of UGB

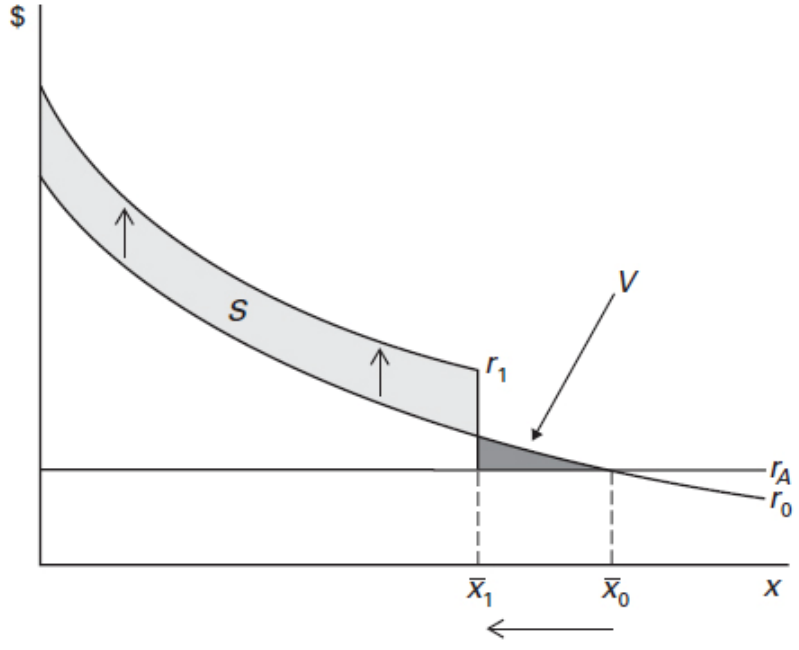


Figure 4.2

UGB enriches landowners.

Due to the UGB, land prices in the city shift up from r_0 to r_1

The additional rental income is the area S

The UGB also force some of the land from urban to agricultural use leading to decrease in rental income from (area V)

From the figure we can see that as long as $S > V$, the restriction is in the landowners' interests

Political economy of UGB

In this case, there are no open-space benefits, and the residents of the city are worse off, and the society is worse off as well

If landowners have sufficient political power, a UGB may be introduced even in this case

A more realistic model would have both renters and homeowners living in the city

The homeowners would have similar incentives as landowners in this simpler model

Building height restrictions

Building height and density restrictions

In addition to a UGB, cities implement many other types of building regulations

One example is building height restrictions that may be either explicit or implicit

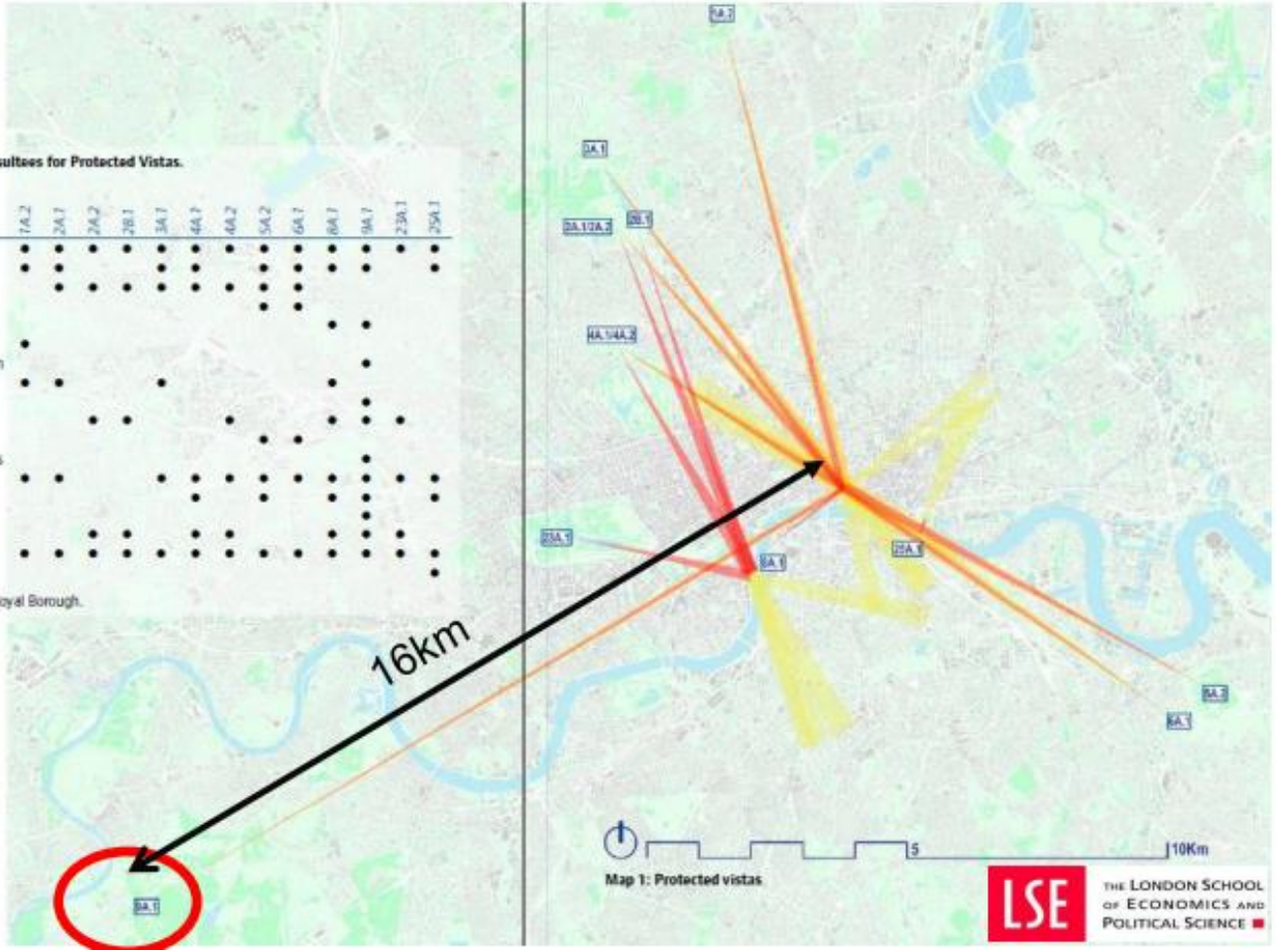
- Example: no building in the District of Columbia part of the Washington metro area can be taller than the U.S Capitol
- In Paris, there are very few very tall buildings in the central city
- The same is true in Helsinki
- Also, London has several height restrictions designed to protect views to historic monuments and buildings

