

# **Land ownership and land use regulation**

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# Stylized Fact 1

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- **Restrictiveness of planning system differs across space**
  - ▶ **Estimated “Regulatory Tax” for US housing markets (Glaeser, Gyourko and Saks 2005)**

<b>Manhattan &amp; SF</b>	<b>&gt;50% of HV</b>
<b>Pittsburgh or Detroit</b>	<b>0%</b>

- ▶ **Even bigger RT & larger differences in UK/Continental Europe (Cheshire & Hilber 2008)**

# Stylized Fact 2

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- **Restrictiveness of planning system changes over time**
  - ▶ **First zoning laws in US :**
    - in SF (1880s) and NYC (1916) (Fischel 2004)
  - ▶ **Regulation spreads from city centers to surrounding suburbs (Fischel 2004)**
    - Restrictiveness of zoning is tied to distance from central city (Rudel 1989)

# Research Question

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⇒ **What causes (tightness of) land use regulations?**

- **Answers**

- ▶ Literature: homeowners vs. tenants

- (“*homevoter hypothesis*”)

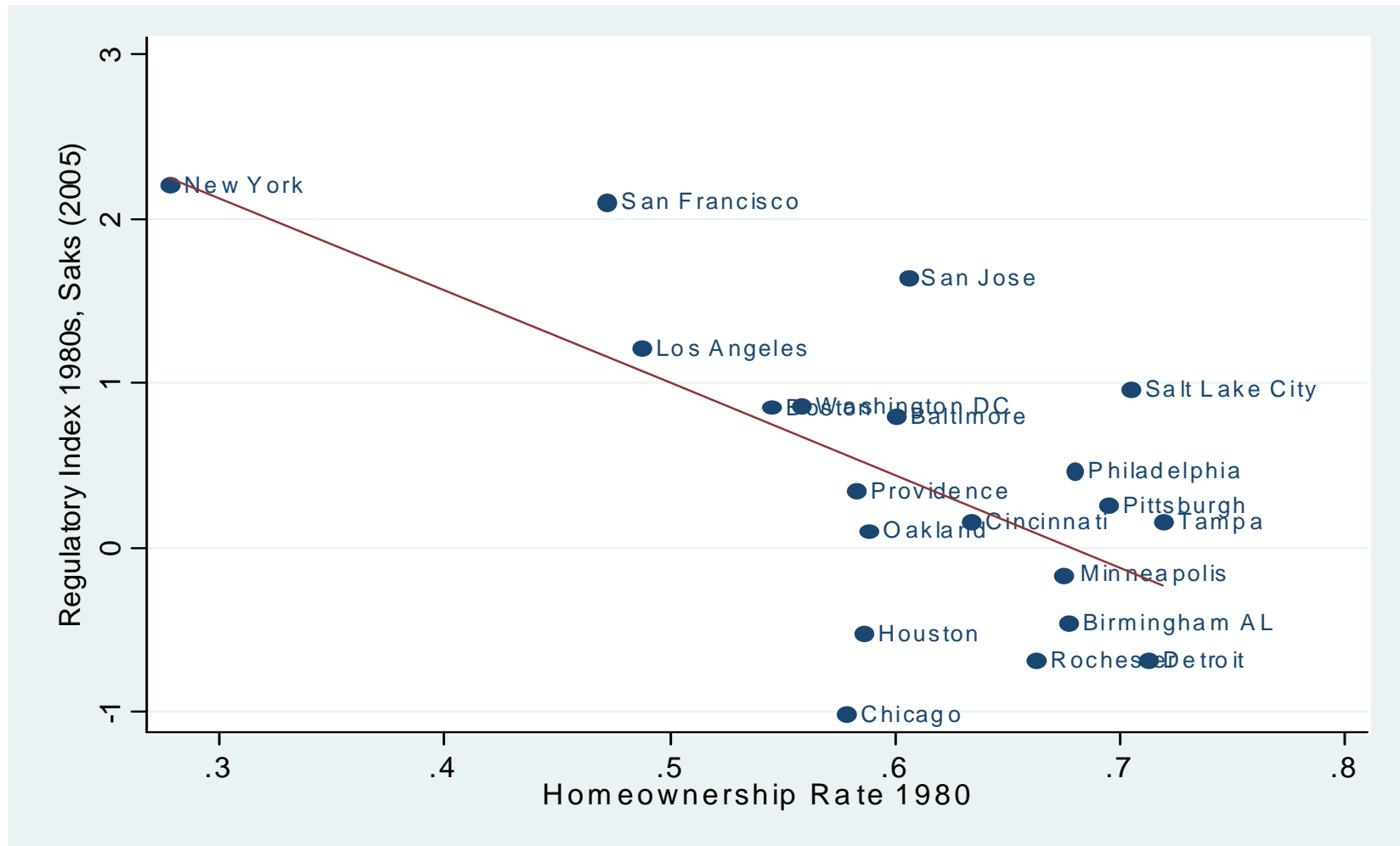
- ▶ Ours: owners of developed land vs. owners of undeveloped land (*lobbying*)

