Equilibrium Effects of Housing Subsidies: Evidence from a Policy Notch in Colombia

Juan Pablo Uribe

April 25, 2022

PhD Dissertation Defense

Chapter 1: Equilibrium Effects of Housing Subsidies: Evidence from a Policy Notch in Colombia

Paper Fit In the Literature and Contributions

Integrates the ***bunching*** and ***hedonic*** literatures to propose a method to think about welfare consequences of ***housing policies***

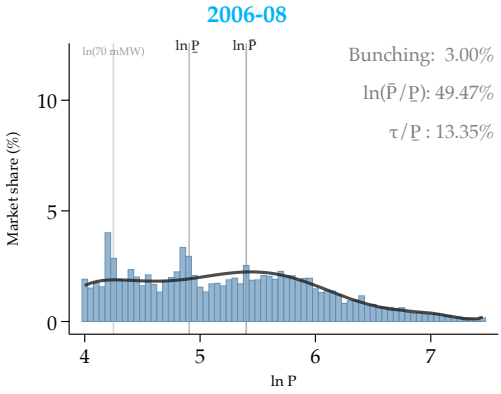
Bunching	**Hedonic**	**Housing Policy**
▶ Housing market	▶ Policy notch	▶ Evidence
▶ Link to model	▶ Supply side	▶ Welfare
▶ Supply and demand	▶ Identification	▶ Counterfactuals

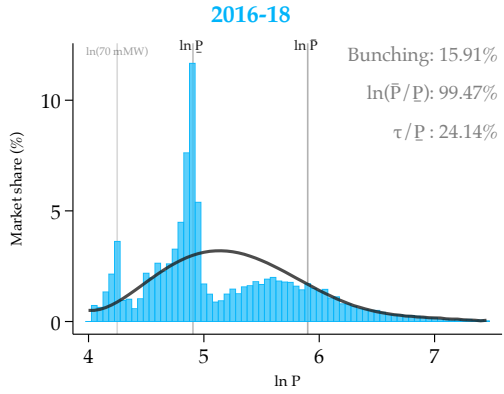
- Housing market applications
  Best et al. (2019), DeFusco and Paciorek (2017)
- Methodology
  Notches >> Kinks:
  Kleven (2016), Bertanha et al. (2021), Blomquist et al. (2021)

- Seminal paper
  Rosen (1974),Epple (1987)
- Recent Contributions
  Bajari and Benkard (2005), Heckman et al. (2010), Epple et al. (2020), Chernozhukov et al. (2021)
- Reviews
  Kuminoff et al. (2013), Greenstone (2017)

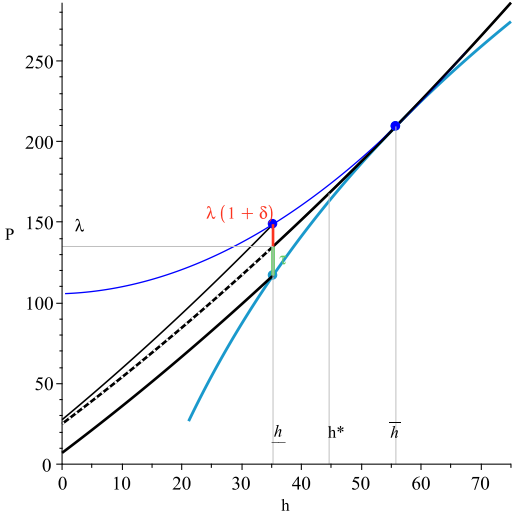
- Developers subsidies
  Baum-Snow and Marion (2009), Soltas (2021), Sinai and Waldfogel (2005)
- Households Subsidies
  Carozzi et al. (2020)
- Incidence and welfare
  Poterba (1992), Galiani et al. (2015)

1. Bunching Evidence



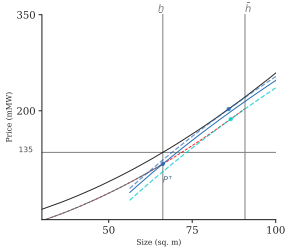


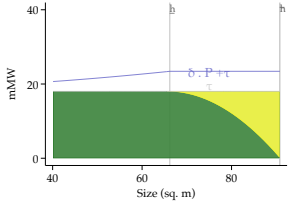
2. Identification of a Model that Rationalizes the Evidence



