





# **Local Labor Markets**

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## Introduction

- Much research has been devoted to understanding income differences across countries
- Yet, within country differences in output, income, wages and productivity are also remarkably large
- Within country differences are largely persistent over long periods of time

## Economic output per square kilometer

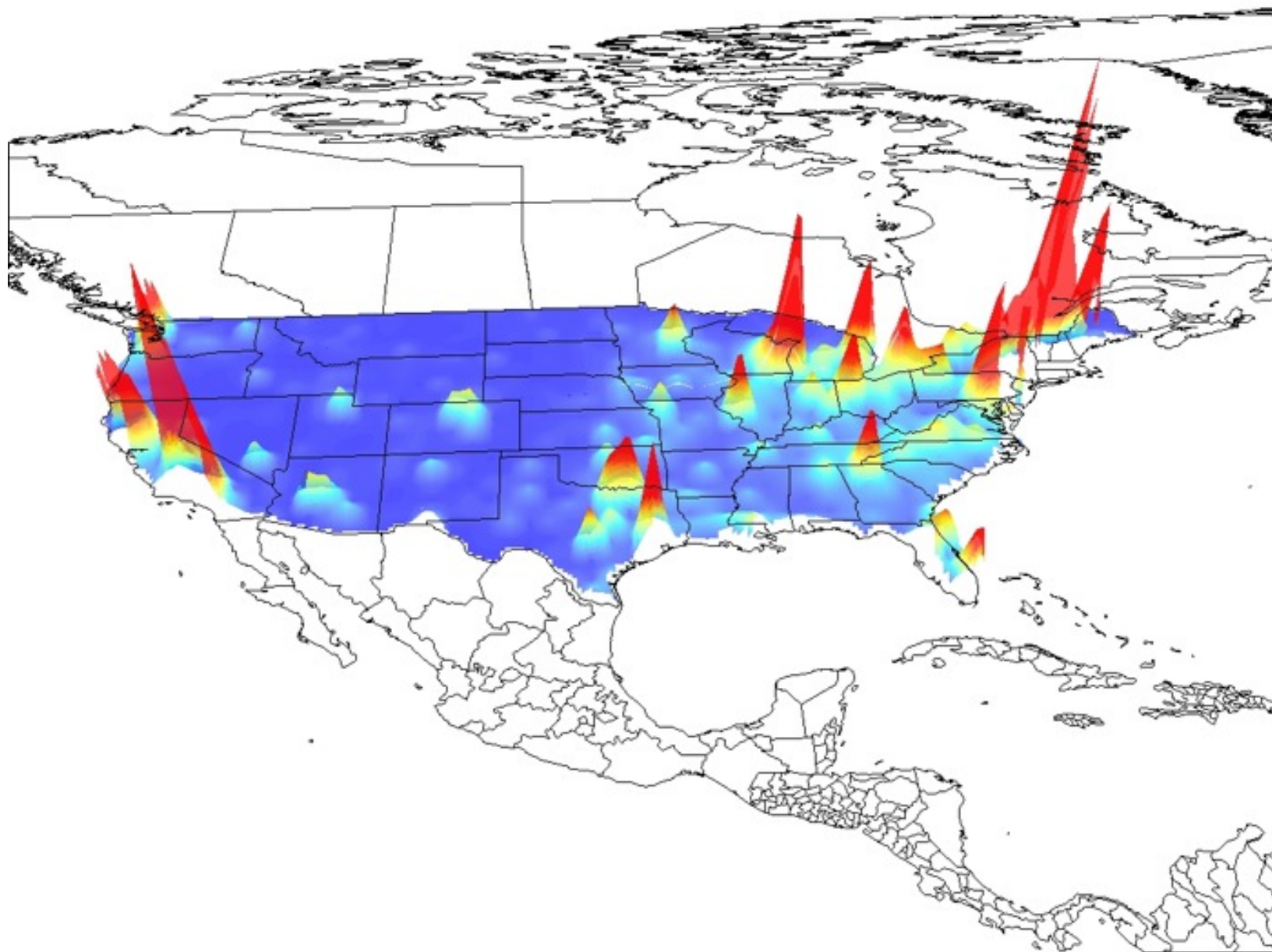


Table 1: Metropolitan Areas with the Highest and Lowest Wage for High School Graduates in 2000