# Evidence in Favor of “Homevoter Hypothesis”?

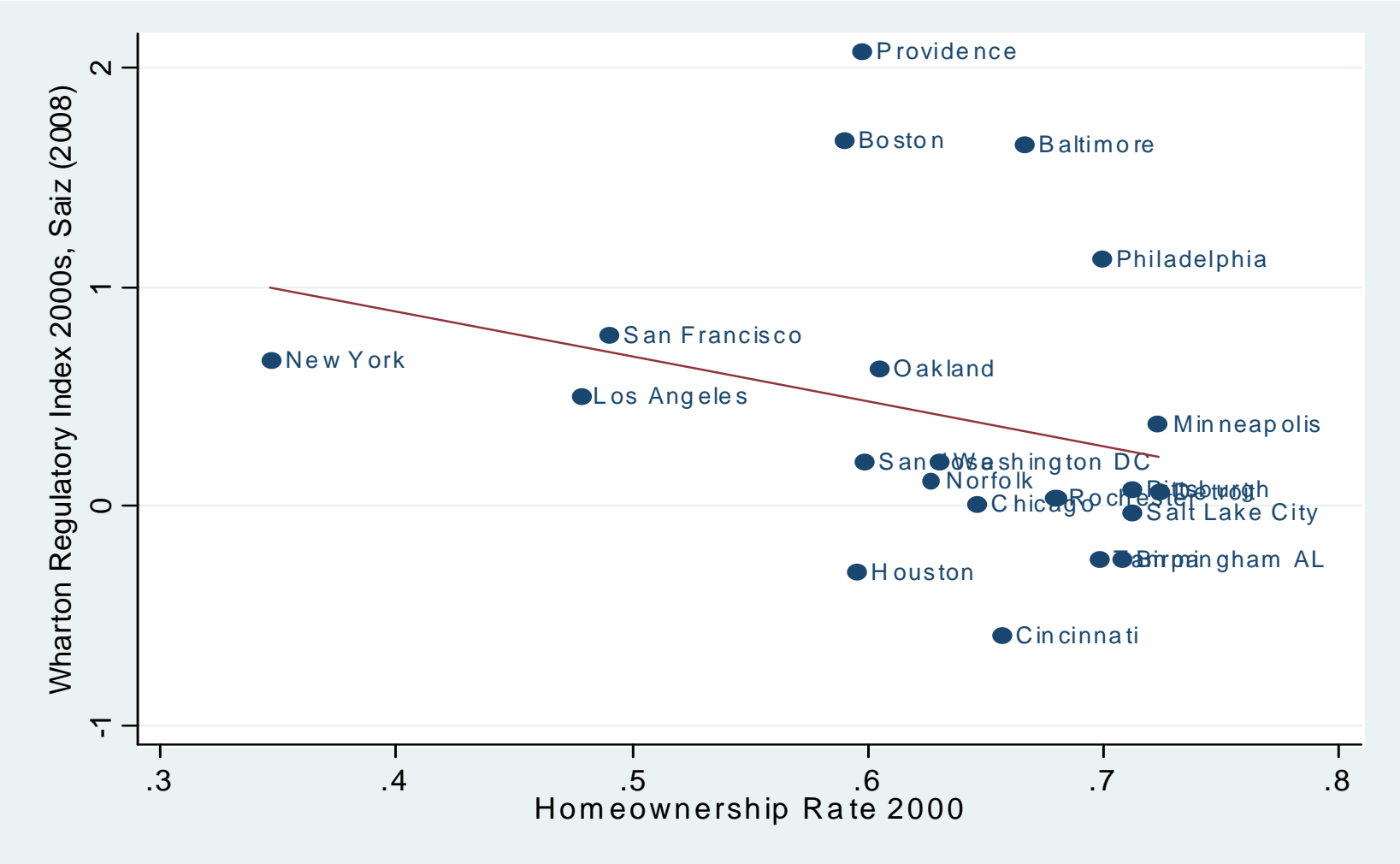
	Regulatory Tax (2000)		Regulatory Index Rank		Homeownership (2000)	
Metro Area	in %	Rank	1980s	2000s	in %	Rank
SAN FRANCISCO	53.1	1	2	5	49.0	19
SAN JOSE CA	46.9	2	3	10	59.8	15
LOS ANGELES CA	33.9	3	4	8	47.8	20
WASHINGTON DC	21.9	5	6	11	63.0	12
BOSTON MA	18.6	7	7	2	59.0	18
NEW YORK NY	12.2	8	1	6	34.7	21
CHICAGO IL	5.7	10	20	16	64.6	11
PITTSBURGH PA	0	Last	11	13	71.2	4
DETROIT MI	0	Last	19	14	72.4	1