Example: protected view's in London

Table 2 – Statutory Consultees for Protected Vistas.

Viewing Location	1A.2	2A.1	2A.2	2B.1	3A.1	4A.1	4A.2	5A.2	6A.1	8A.1	9A.1	23A.1	25A.1
GLA	•	•	•	•	•	•	•	•	•	•	•	•	•
City of London	•	•			•	•		•	•	•	•		•
LB Camden		•	•	•	•	•	•	•	•				
LB Greenwich								•	•				
LB Hackney										•	•		
LB Haringey	•												
LB Hammersmith & Fulham											•		
LB Islington	•	•			•					•			
RB Kensington & Chelsea											•		
LB Lambeth			•	•			•			•	•	•	
LB Lewisham								•	•				
LB Richmond upon Thames											•		
LB Southwark	•	•			•	•	•	•	•	•	•	•	•
LB Tower Hamlets						•		•		•	•		•
LB Wandsworth											•		
City of Westminster			•	•		•	•			•	•	•	
English Heritage	•	•	•	•	•	•	•	•	•	•	•	•	•
Historic Royal Palaces													•

LB London Borough; **RB** Royal Borough.



Source: London View Management Framework (2012)

Source: Prof. Christian Hilber's Inaugural Lecture, LSE 21 March 2017

Protected view from King Henry VIII' Mound (Richmond Park)

Source: Prof. Christian Hilber's Inaugural Lecture, LSE 21 March 2017

Protected view from Westminster Pier to St Paul's Cathedral

https://upload.wikimedia.org/wikipedia/commons/c/c4/London_protected_views_map.svg

Helsinki skyline

Helsinki skyline

Floor area ratio restriction

Technically, height restrictions specify a limit on a building's floor area ratio (FAR)

- $FAR = \frac{square\ meters\ of\ floor\ space\ in\ the\ building}{lot\ area}$

If a building covers the whole lot area, floor space of each floor would equal the lot area

A FAR restriction of 8 would then limit the height of the building to 8 stories

If the building only takes up half of the lot, the implicit height restriction would be 16

Effects of FAR restriction

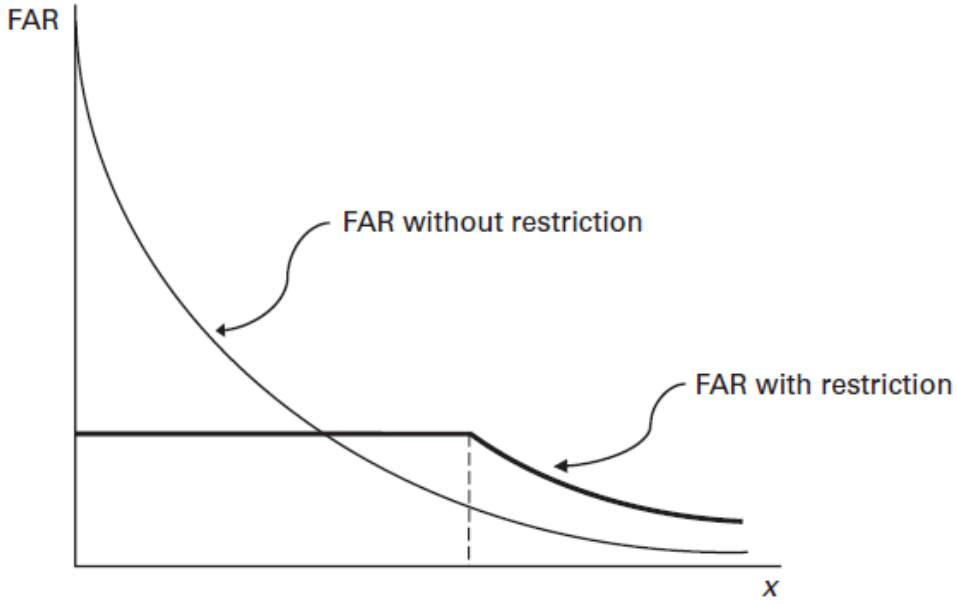


Figure 4.3

Effect of building-height restrictions.

From the figure, we can see the FAR in different parts of the city with and without the restriction

Height restrictions are binding in central part of the city where buildings would be taller without the limit

But building height increases in the outer parts of the city

The city also expands spatially

Effects of FAR restriction

The spatial expansion of the city is natural because the height limit reduces the land's ability to accommodate all the residents

- The city must expand to fit its population (which is fixed in this analysis)

Thus, the FAR restriction causes urban sprawl!

