The Missing Middle in Superstars: Research Proposal

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Motivation


Detached Single-Family
Houses
Duplex:
Side-By-Side +
Stacked
Fourplex:
Stacked
Courtyard
Building
Cottage
Court
Townhouse
Multiplex:
Medium
Triplex:
Stacked
Live-
Work
Mid-Rise
Missing Middle Housing
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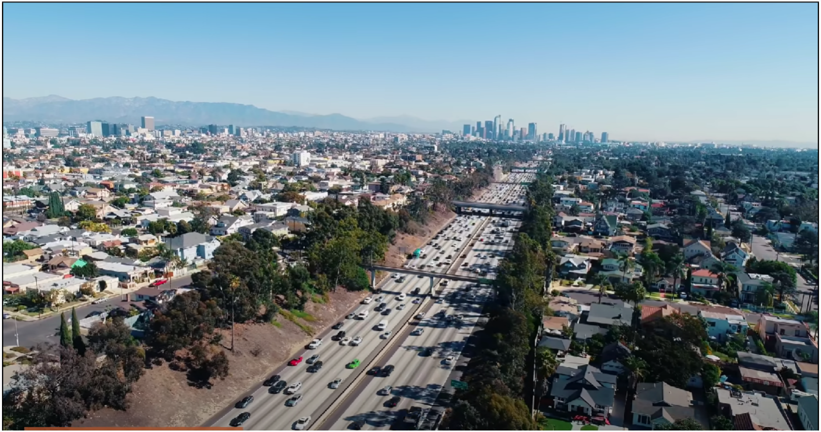
Motivation: Los Angeles



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(Eventual) Research Questions

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2. How do they differ across income groups?
3. Why target the missing middle and not other types of housing, such as large apartment buildings (Asquith et al., 2021)?

- Structural GE model $\implies$ convincing welfare estimates where household mobility plays first order role
- Tiebout sorting or congestion/agglomeration externalities.

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- Provides a series of empirical observations that show:
  1. Superstar cities differ the most in very high and very low density structures, but not as much in medium density ones.
  2. Appears to be related to the within-city distribution of housing unit density.
  3. It accompanies stronger residential sorting on income.

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  1. Minimum lot sizes induce a minimum quality of housing. This minimum quality is endogenously higher in superstars.
  2. Implies low density neighborhoods are relatively less dense in superstars. High density neighborhoods are relatively more dense. This is in line with empirical evidence.
  3. Creates additional consumption inequality. Households with income below an endogenous cut-off are made relatively worse off than those above. This cut-off is generally higher in superstars.

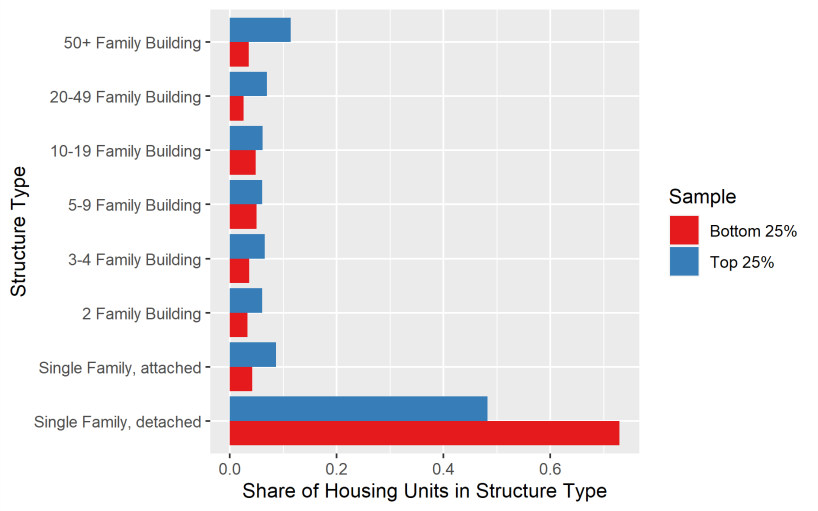
Literature

- Residential income sorting, segregation and/or inequality in cities Couture et al. (2019), Brueckner et al. (1999), Couture and Handbury (2020), Su (2022), Guerrieri et al. (2013), Fogli and Guerrieri (2019), Baum-Snow and Pavan (2013), Eeckhout et al. (2014), Baum-Snow and Hartley (2020)

