

Gentrification and Residential Sorting: Reasons for Displacement and Environmental Injustice in Los Angeles

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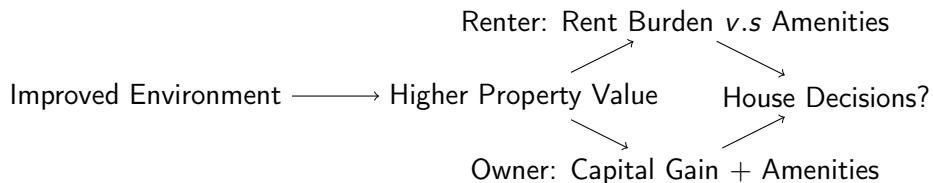
Duke University

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- Effect of Environmental Policies: welfare redistribution

Motivation



- Environmental Gentrification ⇒ ambiguous welfare effect of policies

Who Gains and Who Loses

Question:

- How does environmental gentrification disproportionately distribute benefits among different groups?
- Who is more likely to be displaced and harmed?
- What's the effect of environmental gentrification (environmental policies) on their welfare?

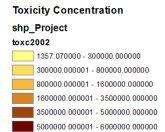
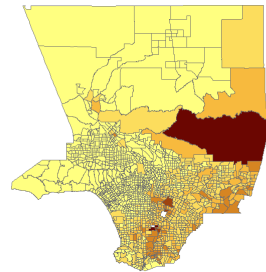
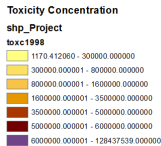
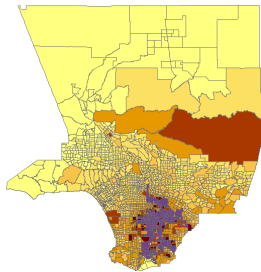
- Models of household location choice (Charles M. Tiebout 1956, Kelvin J. Lancaster 1966, Edwin S. Mills 1967, Thomas C. Schelling 1969, William M. Gorman 1980)
- Equilibrium sorting models: public amenities, heterogeneity, endogeneity (Epple and Sieg 1999, Bayer, McMillan, and Kim Rueben 2004, and Ferreyra 2007)
- Dynamics and forward-looking agents (Bayer et al 2016)
- Tenure (renter v.s owner) decisions (Binner and Day 2015, 2018)

Contribution:

- A novel data with housing dynamics for renters and owners
- A dynamic equilibrium sorting model with tenure decisions endogenized
 - Dynamics:
 - Moving cost
 - Expectation on housing values
 - Evolved preferences
 - Tenure:
 - Increased house values: capital gain for owners; rent burden for renters
 - Moving cost: owners need to pay 6% of house values to realtors

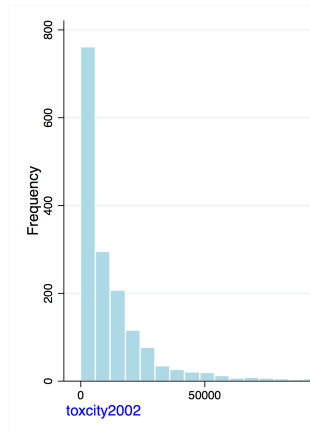
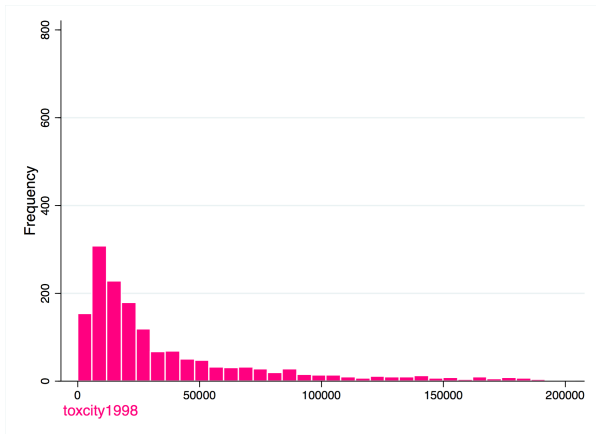
Environmental Gentrification in LA

- An unexpected negative environmental shock in after California Electricity Crisis