Effects of FAR restriction

The FAR restriction increases the price per square meter of housing (*p*) in all locations

- This happens because there are fewer dwellings in central parts of the city, and they become relatively more scarce
- Some households need to find housing somewhere else, which increases the demand for housing elsewhere causing the housing price to increase there as well
- Higher housing price leads consumers to reduce dwelling sizes

Increase in *p* in more remote locations, will increase land rent *r* in these locations

- Leads to taller buildings and higher FAR

Effects of new housing supply

Background – public discussion

Housing costs are high and have risen rapidly in many major cities around the world

Increasing supply by relaxing land-use regulation especially in central and expensive parts of cities is frequently proposed as a solution to rising housing costs

Counterargument:

- Constructing market-rate housing in high-demand locations only benefit the rich because these units will be expensive
- We should build new housing in places where new units would be cheap

But don’t we already know the answer?

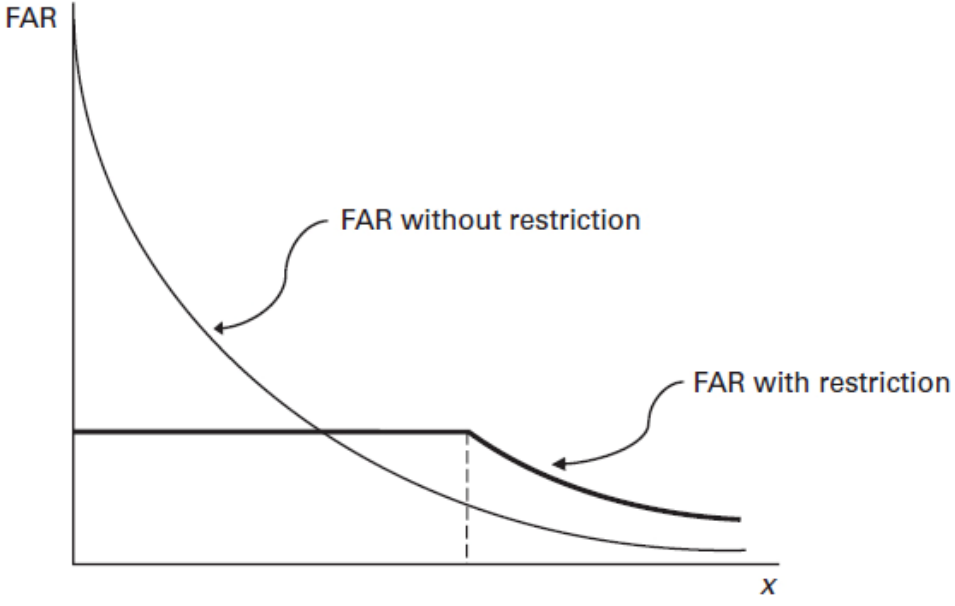


Figure 4.3

Effect of building-height restrictions.

The FAR restriction increases the price per square meter of housing in all locations

There are fewer dwellings in central parts of the city, and they become relatively more scarce

Some households need to find housing somewhere else, which increases the demand for housing increasing prices there as well

Higher prices lead consumers to reduce dwelling sizes

Not necessarily

The effect is obvious in a simple model of homogenous housing units, but housing is highly differentiated

- New construction is predominately expensive and quite different from units that are affordable to lower-income households
- If the housing market is highly segmented, with few households searching or moving across dissimilar housing types and neighborhoods, an increase in the supply of expensive new units could have little effect on the market for lower-income housing

The strength of this relationship is crucial to policymakers considering reforms that increase market-rate construction

- Need to weigh benefits against costs, such as objections from neighbors, concerns of gentrification etc.

ELSEVIER

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In Press, Corrected Proof ?

JUE insight: City-wide effects of new housing supply: Evidence from moving chains ☆

Cristina Bratu [a] ✉, Oskari Harjunen [b] ✉, Tuukka Saarimaa [c] ✉

https://www.sciencedirect.com/science/article/pii/S0094119022001048

Bratu et al. (2023)

