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How Do Homes Transfer Across The Income Distribution? The Role of Supply Constraints*

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Abstract

We examine how supply constraints matter for housing affordability. Using housing transactions matched to buyer and seller income, we estimate filtering, whereby existing homes transfer across the income distribution as they age. Treating supply constraints as unobserved, we document significant upward filtering of homes of +0.3% to +0.4% per home year, with buyers having higher income than sellers on average. However, there is considerable heterogeneity in these estimates. A change in local planning laws is used to identify the causal impact of regulatory supply constraints. Controlling for them, filter rates are close to zero or negative in line with theory. Low-income buyers (relative to the sellers) are more affected by supply constraints than high-income buyers.

Keywords: Filtering, Housing Supply Constraints, Household Income

JEL: R21, R31, R38

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1 Introduction

The longstanding debate on policies designed to increase access to affordable housing for the poor has come to the fore in recent decades. Housing prices have grown more rapidly than income, and home-ownership rates have declined.[1] While regulatory constraints on the supply of new homes reflect local resident preferences and a desire by policymakers to have new homes built with a minimum quality, energy efficiency and safety, they are also thought to be an important part of the recent decline in housing affordability. When coupled with rising demand, such constraints can increase the price elasticity of demand and distort urban movement decisions (Hilber and Vermeulen, 2015; Hsieh and Moretti, 2019).

Do regulatory supply constraints (hereafter supply constraints) matter for the distribution of housing prices, income, urban movement, productivity and welfare? In one view, reducing or eliminating them would do little to alter housing prices or affordability (Rodríguez-Pose and Storper, 2020). In this view, there is little direct evidence that supply constraints affect affordability, and relaxing them is unlikely to stimulate migration to more productive neighborhoods. The alternative is that, as the demand for homes has grown, supply constraints contribute to higher prices, reduce affordability, and distort individual housing and location decisions that aggregate to have significant micro and macro consequences (Manville et al., 2022).

At the centre of this debate is whether households at different income levels can purchase homes. Yet, direct evidence on how homes transfer across the income distribution remains only sparse.[2] Evidence on how supply constraints affect those transfers is largely non-existent (Molloy, 2020). In this paper we use a unique data set on private home sales, matched to buyer and seller income, to provide the first direct evidence on how geographic variation in supply constraints affects the rate at which homes *filter* across the income distribution.

[1] See, for example, Rodríguez-Pose and Storper (2020); Manville et al. (2022).

[2] The notable exceptions are Rosenthal (2014) and Liu, McManus, and Yannopoulos (2021) who document new facts on income transfers across buyers for the US.

Filtering is a dynamic process whereby existing homes are transferred from high- to low-income households as they depreciate with age. It is a key mechanism for the supply of homes by low-income households.[3] As developers build relatively little unsubsidized housing for the poor (Rosenthal, 2014; Baer, 1986), filtering is crucial for understanding whether low-income households can purchase homes and is a natural (though not the only) metric for assessing housing affordability.[4] Whether filtering is quantitatively important matters for the design of affordable housing policies such as rental or home purchase subsidies, subsidies for new construction and for reducing supply constraints (Nathanson (2020); Mast (2021); Molloy et al. (2022); Sweeney (1974); Braid (1984)).

The standard approach to estimate filtering, due to Rosenthal (2014), is to difference across the income of different buyers of the same home between resales. Differencing avoids the well known problem that omitted home attributes, that capture a home's quality, are correlated with income and so estimates without differencing would be biased. This repeat-buyer-income approach requires a long time series of market sales or survey data, homes with attributes and implicit prices that remain unchanged between resales, and that resales are not affected by selection.[5]

Like Rosenthal (2014), we estimate filtering using differences in income when homes are sold. However, motivated by a rich cross section but limited time series of data on matched housing transactions to buyer and seller income, we estimate filtering using an alternative approach based on the log-income of buyers *and sellers*. Instead of differencing across the log-income of buyers over time, we difference across the log-income of the buyer and seller *on the same transaction*. The advantages of this

[3]Theoretical models predict that homes should filter down the income distribution to buyers with lower income on average over time (e.g. Sweeney (1974), Ohls (1975), Braid (1984) and Nathanson (2020)). However, empirical evidence on the importance of this mechanism is sparse, and often only indirect. International estimates of price depreciation, the most common indirect measure, suggest that homes depreciate only slowly in their prices, about 0.5% on average per home-year (Rosenthal, 2014).

[4]Other measures of affordability, such as the rental cost of housing are also clearly important (Molloy et al., 2022). In the presence of rental or credit market frictions that prevent households from replicating ownership through rental contracts and that do not provide a resale option, the ability to purchase a home will in general matter for housing affordability as well.