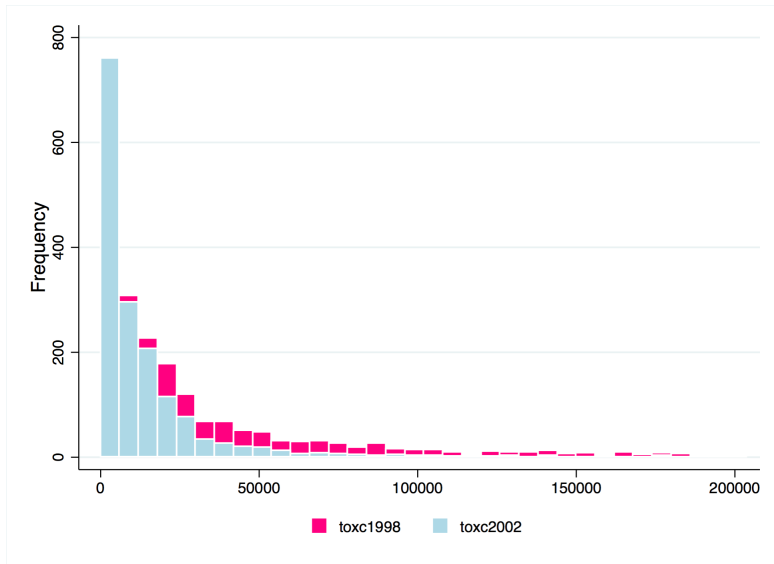
Environmental Gentrification in LA

- Many areas become much cleaner after the Crisis.



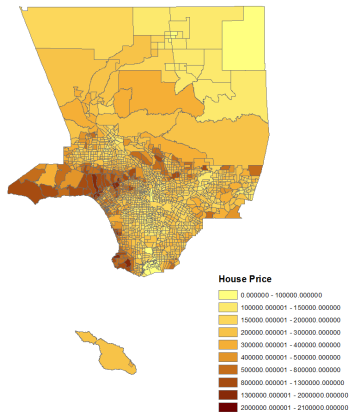
Environmental Gentrification in LA

- Toxicity concentration of 2002 in many areas are less than that in 1998.

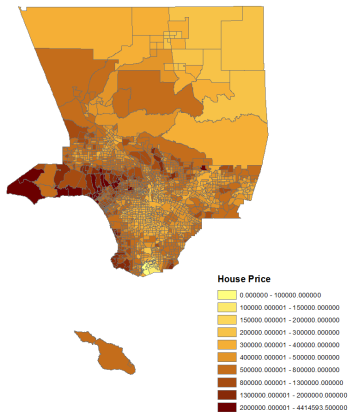


House Price: Significantly Increased house value

Distribution of House Price(2001, LA, Tract)

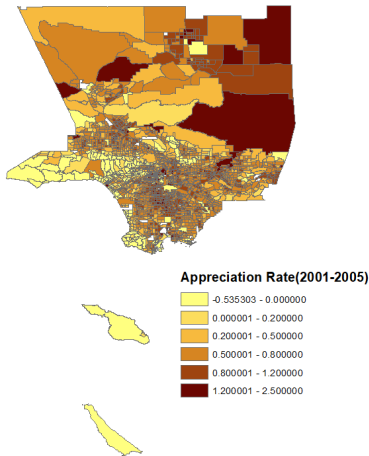


Distribution of House Price(2005, LA, Tract)



House Price: Significantly Increased house value

House Price Appreciates More in Cleaned Areas



Structure Model

Households' decisions process: 1. tenure 2. move or stay 3. location
Utility function:

$$u_{ij,t} = \alpha_i X_{j,t} + \gamma_i \text{usercost} + \xi_{j,t} + \epsilon_{ij,t}$$
$$\alpha_i = \beta Z_{i,t}$$

- $j = 0, \dots, J$ index neighborhoods in choice set
- $X_{j,t}$ is neighborhood characteristics.
- $Z_{i,t}$ is household characteristics including tenure choices $T_{ij,t}$
- $\xi_{j,t}$ is the unobserved neighborhood fixed effect, assumed to be identical for owners and renters.
- $\epsilon_{ij,t} \sim$ iid type I extreme value

Utility function:

$$u_{j,t}^{\tau} = \alpha^{\tau} X_{j,t} + \gamma^{\tau} \text{usercost} + \xi_{j,t}^{\tau} + \epsilon_{j,t}$$
$$\alpha^{\tau} = \beta Z_{i,t}^{\tau}$$

- Type: categorized preference heterogeneity $\alpha_i \Rightarrow \alpha^{\tau}$
 - $Z_{i,t}$ includes wealth, income and tenure
 - Residents who stay: $\alpha^{\tau}(Z_{i,t})$
 - Renters who move: $\alpha^{\tau}(Z_{i,t})$
 - Owners who move: $\alpha^{\tau}(\bar{Z}_{i,t})$ where wealth $\bar{W}_{ij,t} = W_{ij,t} - FMC_{ij,t}$