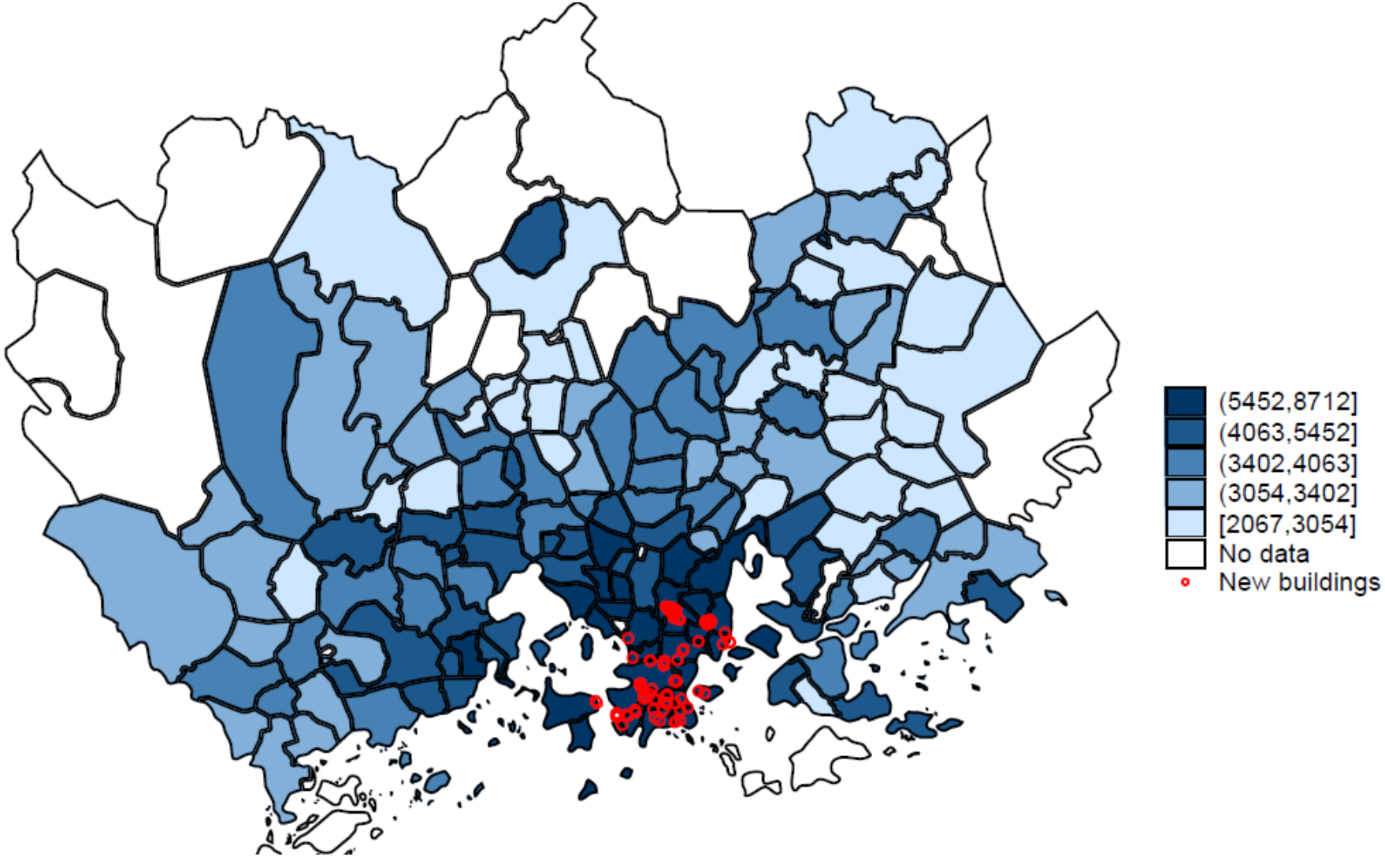
Study moving chains initiated by buildings built between 2010 and 2019 within a 3km radius of Helsinki Central Station

Use geo-coded register data containing information on all residents in Finland over the 2009–2019 time period

- The data includes rich demographic and socio-economic characteristics: gender, income, education and number of children
- Can link individuals to both their home buildings and the housing units at the end of each calendar year

Granular location information

- If there are at least three households in the building, know the exact coordinates of the building
- Otherwise, the coordinates refer to 250 square meter grids


(5452,8712]
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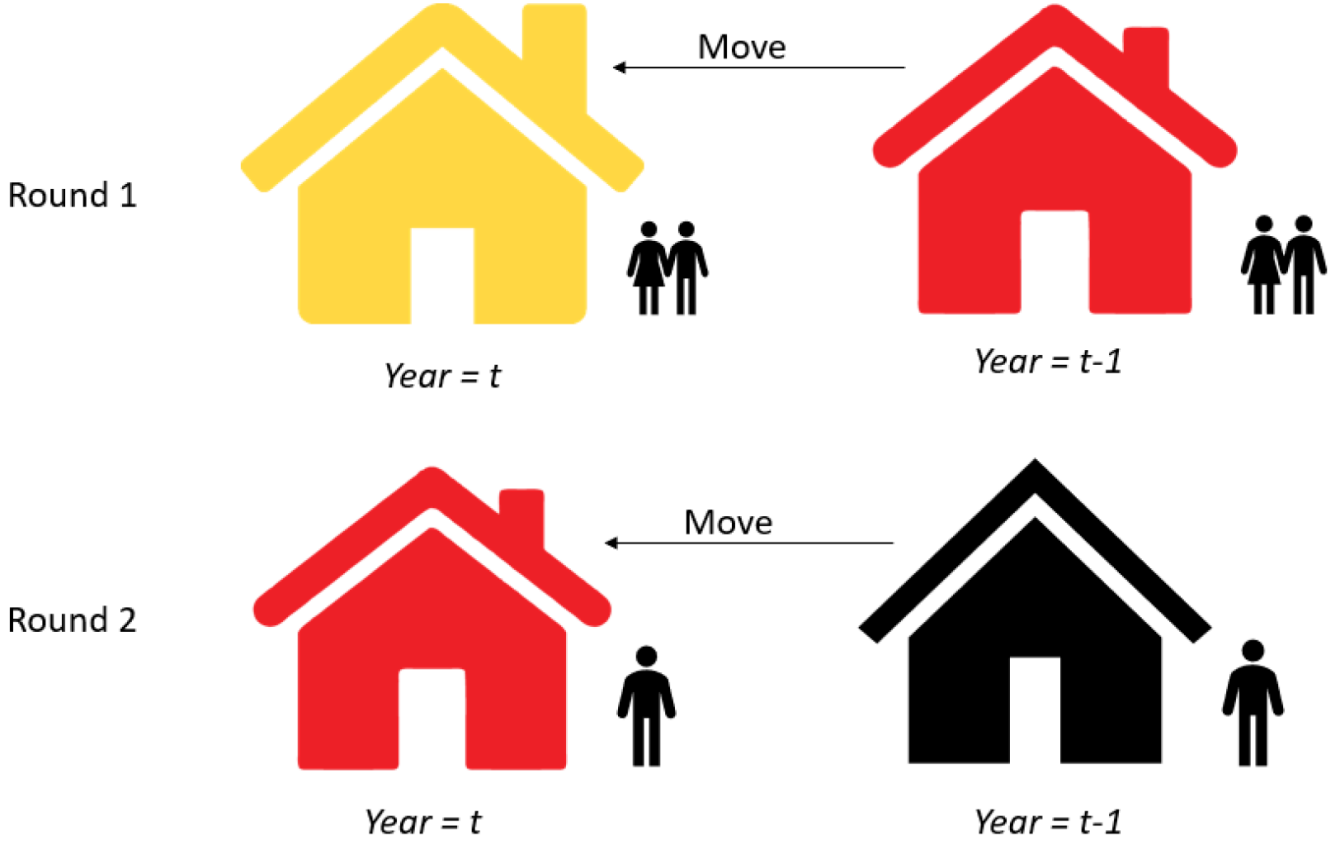
[2067,3054]
No data
New buildings