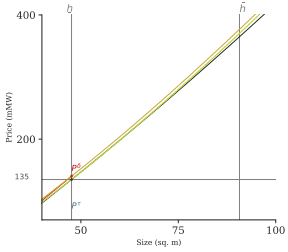
3. Framework to think about Housing Policy

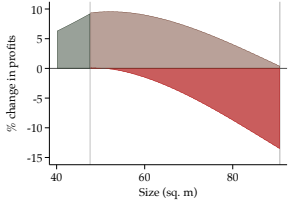
1. Efficiency losses under notched incentives





2. Artificial increase of profits to avoid exit/market shortage





What is missing/How to improve it: Main Comments

1. Is there an extensive margin response $\rightarrow$ Effect on stock and/or home-ownership for low income households? *discussion*
2. Welfare and Incidence. *discussion*
3. Mapping between model and data. *discussion*
   - How much is explained by size vs other characteristics. Characteristics vs only price changes.
   - Is the new approach to estimate $\underline{h}$ and $\overline{h}$ and better?
   - Missing mass vs partially missing mass.
4. Heterogeneity.
   - Estimates by city
   - Estimates by type of house. One number of bedrooms. Multi vs single family.

   discussion
5. Sensitivity/robustness.
   - Price function
   - Utility and marginal cost functional forms.
   - Constant set of cities.
   - User cost instead of Market price.

What is missing: More Technical Points

1. Bunching. Use the algorithm used by Chen, Liu, Suárez Serrato, and Xu (2021). Alternatively, I could try to use MLE if I impose functional forms for Y following Bertanha et al. (2021).
2. Missing proofs of key statements.
   - Constructive identification. I am relying on the proof of Best et al. (2019) and Blomquist et al. (2021) Bertanha et al. (2021).
   - $P^{-1}(\underline{P}) = \underline{h}$ and $P^{-1}(\overline{P}) = \overline{h}$
3. Model: Endogenize the choice of Q.
4. Estimation.
   - Get standard errors bootstrap whole process.
   - GGM to estimate the model.
   - Use Robinson (1988) to estimate hedonic price function. Very slow and the results are similar to what I am currently doing.
5. Calculate the share of unit builds that receive the subsidy.

Out of scope

1. Role of financial institutions and inter-temporal choices.

2. GE effect on employment and other sectors.

3. Role of market power.

Should I mention these in the conclusion?

Discussion on main points

1. Extensive margin and the effect of the policy

- I study the effect of the policy on the **type of housing built**. However, to be able to know if the policy is effective or not, we need to know the effect on the number of units. Does this policy incentivize the construction of units that would not have been built in the absence of the policy? My setting is not particularly well-suited to answer this question. In the model, I am not including the decision to buy a unit or not, nor am I including the decision to participate or not.
- There is an empirical exercise based on figure 1.4 resembling a diff and diff that could provide some insights into this question.
  1. Comparing the distributions over time. Compare the counterfactual distribution in figure 1.4. How does the increase in the demand subsidy affect the distribution of housing.?
  2. They may be other things changing at the same time. To account for this, I could use the non residential sector. To show a diff&diff in distribution type of analysis.
- From the model perspective, I could use the approach presented by Gruber, Jensen, and Kleven (2021). However, my inclination is to use the exercise above to say that this response seems less important than the one I am focusing on an in that way justify the choice on not including this in the model.

Main Comments

2. Welfare and policy evaluation

1. My approach so far is not too ambitious. It uses the structure of the model to show some basic counterfactual analysis to study the effect of the policy and analyze the role of the subsidies and tax refunds. I could add some additional exercises to illustrate how my framework can help the design of housing policy.
    - Changes in regulation such as limit in housing units built. Cap in $Q(h)$
    - Limit on Size Standard size and quality.
    - Colombia increase the cutoff for the major 5 cities. Show the welfare gains from this.
2. An alternative approach is to do the incidence analysis of the expansion of the subsidies scheme. This is comparing the before and after the subsidy expansion. (X)
3. A comprehensive incidence analysis would imply a closed form solution for prices and evaluating the effect on quantities. This has been proven hard and I do not have a way to empirically or theoretically address it. (X)