N=21, Sources: GGS (2005), Saks (2008), GSS (2008), Saiz (2008), Census

# Homevoter Hypothesis in 1980s?



# Homevoter Hypothesis in 2000s?

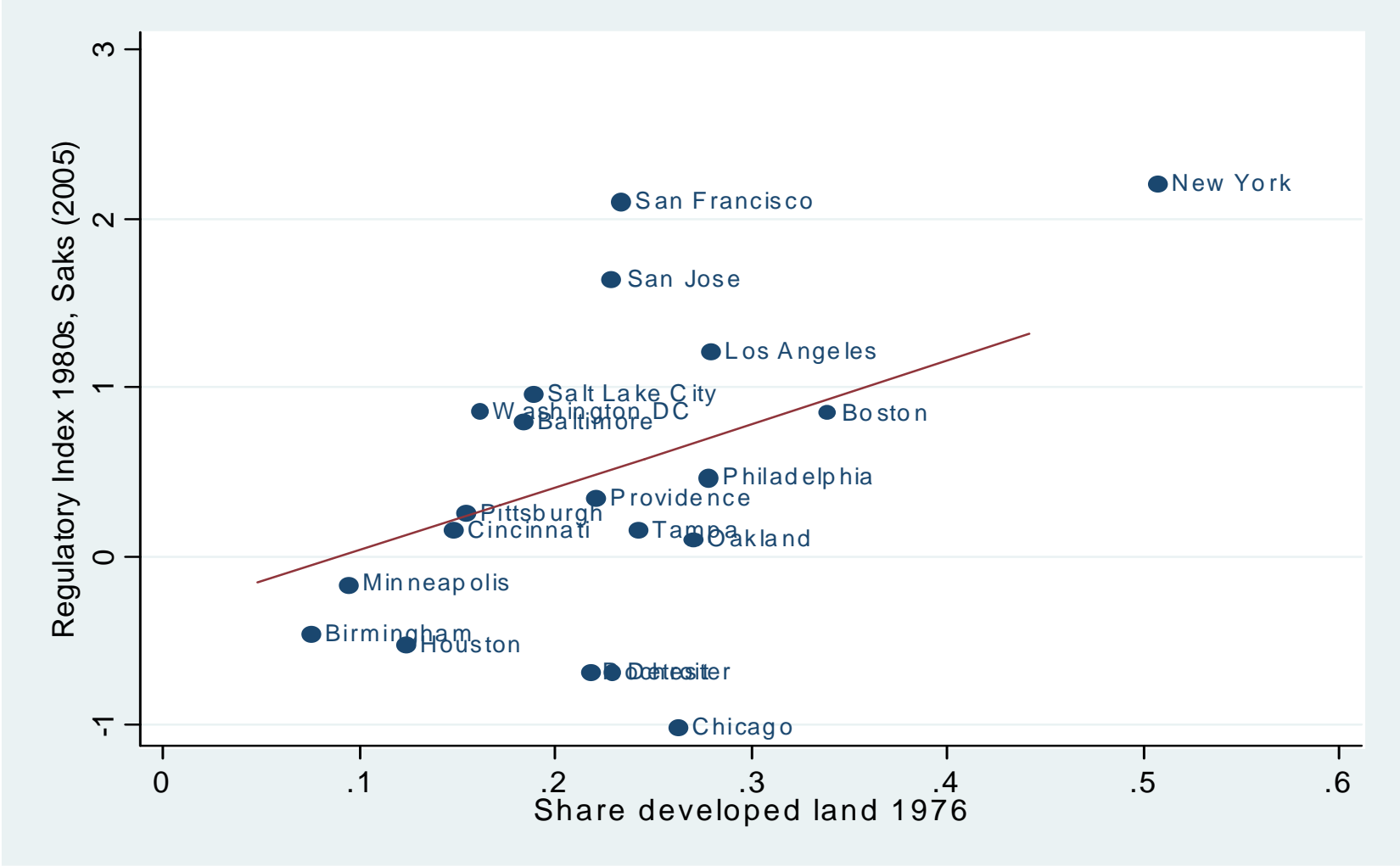


# Land Scarcity and Regulation

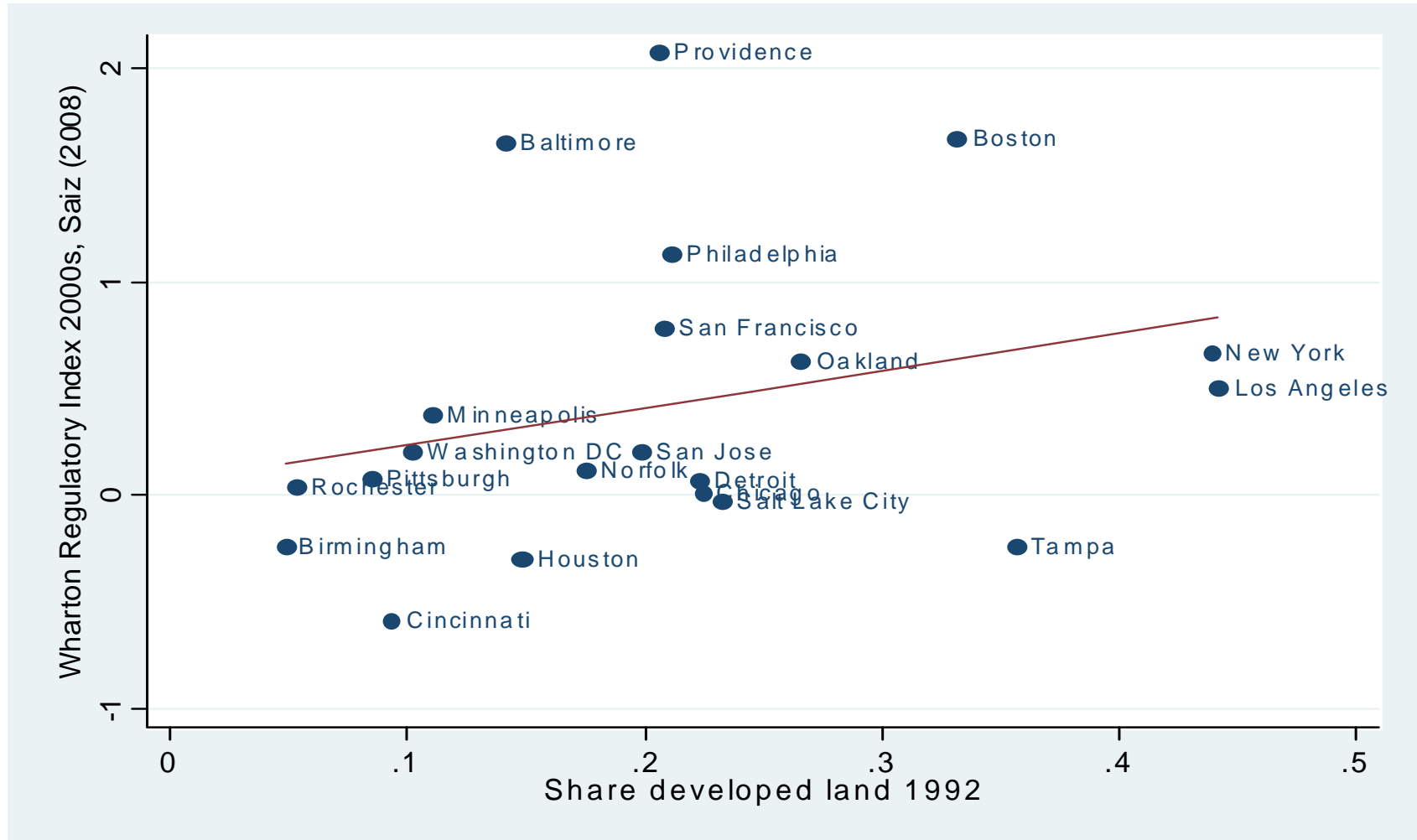
Metro Area	Regulatory Tax (2000)		Regulatory Index Rank		Developed / Developable	
	in %	Rank	1980s	2000s	in %	Rank
SAN FRANCISCO	53.1	1	2	5	20.8	10
SAN JOSE CA	46.9	2	3	10	19.9	12
LOS ANGELES CA	33.9	3	4	8	44.2	1
WASHINGTON DC	21.9	5	6	11	10.2	17
BOSTON MA	18.6	7	7	2	33.2	4
NEW YORK NY	12.2	8	1	6	43.9	2
CHICAGO IL	5.7	10	20	16	22.4	7
PITTSBURGH PA	0	Last	11	13	8.5	19
DETROIT MI	0	Last	19	14	22.3	8