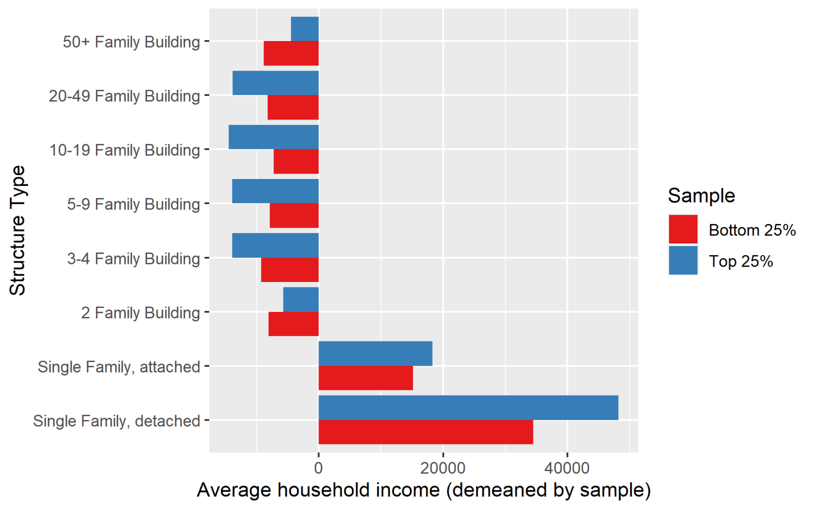
- Zoning + Housing Supply + Regulation + Affordability Fernandez and Rogerson (1997), Calabrese et al. (2007), Hamilton (1975), Hamilton (1976), Gyourko and Molloy (2015), Gyourko et al. (2013), Mast (2020), Turner et al. (2014), Bertaud and Brueckner (2005), Geshkov and DeSalvo (2012), Gyourko and Voith (1997), Baum-Snow and Han (2021), Hilber et al. (2020) Hilber and Robert-Nicoud (2013), Ortalo-Magné and Prat (2014), Davidoff et al. (2022), Saiz (2010), Grieson and White (1981), Kulka (2019), Song (2021), Parkhomenko (2020), Mast (2021), Asquith et al. (2021), Albouy et al. (2016)

- Quantitative spatial models Redding and Rossi-Hansberg (2017), Ahlfeldt et al. (2015), Allen and Arkolakis (2022), Allen, Arkolakis and Li (2016), Acosta (2021), Herzog (2022).

Fact 1: Disproportionate differences in high density structures



Fact 2: Stronger income sorting on structure density



Fact 3: Implications for the housing unit density distribution

- Idea: if
    1. There is spatial correlation in the locations of high density structures (i.e. large condominiums concentrated downtown)

[1] Here, I'm measuring density as the number of housing units per unit of land.

Fact 3: Implications for the housing unit density distribution

- Idea: if
  1. There is spatial correlation in the locations of high density structures (i.e. large condominiums concentrated downtown)
  2. and high density structures are disproportionately represented in superstars
- Then, high density locations[1] might be relatively higher density in superstars.
- Same logic could be applied to medium density structures, so that *medium density locations are relatively less dense in superstars.*
- This is what I find!

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- Within each MSA, I rank tracts by their density of housing units. Ranking lies in the unit interval.
- I flexibly regress tract-level housing unit density against this ranking separately for both the superstar and non-superstar samples.
- Housing unit density is normalized to be on average 1 across tracts within each MSA. Controls for MSA fixed effects.