New housing units trigger a chain of moves



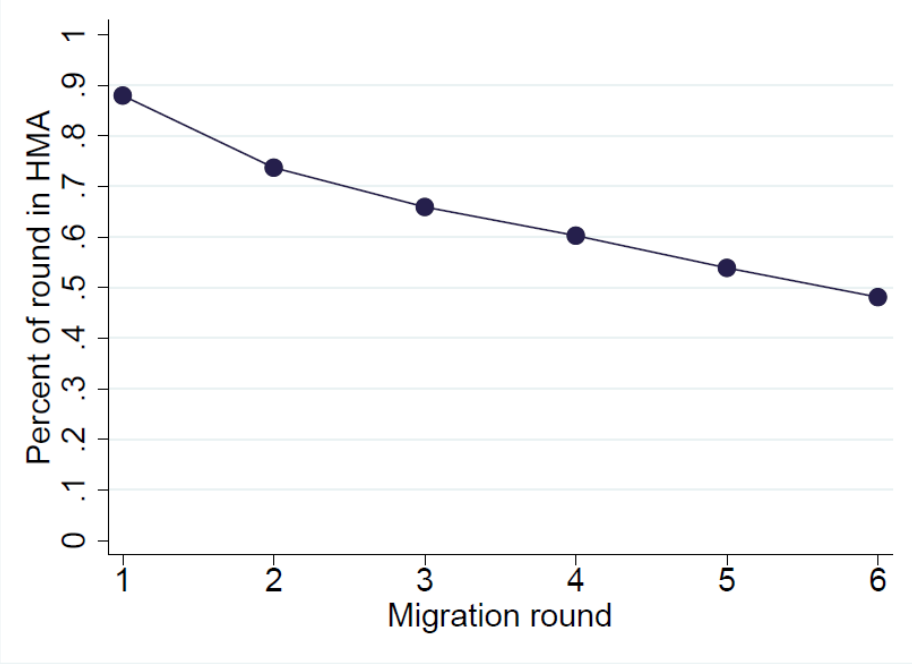
Movers to new buildings

Table 1
Summary statistics for movers and stayers in free-market buildings.

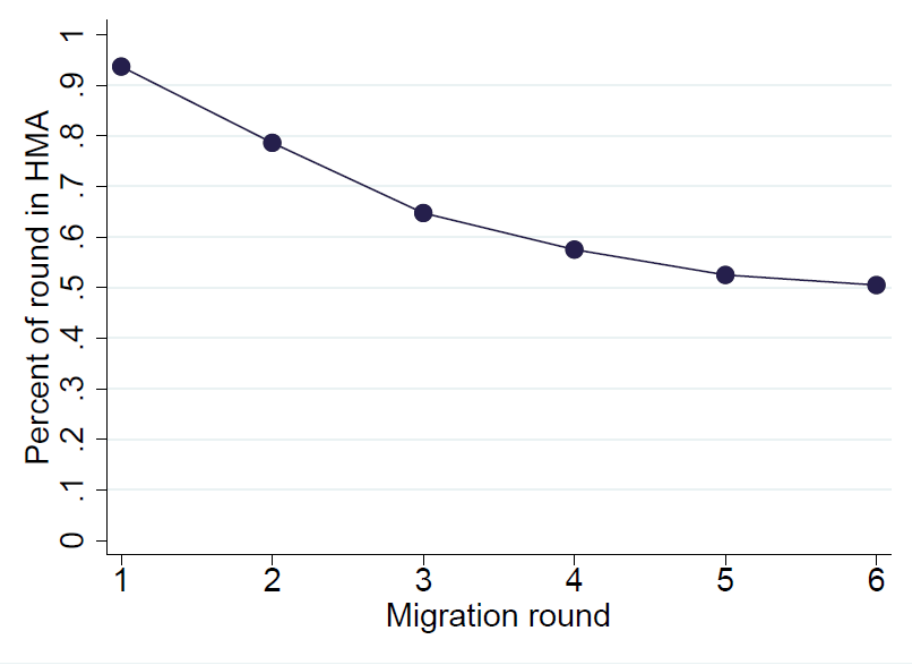
	Stayers	All movers	Movers to new buildings
Age household head	56.247	36.914	40.697
	[14.910]	[13.216]	[13.895]
Median household disposable income	27,616.865	24,216.484	33,906.445
	[60,730.066]	[55,910.324]	[57,765.914]
Master's degree or higher in household	0.329	0.279	0.458
Household with children	0.429	0.396	0.307
Origin single-family home	0.352	0.170	0.116
Origin owned home	0.904	0.448	0.514
Number of observations	3,730,715	1,134,761	5400

Notes: Stayers are defined as those that never move over the 2009–2019 time period. All movers exclude round 1 movers to new buildings within 3 km of the CBD. Standard deviations are reported in square brackets.