Sources: GGS (2005), Saks (2008), GSS (2008), Saiz (2008), NLCD92

# Positive Correlation in the 1980s...



# ...And positive correlation in 2000s



# Outlook

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- Stylised facts
- Question
- **Theory**
- Results
- Quantification
- QAWI
- Conclusions

# A Simple Theory

## —“The 2 Minute Version”

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1. **Desirable and easily developable locations get “filled in” first**
  - ▶ *Demand side:* **Areas with better amenities more developed**
  - ▶ *Cost side:* **Easily developable areas more developed**
2. **Assuming lobbying is feasible, over time political influence of owners of developed land increases**

## **A Simple Theory**—*Continued*

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- 3. At some point balance of political power tilts in favor of owners of developed land**  
***(happens earlier in more desirable locations)***
  - ▶ **Owners of DL prefer high RT because positively capitalized into property values**
  - ▶ **Owners of UDL prefer low RT because RT increases cost of further developments**

# Main Propositions

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- 1. More desirable / easily developable locations should be more developed**
- 2. More developed locations should be more regulated**

*What about role of homeownership?*

⇒ Sign of coefficient ambiguous

- Homeowners are “landlords renting to themselves” (favor RT less strongly than landlords) (see Brueckner and Lai 1996)
- Depends on whether voting or lobbying more relevant, tenancy duration, org. abilities of groups (Olson 1971)

# A simple model

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- **Two monocentric cities [jurisdictions]**
  - ▶ A planning board in each
- **Each monocentric jurisdiction**
  - ▶ CBD, Commuting cost  $\tau$  per unit distance; Open
- **Residents consume one unit of housing**
  - ▶ Each unit of housing = 1 unit of land
  - ▶ Homogeneous HH choose b/n 1 and 2
    - And then where to live in the city they have chosen

# Game: timing and players

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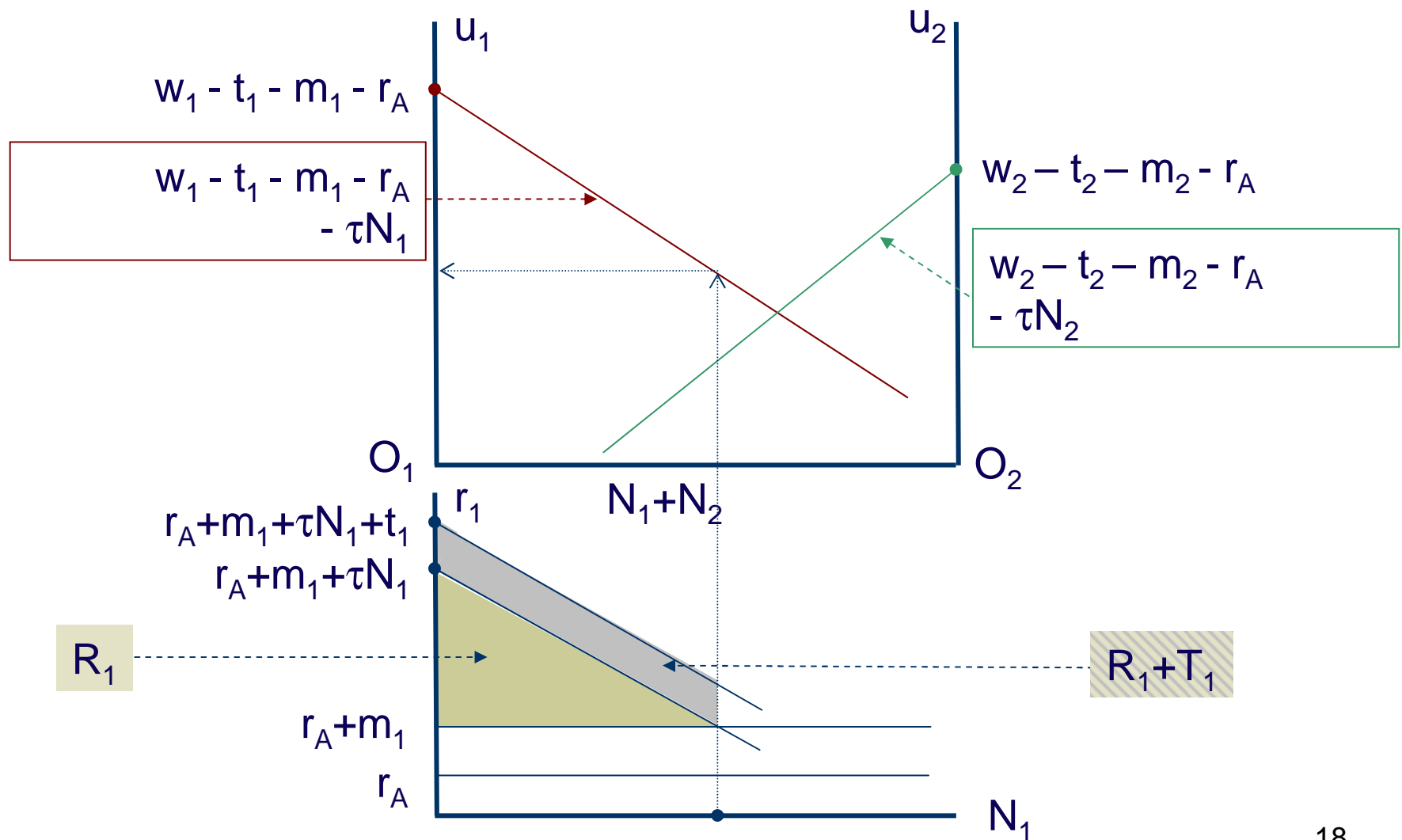
1. Each Jurisdiction's planning board chooses regulatory tax  $T$ , taking  $T^*$  as given
  - Non-cooperative game
2. Landlords competitively post land rents  $R_j(h)$ 
  - $\underline{h}$  = distance from CBD
3. Households choose between  $j=1$  and  $j=2$
4.  $\underline{N}$  Households choose a plot where they consume housing, i.e. they chose an 'h'