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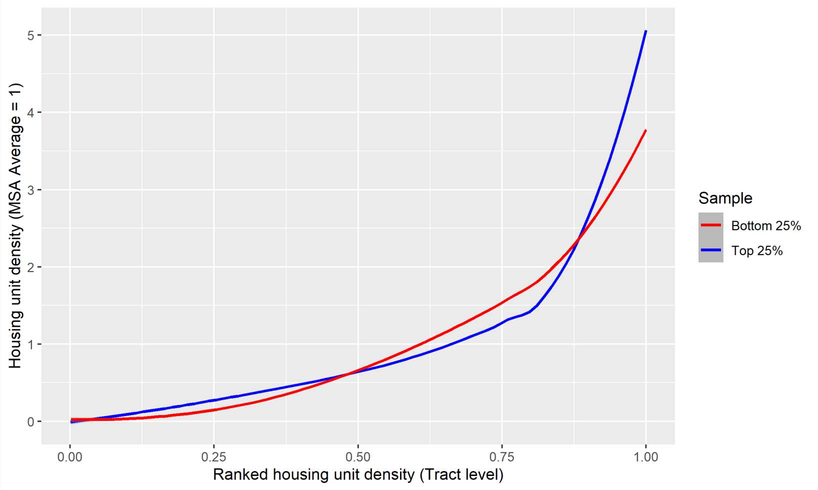


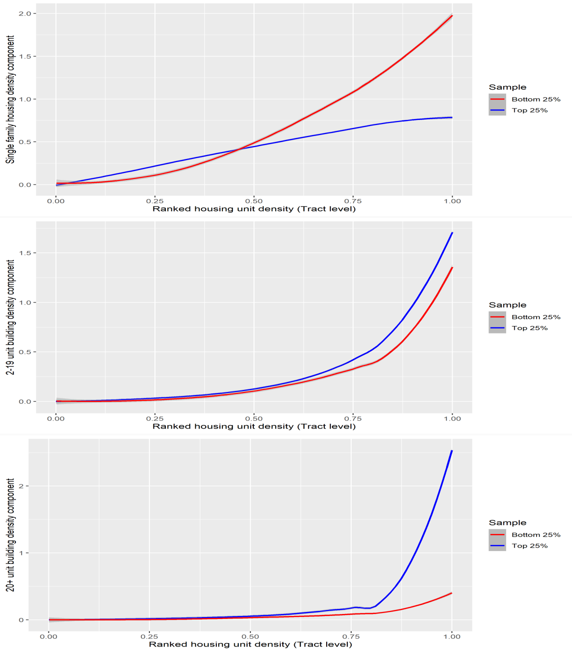
Fact 3:

- The shape of the distribution *may not* be driven the presence of different types of structures, suggesting the missing middle is irrelevant.
- To delve deeper, I linearly decompose housing unit density $D_{H,im}$ into three margins:

$$D_{H,im} = D_{S,im} + D_{M,im} + D_{L,im} \tag{1}$$

- where $D_{S,im}$ is the number of single family homes in MSA m and tract i divided by the total land mass of the tract.
- $D_{M,im}$ and $D_{L,im}$ are defined analogously for structures with 2-19 housing units and 20+ units, respectively. Call them Middle and High density components.
- Repeat the regression for each component separately. Justified because the conditional expectation is additive.

Fact 3:



Single family housing density component
2.0
1.5
1.0
0.5
0.0
0.00
0.25
0.50
0.75
1.00
Ranked housing unit density (Tract level)
Sample
Bottom 25%
Top 25%
2-19 unit building density component
1.5
1.0
0.5
0.0
0.00
0.25
0.50
0.75
1.00
Ranked housing unit density (Tract level)
Sample
Bottom 25%
Top 25%
20+ unit building density component
2
1
0
0.00
0.25
0.50
0.75
1.00
Ranked housing unit density (Tract level)
Sample
Bottom 25%
Top 25%

Fact 3:

- Takeaways:
    1. Above the 50th percentile, the single family margin is pushing down housing unit density in superstars. The middle and high density margins are not large enough to compensate below the 90th percentile.
    2. Perhaps surprisingly, the medium density components look very similar across samples.
    3. Could point toward low density single family housing crowding out other types of housing in this region (The Missing Middle!)