Rank	Metropolitan Area	Average Conditional Hourly Wage
<u>Metropolitan Areas with the Highest Wage</u>		
1	Stamford, CT	20.72
2	San Jose, CA	19.85
3	Danbury, CT	19.24
4	San Francisco-Oakland-Vallejo, CA	19.21
5	New York-Northeastern NJ	19.16
6	Santa Rosa-Petaluma, CA	18.62
7	Monmouth-Ocean, NJ	18.53
8	Santa Cruz, CA	18.33
9	Ann Arbor, MI	17.98
10	Ventura-Oxnard-Simi Valley, CA	17.97
<u>Metropolitan Areas with the Lowest Wage</u>		
319	Jacksonville, NC	12.44
320	Joplin, MO	12.43
322	Dothan, AL	12.40
324	Ocala, FL	12.33
326	El Paso, TX	12.30
327	Danville, VA	12.28
328	Killeen-Temple, TX	12.25
329	Abilene, TX	12.21
331	Brownsville-Harlingen-San Benito, TX	11.58
332	McAllen-Edinburg-Pharr-Mission, TX	11.05

Notes: Sample includes workers between 25 and 60 years old who live in the relevant city.



## **Introduction**

- How can this be an equilibrium, given mobility of workers and firms?
- Natural advantages alone cannot account for all observed agglomeration (Ellison and Glaeser, 1999).
- The areas where economic activity is concentrated are typically characterized by high costs of labor and land.
- Agglomeration is particularly remarkable for traded goods industries



## Relevance

- These questions are important for economists:
  - labor economics
  - urban economics
  - macro economics
- These questions are important for policy-makers:
  - local governments: incentives to firms to locate within their jurisdictions
  - state governments: taxes, labor regulation, education
  - federal government: taxes and transfers

## Outline

- The chapter has 5 objectives:
  1. Document existing differences in wages, productivity and cost of living across US cities
  2. Develop a tractable general equilibrium framework
    - How can these differences persist in equilibrium?
    - Who ultimately benefits from these differences?
    - What causes these differences?

3. Survey the existing empirical evidence
4. Discuss the implications for location-based policy
5. Identify important topics for future research

## The Effect of Productivity Differences Across Cities

- Consider a skilled-biased shift in the productivity of labor in a city
- In a partial equilibrium setting, the only effect is an increase in the wage of skilled workers in that city
- But in general equilibrium, all workers in the economy are affected:
  - Unskilled workers in the same city are affected through the housing market and imperfect substitution
  - Workers in other cities (both skilled and unskilled) are also affected

## The Rosen-Roback Model

- The most frequently used spatial equilibrium model.
- Assumptions:
  1. Each city is a competitive economy that produces a single internationally traded good
  2. Workers care about wages, cost of living and amenities
  3. Labor is homogenous
  4. Labor is perfectly mobile → local labor supply is infinitely elastic
  5. Land is the only fixed factor → housing supply has zero elasticity

- Key insights:
  1. Any local shock to the demand or supply of labor in a city is *fully* capitalized in the price of land.
  2. Workers are always indifferent.
  3. By construction, the shock does not cause migration or redistribution.
  