# Payoffs and SPE

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- Within Jurisdiction Equ'm: Households in j
  - ▶ **Utility:**  $u_j = u_j(h) = w_j - \tau_j h - r_j(h) - t_j$
  - ▶ **Thus:**  $u_j = u_j(h) = w_j - \tau_j N_j - t_j - m_j - r_A$
- AJE: Choosing between j=1 and j=2
  - ▶ **Comparing 'economic amenities' u1 v. u2**
    - j-specific income, congestion
  - ▶ **Comparing natural amenities**
    - Discrete choice model
    - e.g. Boulder CO v. SF

# Payoffs and SPE



# Across Jurisdictions Equilibrium

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## Discrete choice model

- Heterogeneous households
- Common, observable component:  $u_1$  ,  $u_2$
- Unobservable, HH-specific component  $v$ :

$$V_1(H) = u_1 + v/2$$

$$V_2(H) = u_2 - v/2$$

- ▶  $v \sim F(\cdot)$  on  $[\alpha, \text{var}]$
- ▶ Uniform distribution:  $F(v) = (v - \alpha + \sigma) / (2\sigma)$

# Across Jurisdictions Equilibrium

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## Discrete choice model

- Indifferent individual has  $v$  s.t.

$$v = u_2 - u_1$$

- Fraction of people *willing* to live in 1 given  $u_1$  and  $u_2$ :

$$n_1 = F(u_1 - u_2)$$

- AJE :  $n_1 = N_1/N$

$$N_1(t_1, t_2; \beta) = \frac{N}{2} + \frac{\alpha + (w_1 - w_2) - (t_1 - t_2) - (m_1 - m_2)}{2(\sigma + \tau)}$$

# Political Economy

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- **Planning boards cater to the interests of landowners**
  - ▶ Owners of developed land: favour a high T
  - ▶ Owners of undeveloped land: favour a low T
  - ▶ **Lobbying** (Grossman-Helpman 1994, Bernheim-Winston 1986)
  - ▶ **Reduced form:**

$$\max_{t_1 \geq 0} R_1(t_1, t_2^*; \alpha) + T_1(t_1, t_2^*; \alpha) = N_1(t_1, t_2^*; \alpha) \left[ t_1 + \frac{\tau N_1(t_1, t_2^*; \alpha)}{2} \right]$$

- **Possible extension: voters matter, too**

# Equilibrium features

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- **At SP Equilibrium, the more regulated jurisdiction is more populated and**
  - ▶ has nicer natural amenities:  $\alpha > 0$
  - ▶ has nicer economic amenities:  $\Delta w > 0$
  - ▶ is easier to build on:  $\Delta m < 0$
  - ▶ Or both
- **Nice locations get populated first**