Figure 3: Share of movers originating from the HMA at each round.

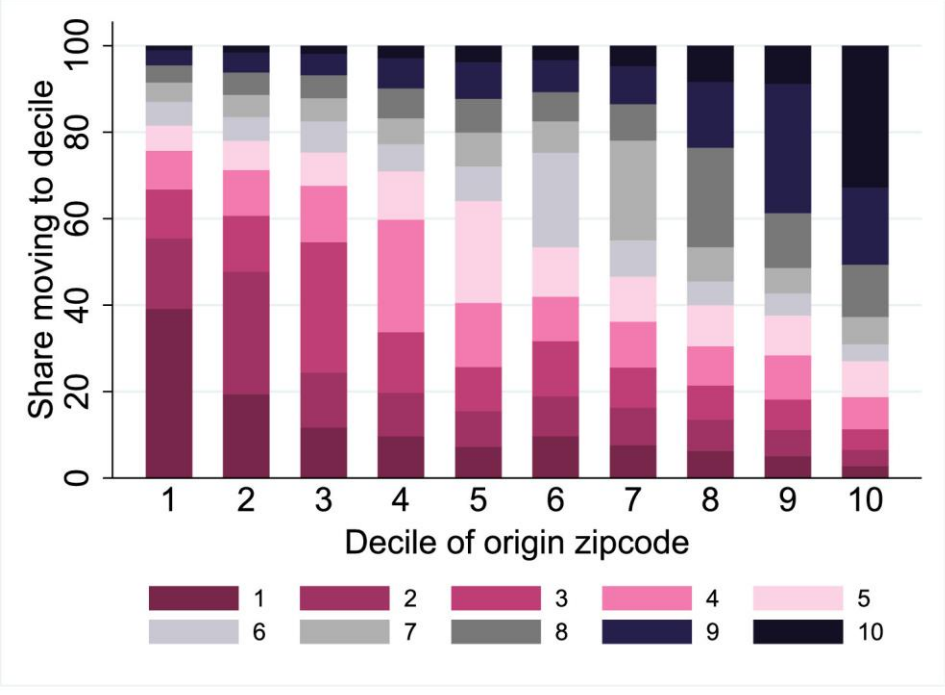


(a) Market-rate units

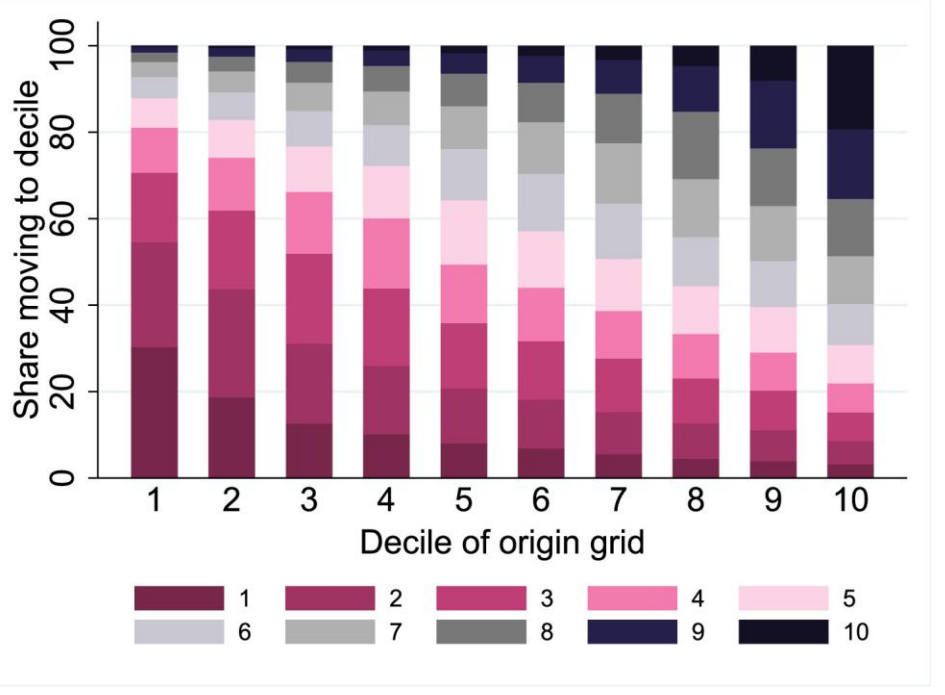


(b) Social housing units

Mobility across neighborhoods

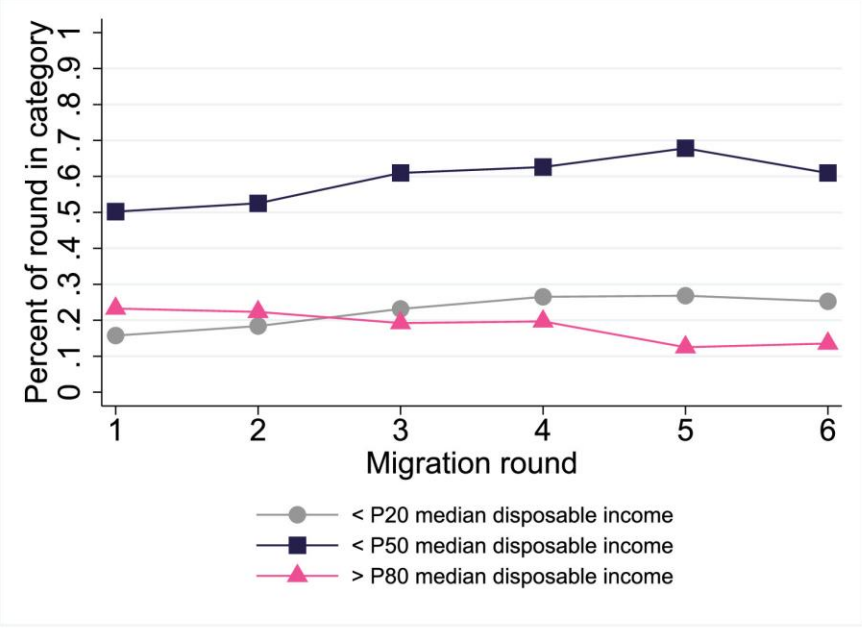


(a) Zip codes