Main Comments

3. Mapping between the model and data

- Multiple Characteristics vs. Parsimonious Analysis

  1. I justify the reduction to a single characteristic - size- as a way to make the analysis tractable. However there may be other dimensions that matter (quality,location etc.).
  2. To clarify the role of other characteristics other than size, I can use a Oaxaca blinder/Di Nardo et. al re-weighting procedure to decompose the changes over time into changes in characteristics vs changes in prices. (McMillen, 2008; Soltas, 2021).
  3. Model prediction of missing mass vs. data. I have a paragraph in the paper addressing this but I could try to do better. There are different explanations for this in the literature. Try to see what is the best explanation for my setting. A new paper based on measurement error is Alvero and Xiao (2020). Not really sure what to do for this.

Main Comments

4. Heterogeneity

- Showing heterogeneity by city or type of housing could work as a test for the assumption of common parameters across usually assumed in the lit and not required in my case. This is a usual assumption used in papers trying to identify structural parameters in hedonic models. (i.e., the parameters are the same across different markets), my approach does require that.

- Alternatively, I could try to use this to learn something about housing supply and a validation test for the model. Maybe check if cities with higher geographic constraints have a less elastic housing supply (Saiz, 2010).

- I adapted the programs to make this straightforward to do.

Main Comments

Chapter 2: The Effect of Location-Based Subsidies on the Housing Market

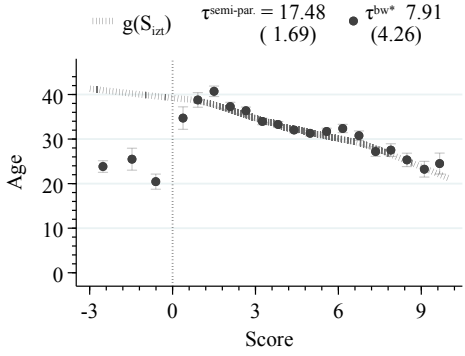
Paper Fit In the Literature and Contributions

1. How to target subsidies (Gaubert, Kline, & Yagan, 2020; Hanna & Olken, 2018; Kline & Moretti, 2014)

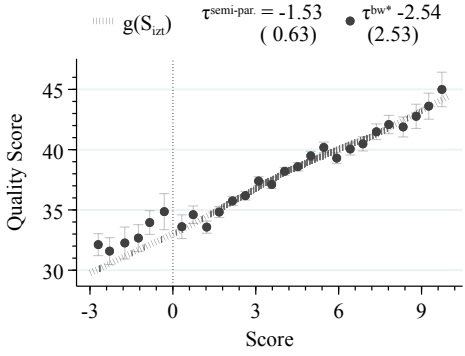
2. Empirical evidence to a key question in Urban Economics. Location based subsidies, affect the housing markets and this affects the validity of the policy.

Subsidies Induced Newer Buildings and Better Houses

Age

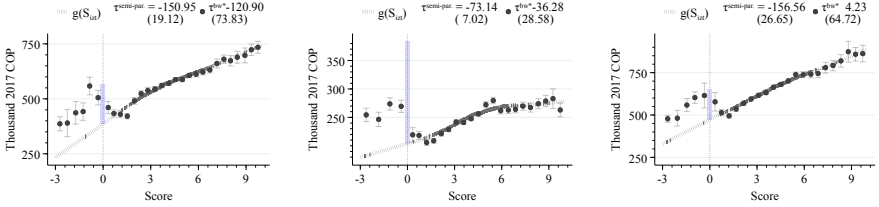


Quality

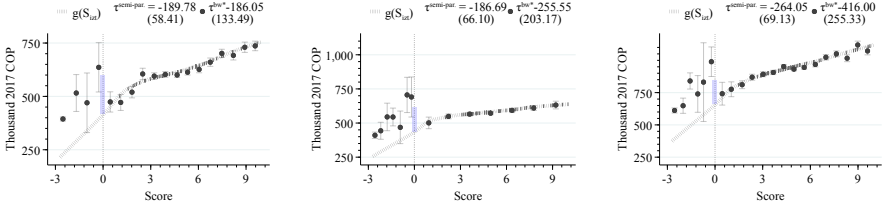


Higher Prices in the Subsidized Areas

Single Family Units



Multi Family Units



a. Land *b.* Structure *c.* Property

Benchmark for Complete Capitalization: 180 Thousand COP.