# How to Test Empirically?

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- Use datasets from different sources and geographically match to MSA-level
  - ▶ RI: Saks (2008), Gyourko et al. (2008), Saiz (2008)
  - ▶ Aerial / satellite land use data from NLCD (1976, 92, 01)
  - ▶ Census, Census of Gov., NCDB, NASD
- **Regulatory tax** = f (**%developed land**, **HOR**; **controls**) +  $\varepsilon$
- Address endogeneity issues
  - ▶ **%DL** = f (natural amenities, topography)
  - ▶ **Homeownership** = f(%DINKS)

# Outlook

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# Results: 1st Stage (OLS) $N=95$

	%DL, 1992	HOR, 1990
<b>Amenities</b>		
Coastline	0.133 ***	-0.046 ***
Sun, January, 1941-1970	0.00075 **	-0.00027 **
<b>Topography</b>		
%Flat plains	0.95 *	0.06
% DINKS 1990	-0.96 ***	1.68 ***
Region Fixed Effects	Yes	Yes
Constant	0.29 ***	0.21 ***
Adj. R <sup>2</sup>	0.44	0.61

Notes: Robust estimates. \*\*\*, \*\*, \* Significant at 1%-, 5%- ,10%-level.

# Results: Naive OLS $N=95$

	Wharton Regulatory Index 2000s	Wharton Regulatory Index 2000s
%DL 1992	1.28 **	1.41 **
HOR 1990	-1.72 *	0.26
Regional dummies (default = MW)		
South		0.19
West		0.95 ***
North East		0.66 ***
Constant	0.99	-0.68
Adj. R <sup>2</sup>	0.12	0.36

Notes: Robust estimates. \*\*\*, \*\*, \* Significant at 1%-, 5%-, 10%-level.

# Results: 2nd Stage (2SLS) $N=95$

	Wharton Regulatory Index 2000s	Wharton Regulatory Index 2000s
<b>%DL 1992</b>	1.41 **	<b>2.30 ***</b>
<b>HOR 1990</b>	0.26	1.35
<b>Regional dummies (default = MW)</b>		
<b>South</b>	0.19	<b>0.19</b>
<b>West</b>	0.95 ***	<b>1.00 ***</b>
<b>North East</b>	0.66 ***	<b>0.62 ***</b>
<b>Constant</b>	-0.68	-1.5
<b>Adj. R<sup>2</sup></b>	0.36	

Notes: Robust estimates. \*\*\*, \*\*, \* Significant at 1%-, 5%-, 10%-level.

# Results: Housing growth $N=95$

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	Growth of housing stock 1990-2000 (in %)
Wharton Regulatory Index 2000s	-0.046 **
Growth housing stock, 1980-1990	0.44 ***
Housing stock (level), 1990	$-10^{-8}$
Constant	0.06 ***

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*Notes: Robust estimates. Bootstrapped standard errors. \*\*\*, \*\*, \* Significant at 1%-, 5%-, 10%-level.*

# Robustness: density (2SLS)

	Wharton Regulatory Index 2000s	Wharton Regulatory Index 2000s
<b>%DL 1992</b>	2.30 ***	<b>2.48 ***</b>
<b>HOR 1990</b>	1.35	2.47
<b>Population density (dev.) 1990</b>		10 <sup>-4</sup>
Regional dummies (default = MW)		
South	0.19	<b>0.27</b>
West	1.00 ***	<b>1.12 ***</b>
North East	0.62 ***	<b>0.59 ***</b>
<b>Constant</b>	yes	yes

N=95. Notes: Robust estimates. \*\*\*, \*\*, \* Significant at 1%-, 5%-, 10%-level.

# Robustness: income (2SLS)

	Wharton Regulatory Index 2000s	Wharton Regulatory Index 2000s
%DL 1992	2.30 ***	2.88 **
HOR 1990	1.35	3.16
Population density (dev.) 1990		2·10 <sup>-4</sup>
Wage 1990		10 <sup>-5</sup>
Regional dummies (default = MW)		
South	0.19	0.34 *
West	1.00 ***	1.19 ***
North East	0.62 ***	0.54 ***
Constant	yes	yes

N=95. Notes: Robust estimates. \*\*\*, \*\*, \* Significant at 1%-, 5%-, 10%-level.

# Robustness: residential (2SLS)

	Wharton Regulatory Index 2000s	Wharton Regulatory Index 2000s
<b>%DL 1992</b>	2.30 ***	<b>2.50 **</b>
<b>HOR 1990</b>	1.35	1.22
Regional dummies (default = MW)		
<b>South</b>	0.19	<b>0.18</b>
<b>West</b>	1.00 ***	<b>1.00 ***</b>
<b>North East</b>	0.62 ***	<b>0.61 ***</b>
<b>Constant</b>	yes	yes

N=95. Notes: Robust estimates. \*\*\*, \*\*, \* Significant at 1%-, 5%-, 10%-level.