Fact 3:

- This may not be enough. *Why* is the single family component driving down density in these tracts? Two reasons:
    1. Single family homes occupy a lot of land, but they are low density (Missing Middle)
    2. Single family homes are high density, but they occupy a small fraction of tract land (Not Missing Middle)

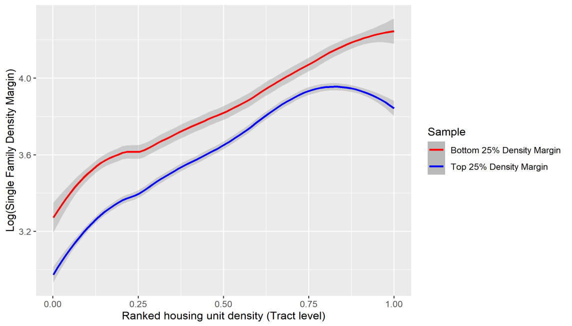
Fact 3:

- Log-linearly decompose the single family component into *density* and *land* margins, respectively:

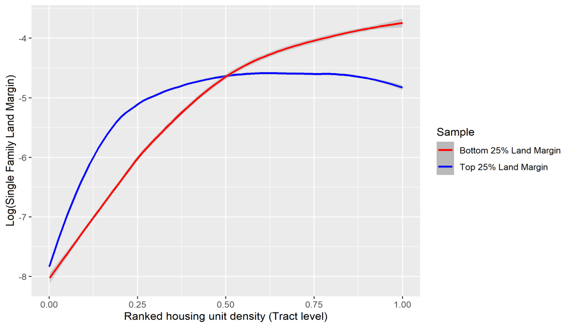
$$log(D_{S,im}) = log(\tilde{D}_{S,im}) + log(L_{S,im}) \tag{2}$$

- where $\tilde{D}_{S,im}$ is the number of single family homes divided by the total land used for single family housing, and $L_{S,im}$ is the fraction of tract land used for single family housing.
- Repeat the regression for each component separately.
- National Land Cover Database (NLCD) satellite data. Use "light" and "medium" development as empirical proxy to $L_{S,im}$.

Fact 3:



Log(Single Family Density Margin)
4.0
3.6
3.2
0.00
0.25
0.50
0.75
1.00
Ranked housing unit density (Tract level)
Sample
Bottom 25% Density Margin
Top 25% Density Margin



Log(Single Family Land Margin)
-4
-5
-6
-7
-8
0.00
0.25
0.50
0.75
1.00
Ranked housing unit density (Tract level)
Sample
Bottom 25% Land Margin
Top 25% Land Margin

Takeaways:

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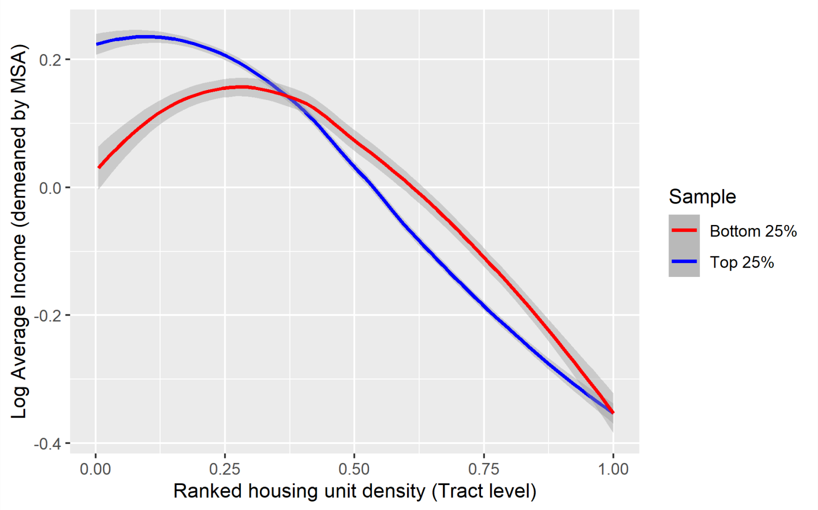
    1. Both land and density margins contribute to low single family density, but a majority of the effect comes from the land margin.
    2. Suggests that single family homes crowd out land that could be used for other types of structures, but that this effect is modest.