[5]Most homes are only sold infrequently. The average turnover rate for homes in Australia and the US is about six percent, see for example Leal et al. (2017).

approach is that it can be implemented where only cross-sectional data are available, it does not require strong assumptions about time-invariant home attributes (or implicit prices), and it relaxes the assumption that resales are necessarily random.

The data we use cover a census of housing sales from the State of Victoria, Australia (covering a quarter of the national population), and leverage the fact that Victoria's topography is comparatively smooth notwithstanding significant variation in local regulatory supply restrictiveness.[6] This is especially true in urban areas, such as Greater Melbourne, where there is significant variation in supply constraints, but little variation in natural barriers that would otherwise preclude the building of new homes.[7]

The second reason our data are ideally suited to quantify the effect of supply constraints on filtering is that a significant local planning reform was introduced in Victoria in 2014, two years prior to our main estimation sample. The reform, locally known as *VicSmart*, provides an exogenous source of variation in how tightly local planning authorities implemented supply constraints as observed in the heterogeneity in their responses to the reform. Motivated by Hilber and Vermeulen (2015), we use these heterogeneous responses, together with data from historical voting patterns at *national* elections, to instrument for the rate at which different planning authorities reject proposals for new residential development applications – the measure of supply constraints.

The main results are as follows. In the absence of any controls for supply constraints (treating them as unobserved), we find significant *positive* log-income differences on average when homes are transferred from sellers to buyers. The unconditional mean difference in relative income (log-buyer less log-seller income) for homes sold between 2011 and 2016 in Victoria is +15.5%. However, there is substantial dispersion in mean log-income differences between urban and regional areas, with greater evidence of the

[6]For the most part, the State is largely unhindered by significant natural barriers to new construction that could also act as a barrier to the supply of new homes, and that would make it more difficult to disentangle differences between regulatory and natural supply constraints (Saiz, 2010).

[7]This is true even on the city's periphery and is in contrast to other large Australian cities (and many other cities globally), for example, where coastline, mountains and rivers provide significant natural barriers to new construction.

upward filtering of homes from sellers to buyers in urban areas, as high as +36.8%.

Controlling for the attributes of homes sold, we estimate a filter rate of +0.3% to +0.4% per-home year – the marginal effect of an additional home year on log-buyer less log-seller income. Comparing this with recent estimates using repeat-buyer-income for the US, our estimates are higher than the filter rate for the mean US city (-0.4% to -0.5%, Liu et al. (2021); Rosenthal (2014)), but lower than estimates for US cities that are typically viewed as highly supply constrained such as Boston (+0.4%) or San Francisco (+0.7%).[8]

Remarkably, controlling for supply constraints using our instruments, we find that the filter rate drops from +0.3% for detached homes to only +0.01%. Supply constraints explain the fall. A one standard deviation increase in a local planning authorities' refusal rate increases the filter rate by +0.1% per additional home-year. To illustrate the quantitative significance of this estimate, we use a simple policy counterfactual based on the same model. Reducing supply constraints by one standard deviation across all local planning areas in Victoria (also known as Local Government Areas) reduces the predicted mean difference in buyer and seller income from +15.5% to +6.6%, and eliminating supply constraints altogether would imply *lower* buyer than seller income with a predicted mean difference of -1.3%.

As there is considerable interest in estimates of filter rates to low-income households specifically, we extend the results by examining whether supply constraints have heterogeneous effects over the relative income distribution (modelling conditional quantiles of log-buyer less log-seller income). To do so, we present a consistent theoretical framework that can be linked to existing estimates of filtering that focus on the mean, and estimate the model using the IV Quantile estimator of Chetverikov, Larsen, and Palmer (2016). When supply constraints are not binding, filter rates are negative and significant for buyers with a low income relative to that of the seller. At

[8]See Liu et al. (2021) for greater detail on filtering estimates across US cities and Gyourko et al. (2013) for evidence on supply constraints.

the 0.15 and 0.30 relative income quantiles, about -2.0% per home-year. This is precisely as theory predicts (Sweeney, 1974; Ohls, 1975; Braid, 1984). As buyer income increases relative to that of the seller, however, the filter rate increases and is positive at high relative-income quantiles.

The effects of supply constraints are essentially a mirror image. They are positive and significant at low relative-income quantiles before declining to zero at high relative-income quantiles. Thus, the economic incidence of supply constraints differs markedly from the locations in which they are binding. While constraints, in our data, are much more likely to bind in high-income urban areas, their effects are borne by buyers with *low* relative incomes. Thus, for policymakers looking for ways to increase filtering to low-income households, regulatory reforms that relax supply constrains offer (another) way to make progress toward this goal.