# Robustness: 20<sup>km</sup>-radius (2SLS)

	Wharton Regulatory Index 2000s	Wharton Regulatory Index 2000s
<b>%DL 1992 (residential, 20km-radius)</b>	<b>2.30 ***</b>	<b>1.28 **</b>
<b>HOR 1990</b>	<b>1.35</b>	<b>.69</b>
<b>Regional dummies (default = MW)</b>		
<b>South</b>	<b>0.19</b>	<b>0.14</b>
<b>West</b>	<b>1.00 ***</b>	<b>0.97 ***</b>
<b>North East</b>	<b>0.62 ***</b>	<b>0.81 ***</b>
<b>Constant</b>	<b>yes</b>	<b>yes</b>

N=95. Notes: Robust estimates. \*\*\*, \*\*, \* Significant at 1%-, 5%-, 10%-level.

# Robustness – summary

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- **Results hold if**
  - ▶ **control for MSA density in developed area**
  - ▶ **control for MSA-level income per capita**
  - ▶ **use other definitions of %DL**

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# Quantitative effects

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- **Quantitative effects plausible and large**
  - ▶ **First stage**
    - Access to major cost → %DL + 1 std dev
    - %Flat plains + 32 p.p. → %DL + 31 p.p. (2.32 std dev)
  - ▶ **Second stage**
    - %DL + 13 p.p. → RI + ½ std. dev.

# Outlook

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## QAWI : 2nd Stage (2SLS) *N*=95

	Wharton Regulatory Index, 2000s
<b>%DL 1992</b>	<b>2.3 ***</b>
<b>HOR 1990</b>	<b>1.35</b>
<b>Region Fixed Effects</b>	<b>Yes</b>
<b>Constant</b>	<b>Yes</b>
Anderson cannon. corr. LR statistic (identification/IV relevance test)	P-val. = 0.00
Hansen J-statistic (over-identification test of all instruments)	P-val. = 0.28
Cragg-Donald (N-L)*minEval/L2	F-stat.=11.36

Notes: Robust estimates. \*\*\*, \*\*, \* Significant at 1%-, 5%-, 10%-level.

# Econometric issues

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- **Pass weak instrument tests**
  - ▶ Stock and Yogo (2005)
- **Estimate using Jackknife-Estimator (UJIVE1/UJIVE2)** (Angrist, Imbens and Krueger 1999)
  - ▶ Larger estimates

# Robustness: Jackknife (UJIVE1)

	Wharton Regulatory Index 2000s	Wharton Regulatory Index 2000s
<b>%DL 1992</b>	<b>2.30 ***</b>	<b>2.69 **</b>
<b>HOR 1990</b>	<b>1.35</b>	<b>1.83</b>
<b>Regional dummies (default = MW)</b>		
<b>South</b>	<b>0.19</b>	<b>0.19</b>
<b>West</b>	<b>1.00 ***</b>	<b>1.03 ***</b>
<b>North East</b>	<b>0.62 ***</b>	<b>0.61 ***</b>
<b>Constant</b>	<b>yes</b>	<b>yes</b>

N=95. Notes: Robust estimates. \*\*\*, \*\*, \* Significant at 1%-, 5%-, 10%-level.

# Robustness: Jackknife (UJIVE1)

	Wharton Regulatory Index 2000s	Wharton Regulatory Index 2000s
<b>%DL 1992 (residential, 20km-radius)</b>	<b>1.28 **</b>	<b>1.65 *</b>
<b>HOR 1990</b>	<b>0.69</b>	<b>1.23</b>
<b>Regional dummies (default = MW)</b>		
<b>South</b>	<b>0.14</b>	<b>0.13</b>
<b>West</b>	<b>0.97 ***</b>	<b>0.99 ***</b>
<b>North East</b>	<b>0.81 ***</b>	<b>0.83 ***</b>
<b>Constant</b>	<b>yes</b>	<b>yes</b>

N=95. Notes: Robust estimates. \*\*\*, \*\*, \* Significant at 1%-, 5%-, 10%-level (borderline 5%).

# Outlook

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- **Stylised facts**
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# Conclusions

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- 1. Restrictiveness of planning system differs across space and changes over time**
- 2. Propose simple theory that explains stylized facts**
- 3. Empirical findings suggest that lobbying may be important (not just voting)**
- 4. Homeownership rate plays role but seems to be of second-order**
- 5. Economic magnitude of effects is large**