- Moving cost: financial moving cost $FMC_{i,t}$; psychological moving cost $PMC_{i,t}$
 - If choosing to be renter $T_{ij,t} = 1$

$$u_{ij,t}^{MC} = u_{ij,t}(X_{j,t}, Z_{i,t}, \xi_{j,t}) - PMC(Z_{i,t})$$

- If choosing to be owner $T_{ij,t} = 0$

$$u_{ij,t}^{MC} = u_{ij,t}(X_{j,t}, \bar{Z}_{i,t}, \xi_{j,t}) - PMC(\bar{Z}_{i,t})$$

- Maximize lifetime expected utility:

$$\operatorname{argmax}_{\{d_{i,t}, r_{i,t}\}_t^T} E[\sum_{\rho=t}^T \beta^{\rho-t} (u^{MC}(X_{j,\rho}, Z_{i,\rho}, \xi_{j,\rho}, \varepsilon_{ij,\rho})) | X_{j,t}, Z_{i,t}, \xi_{j,t}, \varepsilon_{ij,t}, d_{i,t}, r_{i,t}]$$

- Each household make a sequence of decisions on location and tenure $(d_i, r_i)_{t \rightarrow T}$ to maximize their lifetime expected utility given public amenities $X_{j,t}$.

- Measure of pollution exposure:
 - Toxicity Concentration from RSEI data: combined co-pollutant measure for each census tract
- Housing Data:
 - HMDA: housing mortgage and owner's socioeconomic information
 - CoreLogic: house transaction information
 - Merge to get data of owners one time movement
- Movement:
 - LA FANS data: household level data with full moving history
- Amenities: crime rate, school quality

Table: Descriptive Statistics

Variable	Mean	Std.Dev	Min	Max
White	0.2072	0.4054	0	1
Hispanic	0.6215	0.4851	0	1
Black	0.1165	0.3209	0	1
Asian	0.05991	0.2374	0	1
Age	40.6232	12.3685	14	91
Kids	0.8505	0.3567	0	1
Education	11.7206	4.3641	0	19
Income($\times 10,000/\text{year}$)	3.8458	3.6899	0	27.8143
Move	0.5980	0.4904	0	1
Renter(Wave 1)	0.6350	0.4815	0	1
Rent(Wave 1)($\times 1000/\text{year}$)	7.6868	3.0141	0.5	25.6230
Renter(Wave 2)	0.5924	0.4915	0	1
Rent(Wave 2)($\times 1000/\text{year}$)	11.0550	4.7711	0.5	24.6000
House Price(Wave 1)($\times 1000/\text{year}$)	258.7762	187.253	50	3900
House Price(Wave 2)($\times 1000/\text{year}$)	550.6037	3.8095	10	5750
N	1717			

Estimation: two-step approach to dynamic optimization

- Use Bellman Equation to get households' value functions and probability of a household moving to neighborhood j and choosing tenure r .
- Maximize combined likelihood function: use two-step approach to do dynamic optimization
 - Recover estimates of choice-specific value functions from the observed decisions of movers.
 - Combine the estimates of choice-specific value functions and moving costs to get estimates of flow utilities
 - Decompose flow utility to recover preference parameters

Table: Moving Cost Parameters($\gamma_{fmc}, \gamma_{pmc}$)

	PMC	FMC(\times 6% House Price)
$Income_{low}$	7.0184*	12.7643*
$Income_{medium}$	1.7478**	10.1449
$Wealth_1$	0.6831	1.4292*
$Wealth_2$	0.9378*	1.2513
$Wealth_3$	0.6772	0.8206
$Wealth_4$	0.5821*	1.5264
$Wealth_5$	0.6972	0.4403
$Wealth_6$	1.0017	0.3573
$Wealth_7$	0.6831	0.4292
t	1.5672**	
constant	4.6459***	10.9766*

Table: Marginal Willingness to Pay for Amenity Increase by Income

	Low	Medium	High
Pollution(-1000)	255.5565	390.1468	493.2030
Crime Rate(-30)	289.2685	315.4373	517.0178
School(10)	197.2658	398.4820	392.1409