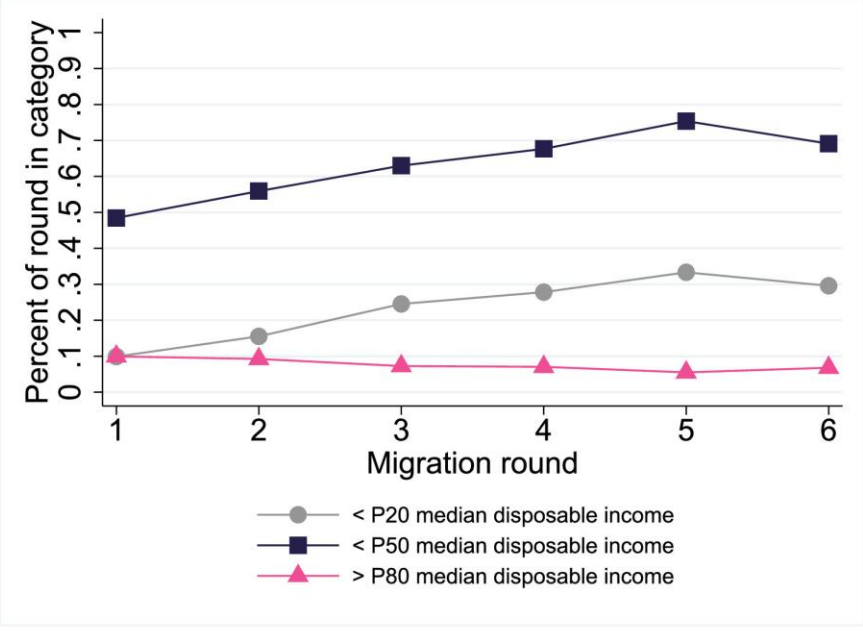


(b) 250m grids

Origin neighborhood characteristics for movers at each round

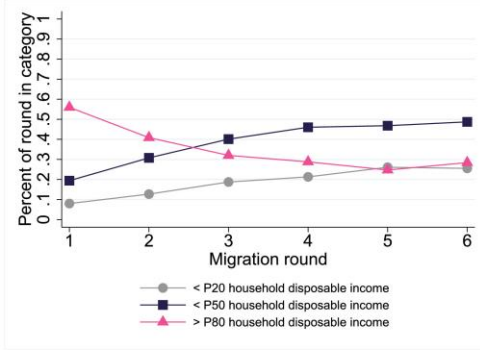


(a) Zip codes

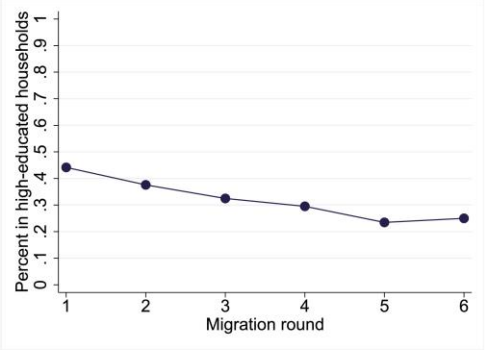


(b) 250m grids

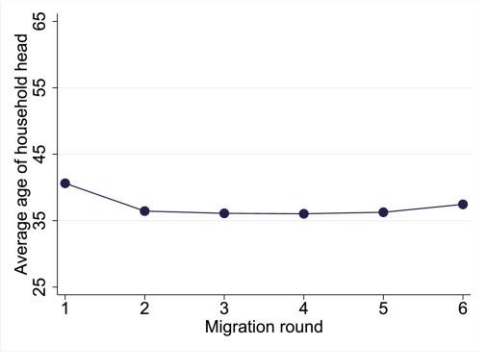
Individual characteristics for movers at each round