What to do with it?

- Document that transaction prices are correlated with assessed / modeled prices.
- Do some sensitivity analysis and improve the writting.
- Send it after a revision on the writing?
- Combine it with Gallego, Montoya, and Sepulveda (2017)

I will present it at AREUEA National Meeting

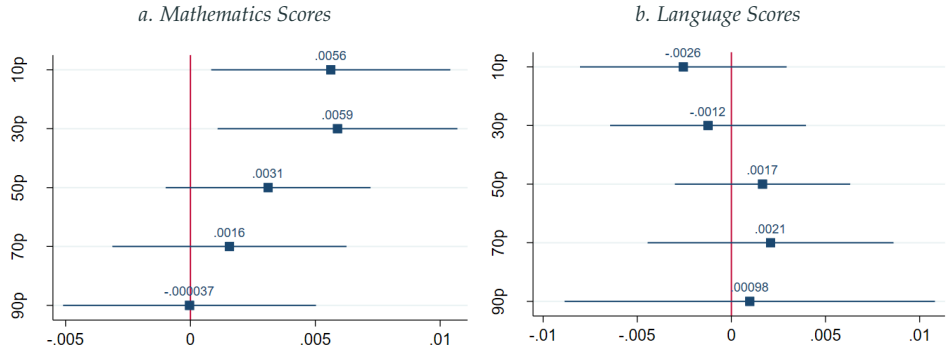
Chapter 3: Internet Expansion and School Performance: Evidence from Colombia

Paper Fit In the Literature and Contributions

1. Bring the empirical approach in the electrification literature to study internet rollout expantions. This is a rapidly growing literature (Hjort & Tian, 2021)

2. One of the first paper to document positive effects of a country wide rollout and separate the effect for people performing at the bottom and top in each school. (Bessone, Dahis, & Ho, 2020; Malamud, Cueto, Cristia, & Beuermann, 2019; Kho, Lakdawala, & Nakasone, 2018).

Estimates for Math and Languages at 10^{th}, 30^{th}, 50^{th}, 70^{th}, and 90^{th}, Percentiles, Including All Controls



Potential concerns and things to do.

1. Could the result be related to reversion to the mean?
2. Try a staggered addoption Research Design.
3. Use school conectivity vs kids with internet.
4. Other outcomes?
5. Clarify the effect on other assets.

References

Alvero, A., & Xiao, K. (2020). Fuzzy bunching. *Available at SSRN 3611447*.

Bajari, P., & Benkard, C. L. (2005). Demand estimation with heterogeneous consumers and unobserved product characteristics: A hedonic approach. *Journal of Political Economy*, *113*(6), 1239-1276. link

Baum-Snow, N., & Marion, J. (2009). The effects of low income housing tax credit developments on neighborhoods. *Journal of Public Economics*, *93*(5), 654 - 666. link

Bertanha, M., McCallum, A. H., & Seegert, N. (2021). *Better bunching, nicer notching*. link

Bessone, P., Dahis, R., & Ho, L. (2020). *The impact of 3g mobile internet on educational outcomes in brazil* (Tech. Rep.). Working Paper.

Best, M. C., Cloyne, J. S., Ilzetzki, E., & Kleven, H. J. (2019, 05). Estimating the Elasticity of Intertemporal Substitution Using Mortgage Notches. *The Review of Economic Studies*, *87*(2), 656-690. link

Blomquist, S., Newey, W. K., Kumar, A., & Liang, C.-Y. (2021). On bunching and identification of the taxable income elasticity. *Journal of Political Economy*, *129*(8), 000–000.

Carozzi, F., Hilber, C., & Yu, X. (2020). *On the economic impacts of mortgage credit expansion policies: Evidence from help to buy* [CEP Discussion Paper No 1681]. link

Chen, Z., Liu, Z., Suárez Serrato, J. C., & Xu, D. Y. (2021, July). Notching rd investment with corporate income tax cuts in china. *American Economic Review*, *111*(7), 2065-2100. link

Chernozhukov, V., Galichon, A., Henry, M., & Pass, B. (2021). *Identification of hedonic equilibrium and nonseparable simultaneous equations*.