Table: Compensation Variation of Owner& Renter with Same Initial Type

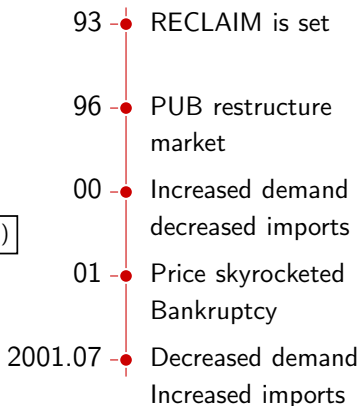
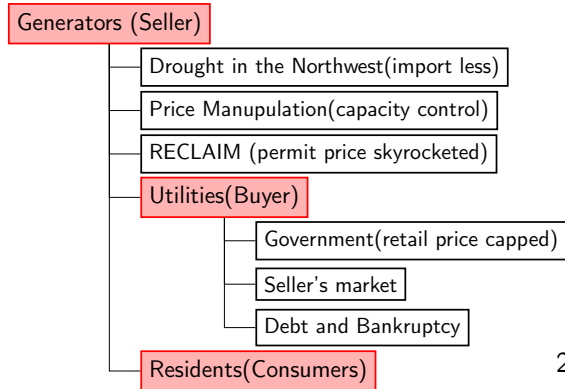
	$Renter_H$	$Owner_H$	$Renter_L$	$Owner_L$
Crime Rate	-663.2298	-1221.69	953.9539	-185.4333
School Quality	-1050.4176	-1030.3749	593.9314	-344.7948
Toxic Concentration	-919.2293	-1127.3707	822.9086	-486.0906

Conclusion

- The marginal value of wealth is positive and higher for lower income residents
- We got estimation on willingness to pay for crime rate, school quality and toxic concentration. Poor residents would like to pay less for amenity improvement.
- Gentrification disproportionately distribute benefit among renters and owners. It might harms residents with lower socioeconomic conditions. With more minorities are renters and poor. They are more likely to get harmed and keep living in worse neighborhood.

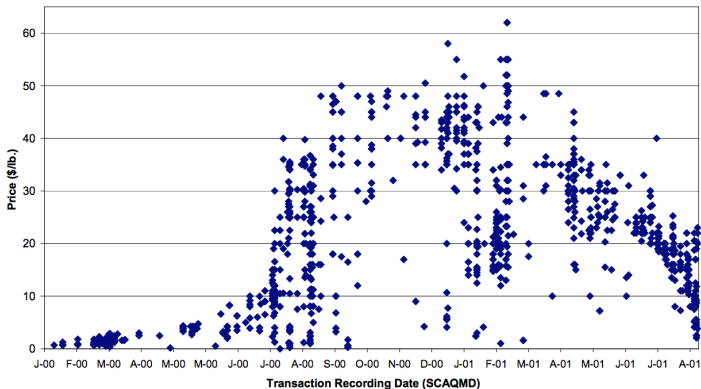
Appendix1: Gentrification in LA

California Electricity Crisis + RECLAIM → less pollution → Gentrification
Timeline 1:



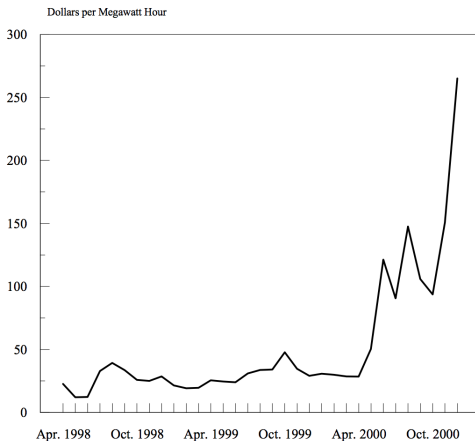
Regional Clean Air Incentives Market(RECLAIM)

- Cap-and-Trade program controlling NO_x emission through locating permits to 392 facilities in South California
- Firm's options to remain in compliance include reducing production, increasing operating efficiency, installing abatement technology or purchasing permits.
- Permits allocation binds production in 2000 and firms get penalty for no compliance.



Appendix2: Electricity Price in California Electricity Crisis

Average Price Utilities Paid for Electricity in Auction (1998.04-2000.12)



SOURCE: Congressional Budget Office based on data for the northern and southern regions from the California Energy Commission (available at www.energy.ca.gov/electricity/wepr/monthly_day_ahead_prices.html).

Appendix3: Risk Screening Environmental Indicator Data

- Risk-screening Environmental Indicators (RSEI) data provide important information about the potential health-related impacts of toxic releases from facilities in your community that report to the Toxics Release Inventory (TRI).
- Toxicity-weighted concentrations could be added across chemicals for the same geographic areas and be averaged to combine geographic areas.