The next section describes our estimation framework. Section 3 discusses data and identification, Section 4 our results and Section 5 robustness. Results are then compared with other recent findings in the literature before conclusions are drawn in the final section.

Note for the Review Committee: The full paper is available on request. The pdf file file was too large to submit through the ACE website.

References

W. C. Baer. The Shadow Market in Housing. *Scientific American*, 255 (5):29–35, 1986. ISSN 00368733, 19467087. URL http://www.jstor.org/stable/24976082.

R. M. Braid. The Effects of Government Housing Policies in a Vintage Filtering Model. *Journal of Urban Economics*, 16(3):272–296, 1984. ISSN 0094-1190. doi: https://doi.org/10.1016/0094-1190(84)90028-7.

D. Chetverikov, B. Larsen, and C. Palmer. IV Quantile Regression for Group-Level Treatments, With an Application to the Distributional Effects of Trade. *Econometrica*, 84(2):809–833, 2016. doi: https://doi.org/10.3982/ECTA12121.

J. Gyourko, C. Mayer, and T. Sinai. Superstar Cities. *American Economic Journal: Economic Policy*, 5(4):167–99, November 2013. doi: 10.1257/pol.5.4.167.

C. A. L. Hilber and W. Vermeulen. The Impact of Supply Constraints on House Prices in England. *The Economic Journal*, 126(591):358–405, 06 2015. ISSN 0013-0133. doi: 10.1111/ecoj.12213.

C.-T. Hsieh and E. Moretti. Housing Constraints and Spatial Misallocation. *American Economic Journal: Macroeconomics*, 11(2):1–39, April 2019. doi: 10.1257/mac.20170388.

H. Leal, S. Parsons, G. White, and A. Zurawski. Housing Market Turnover. *Reserve Bank of Australia Bulletin*, March, 2017.

L. Liu, D. McManus, and E. Yannopoulos. Geographic and Temporal Variation in Housing Filtering Rates. *Regional Science and Urban Economics*, 2021. ISSN 0166-0462. doi: https://doi.org/10.1016/j.regsciurbeco.2021.103758.

M. Manville, M. Lens, and P. Monkkonen. Zoning and Affordability: A Reply to Rodríguez-Pose and Storper. *Urban Studies*, 59(1):36–58, 2022. doi: 10.1177/0042098020910330.

E. Mast. JUE Insight: The Effect of New Market-Rate Housing Construction on the Low-income Housing Market. *Journal of Urban Economics*, 2021. ISSN 0094-1190. doi: https://doi.org/10.1016/j.jue.2021.103383.

R. Molloy. The Effect of Housing Supply Regulation on Housing Affordability: A review. *Regional Science and Urban Economics*, 80:103350, 2020. ISSN 0166-0462. doi: https://doi.org/10.1016/j.regsciurbeco.2018.03.007. Special Issue on Housing Affordability.

R. Molloy, C. G. Nathanson, and A. Paciorek. Housing Supply and Affordability: Evidence from Rents, Housing Consumption and Household Location. *Journal of Urban Economics*, page 103427, 2022. ISSN 0094-1190. doi: https://doi.org/10.1016/j.jue.2022.103427.

C. Nathanson. Trickle-down Housing Economics. Mimeo., 2020.

J. C. Ohls. Public Policy Toward Low Income Housing and Filtering in Housing Markets. *Journal of Urban Economics*, 2(2):144–171, 1975. ISSN 0094-1190. doi: https://doi.org/10.1016/0094-1190(75)90044-3.

A. Rodríguez-Pose and M. Storper. Housing, Urban Growth and Inequalities: The Limits to Deregulation and Upzoning in Reducing Economic and Spatial Inequality. *Urban Studies*, 57(2):223–248, 2020. doi: 10.1177/0042098019859458.

S. S. Rosenthal. Are Private Markets and Filtering a Viable Source of Low-Income Housing? Estimates from a "Repeat Income" Model. *American Economic Review*, 104(2):687–706, February 2014. doi: 10.1257/aer.104.2.687.

A. Saiz. The Geographic Determinants of Housing Supply. *The Quarterly Journal of Economics*, 125(3):1253–1296, 08 2010. ISSN 0033-5533. doi: 10.1162/qjec.2010.125.3.1253.

J. L. Sweeney. A Commodity Hierarchy Model of the Rental Housing Market. *Journal of Urban Economics*, 1(3):288–323, 1974. ISSN 0094-1190. doi: https://doi.org/10.1016/0094-1190(74)90010-2.