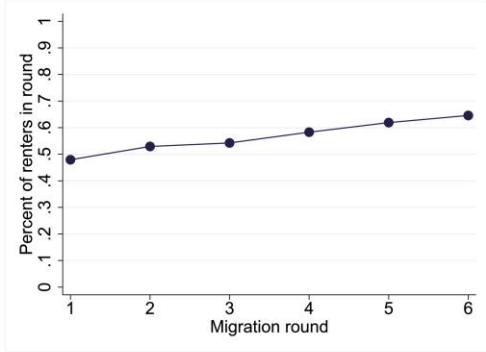
(a) Income



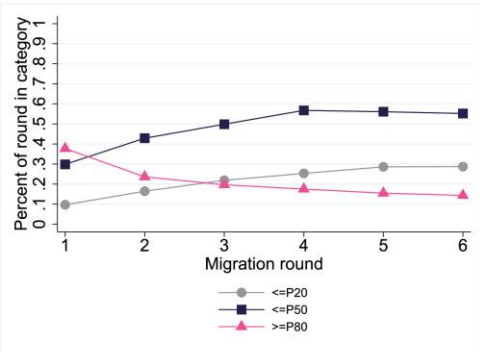
(b) Education



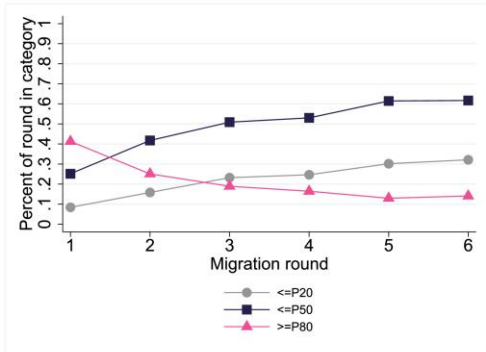
(c) Age



(d) Renter status

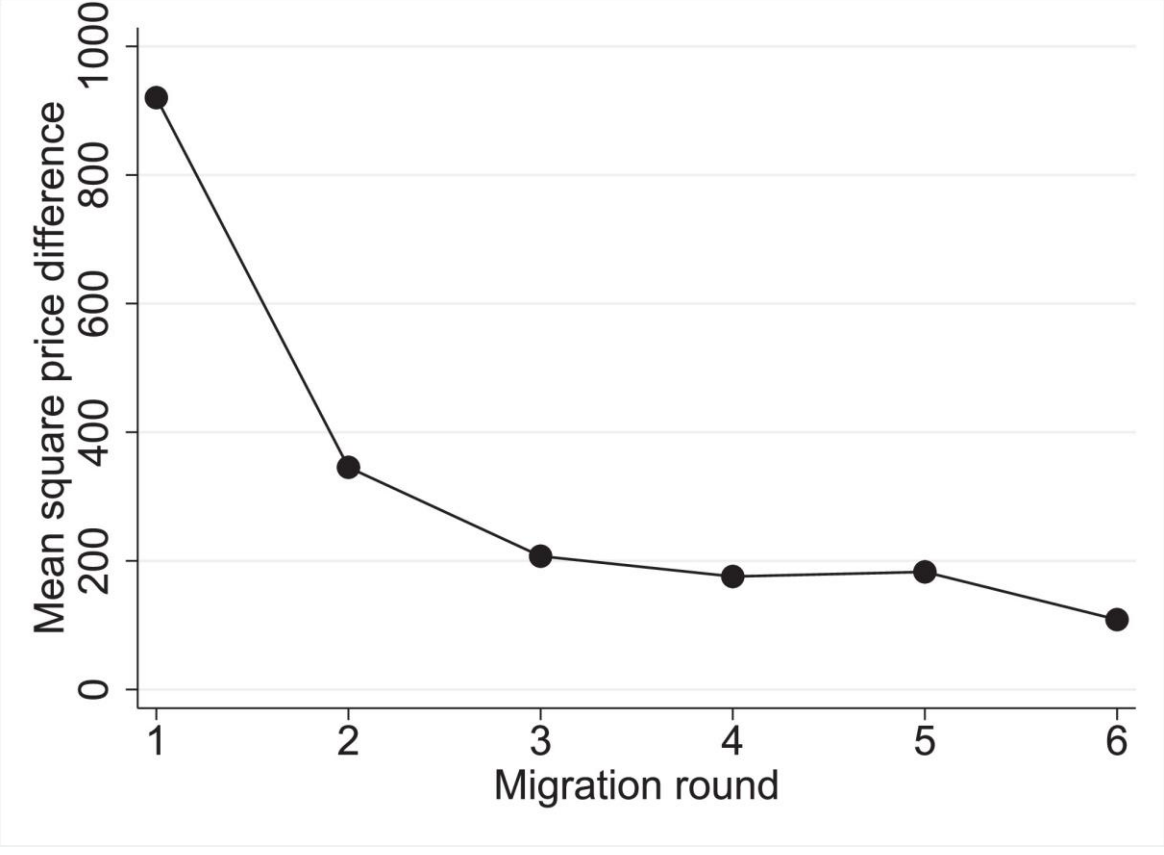


(e) Origin neighborhood



(f) Destination neighborhood

Change in mean neighborhood (zipcode) house prices at each round



Conclusions – Bratu et al. (2023)

Market-based strategies play an important role in improving housing affordability for middle- and low-income households

Market-rate construction

- loosens the housing market in middle- and low-income areas even in the short run
- is likely to improve affordability, even outside of the submarkets where new construction occurs
- improves the lives of middle- and low-income as they are part of the moving chains

New buildings may have effects on their immediate area

- May change amenities or socio-economic makeup in ways that affect prices

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In Press, Corrected Proof

JUE Insight: The effect of new market-rate housing construction on the low-income housing market ☆

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https://www.sciencedirect.com/science/article/pii/S0094119021000656

Other density restrictions

One popular restriction on density is the minimum lot size requirement

- Requires lots for single-family houses to be no smaller, than some threshold value
- Limits the number of people per square meter, thus constraining density
- Has similar effect on the spatial size of the city as height restrictions

In an open-city case with different income groups, this can also be used to keep the poor out of the city/municipality

Why implement FAR or other density restrictions?

With housing more expensive and dwellings smaller, the height restriction makes the urban residents worse off

For this to be desirable from a society's point of view, there must be some offsetting benefits

- For example, aesthetic benefits from preserving the historic character of central cities or preserving the city's skyline
- What else? Also, are the benefits large enough to offset consumer losses?

Bottom line: restrictions, preservation etc. policies usually come with a cost to residents

Recap

Some market failures may cause cities to expand more than they should

- Open-space externalities, biodiversity loss and traffic congestion

The over-expansion can be addressed by price-based remedies

- A development tax in the case of open-space externalities and a congestion toll in the case of traffic externalities

Also, quantity-based remedies are available, e.g. UGB

Policy-makers should recognize that excessively tight limits on urban expansion or density may reduce overall welfare