DeFusco, A. A., & Paciorek, A. (2017, February). The interest rate elasticity of mortgage demand: Evidence from bunching at the conforming loan limit. *American Economic Journal: Economic Policy*, *9*(1), 210-40. link

Epple, D. (1987). Hedonic prices and implicit markets: Estimating demand and supply functions for differentiated products. *Journal of Political Economy*, *95*(1), 59-80. link

Epple, D., Quintero, L., & Sieg, H. (2020). A new approach to estimating equilibrium models for metropolitan housing markets. *Journal of Political Economy*, *128*(3), 948-983. link

Galiani, S., Murphy, A., & Pantano, J. (2015, November). Estimating neighborhood choice models: Lessons from a housing assistance experiment. *American Economic Review*, *105*(11), 3385-3415. link

Gallego, J. M., Montoya, S., & Sepulveda, C. (2017). *Intra-jurisdictional tax variations, vertical differentiation and housing prices*. link

Gaubert, C., Kline, P., & Yagan, D. (2020). *Place-based redistribution* (Paper). Berkeley. link

Greenstone, M. (2017). The continuing impact of sherwin rosen's "hedonic prices and implicit markets: Product differentiation in pure competition". *Journal of Political Economy*, *125*(6), 1891-1902. link

Gruber, J., Jensen, A., & Kleven, H. (2021, May). Do people respond to the mortgage interest deduction? quasi-experimental evidence from denmark. *American Economic Journal: Economic Policy*, *13*(2), 273-303. link

Hanna, R., & Olken, B. A. (2018, November). Universal basic incomes versus targeted transfers: Anti-poverty programs in developing countries. *Journal of Economic Perspectives*, *32*(4), 201-26. link

Heckman, J. J., Matzkin, R. L., & Nesheim, L. (2010). Nonparametric identification and estimation of nonadditive hedonic models. *Econometrica*, *78*(5), 1569-1591. link

Hjort, J., & Tian, L. (2021). The economic impact of internet connectivity in developing countries.

Kho, K., Lakdawala, L., & Nakasone, E. (2018, April). *Impact of Internet Access on Student Learning in Peruvian Schools* (Working Papers No. 2018-3). Michigan State University, Department of Economics. link

Kleven, H. J. (2016). Bunching. *Annual Review of Economics*, *8*(1), 435-464. link

Kline, P., & Moretti, E. (2014). People, places, and public policy: Some simple welfare economics of local economic development programs. *Annual Review of Economics*, *6*(1), 629-662. link

Kuminoff, N. V., Smith, V. K., & Timmins, C. (2013, December). The new economics of equilibrium sorting and policy evaluation using housing markets. *Journal of Economic Literature*, *51*(4), 1007-62. link

Malamud, O., Cueto, S., Cristia, J., & Beuermann, D. W. (2019). Do children benefit from internet access? experimental evidence from peru. *Journal of Development Economics*, *138*, 41-56. link

McMillen, D. P. (2008). Changes in the distribution of house prices over time: Structural characteristics, neighborhood, or coefficients? *Journal of Urban Economics*, *64*(3), 573-589. link

Poterba, J. M. (1992). Taxation and housing: Old questions, new answers. *The American Economic Review*, *82*(2), 237–242. link

Robinson, P. M. (1988). Root-n-consistent semiparametric regression. *Econometrica*, *56*(4), 931–954. link

Rosen, S. (1974). Hedonic prices and implicit markets: Product differentiation in pure competition. *Journal of Political Economy*, *82*(1), 34-55. link

Saiz, A. (2010). The geographic determinants of housing supply*. *The Quarterly Journal of Economics*, *125*(3), 1253-1296. link

Sinai, T., & Waldfogel, J. (2005). Do low-income housing subsidies increase the occupied housing stock? *Journal of Public Economics*, *89*(11), 2137 - 2164. link

Soltas, E. (2021). The price of inclusion: Evidence from housing developer behavior.. link