Fact 4: Stronger income sorting on housing unit density



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- Interpretation: causes disproportionate increases in high density structures (like condominiums) and preserves low density structures (like single family homes).
- This process causes additional welfare inequality for low income households, and harms relative to Pareto efficient outcome.
- Abstracts from Tiebout motives for zoning as in Calabrese et al. (2007), as well as congestion/agglomeration externalities present in Ahlfeldt et al. (2015).

Model

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- S has a minimum lot size, permitting a maximum of $\bar{U}$ households
- Absentee landowners who don't consume housing.
- Households consume local housing with Cobb-Douglas share β
- Developers possess Cobb-Douglas technology with land share α. Capital supplied with perfect elasticity at exogenous cost r.

Zoning and the Developer's Problem

- Let P_i be the price of an efficiency unit of housing in neighbourhood i.
- Issue: Housing developers in S have to respect the minimum lot size.
- Assumption: They can *guarantee* to profit maximize ex-post if they enforce a *minimum quality* $A^{\star}$ satisfying

$$A^{\star} = P_S^{\frac{1-\alpha}{\alpha}} (\bar{U})^{-1} \tag{3}$$

- Assumption: households internalize $A^{\star}$ when choosing a neighbourhood and how much housing to consume.

How lot sizes work in this model

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Conclusion

- The distributions of housing unit density in superstar cities are fundamentally different from others.
- These differences appear to be driven by the presence of single family homes, with inadequate supply responses of medium density homes in the middle of the distribution.
- Single family homes crowding out land plays modest part in explaining this phenomenon.
- I argue minimum lot sizes outside of central cities are important drivers of these facts.

Appendix: Two Key Lemmas

Lemma

In any equilibrium, $\frac{P_S}{P_N} \leq \left[\frac{1-\tau_S}{1-\tau_N}\right]^{\frac{1}{\beta}}$

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Lemma

If, in equilibrium, $\frac{P_S}{P_N} < \left[\frac{1-\tau_S}{1-\tau_N}\right]^{\frac{1}{\beta}}$*, then there exists some* $\bar{z}$ *such that every* $z < \bar{z}$ *chooses neighbourhood* N *and every* $z > \bar{z}$ *chooses neighbourhood* S*.*

Appendix: Superstars and the Missing Middle

Proposition
(Superstars and the Missing Middle) Consider two cities with masses L' and L of households and cut-offs $\bar{z}'$ and $\bar{z}$ that come from an equilibrium satisfying $\frac{P_S}{P_N} < \left[\frac{1-\tau_S}{1-\tau_N}\right]^{\frac{1}{\beta}}$. Then:

1. *If $L' - L$ is sufficiently large, then $\bar{z}' > \bar{z}$.*
2. *If $L' - L$ is sufficiently large, then $\frac{L_N'}{L_S'} > \frac{L_N}{L_S}$*

where L_i is the equilibrium mass of households in i.

Appendix: Regressive Consequences of the Missing Middle

- Let $V(z)$ be the welfare of a type z household
- Define $\tilde{V}(z) := \frac{V(z)}{z}$.
- Crucial: $\tilde{V}(z)$ is *constant in an equilibrium with no minimum lot sizes*.
- Minimum lot sizes cause additional consumption inequality:

Proposition

(Regressive consequences of the Missing Middle) Consider a city with a cutoff $\bar{z}$ that comes from an equilibrium satisfying $\frac{P_S}{P_N} < \left[\frac{1-\tau_S}{1-\tau_N}\right]^{\frac{1}{\beta}}$. Then, $\tilde{V}(z) < \tilde{V}(z')$ for all z, z' satisfying $z < \bar{z} < z'$.

Appendix: Regressive Consequences of the Missing Middle II

- Previous proposition says nothing about how low income households are made worse off relative to a Pareto optimal equilibrium with no lot sizes. So...

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Proposition

(Regressive consequences of the Missing Middle II) Consider a city with a cutoff $\bar{z}$ that comes from an equilibrium satisfying $\frac{P_S}{P_N} < \left[\frac{1-\tau_S}{1-\tau_N}\right]^{\frac{1}{\beta}}$. If $\bar{z}$ is sufficiently large, then for all $z < \bar{z}$, households of type z are made worse off relative to an equilibrium with no minimum lot sizes.

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