- The assumptions are restrictive, and rule out several interesting questions

## A More General Spatial Equilibrium Model

- I consider first the case of homogenous labor; later I consider the case of worker heterogeneity
  - Assume that
    1. Workers have idiosyncratic preferences for location
    2. Land is not necessarily fixed
- Elasticities of local labor supply and housing supply are neither zero nor infinite
- This allows for an interesting distributional analysis

## Local Labor Supply

- Utility of worker  $i$  in city  $c$ :

$$U_{ic} = w_c - r_c + A_c + e_{ic} \quad (1)$$

$w_c$  is wage;  $r_c$  is cost of housing ;  $A_c$  is a local amenity;  $e_{ic}$  is idiosyncratic preference

- Two cities: city  $a$  and city  $b$ . Assume that the *relative* preferences for  $a$  over  $b$  are

$$e_{ia} - e_{ib} \sim U[-s, s]$$

- The parameter  $s$  characterizes labor mobility. If  $s = 0$  we have perfect mobility



- In equilibrium, the marginal worker needs to be indifferent between cities

→ labor supply for city  $b$  is upward sloping. The slope depends on  $s$ :

$$w_b = w_a + (r_b - r_a) + (A_a - A_b) - s + \left(\frac{2s}{N}\right)N_b \quad (2)$$

- Unlike the Rosen-Roback setting, here there are inframarginal workers who enjoy rents

## Housing Market

- If each worker consumes one unit of housing, the local demand for housing is

$$r_b = (w_b - w_a) + r_a + (A_b - A_a) + s - \left(\frac{2s}{N}N_b\right) \quad (3)$$

- The supply of housing is

$$r_c = z + k_c N_c \quad (4)$$

- $k_c$  characterizes the elasticity of supply of housing, and is determined by geography and land regulations

## Production

- Cobb-Douglas technology with CRTS

$$\ln y_c = X_c + hN_c + (1 - h)K_c \quad (5)$$

where  $X_c$  is a city specific productivity shifter.

- Labor and capital are paid their marginal product.
- Capital is infinitely supplied at given price

## Effect of a Localized Productivity Shift

- Assume that the marginal product of labor increases in city  $b$  by  $\Delta$ .
- $\frac{N\Delta}{N(k_a+k_b)+2s}$  workers move from  $a$  to  $b$ .

The number of movers is smaller the larger the importance of idiosyncratic preferences ( $s$ )

- The new marginal worker in city  $b$  has stronger preferences for city  $a$ .

The change in the relative preference for city  $a$  of the marginal worker who lives in city  $b$  is equal to

$$\frac{2s\Delta}{N(k_a+k_b)+2s}$$

- Workers in both cities experience increases in real wages

Change in real wage in  $a$ :  $\frac{k_a N}{N(k_a + k_b) + 2s} \Delta$

Change in real wage in  $b$ :  $\frac{k_b N + 2s}{N(k_a + k_b) + 2s} \Delta$

- With perfect mobility ( $s = 0$ ), the change in real wage is the same in the two cities

- Land prices in city  $b$  increase by  $\frac{k_b N}{N(k_a + k_b) + 2s} \Delta$

Land prices in city  $a$  decrease by  $-\frac{k_a N}{N(k_a + k_b) + 2s} \Delta$

## Who Benefits From the Productivity Increase?

- The benefit of the increase in productivity  $\Delta$  is split between workers and landowners.

- By construction:

$\Delta =$  change in real wage in  $a +$  change in real wage in  $b +$  change in land price in  $a +$  change in land price in  $b$

## Split Between Workers and Landowners

- Split depends on relative elasticities of labor and housing supply
- More variation in idiosyncratic preferences (larger  $s$ )  
→ workers mobility is less sensitive to wage differentials between cities → larger fraction of productivity gain to workers
- Higher elasticity of housing supply in city  $b$  relative to city  $a$  ( $k_b$  smaller than  $k_a$ ) → housing quantity adjusts more in city  $b$  → smaller fraction of productivity gain to landowners

- Special cases:

1. If idiosyncratic preferences are so important that labor is immobile ( $s = \infty$ )  $\rightarrow$  all the benefit to workers in  $b$ .

Workers in  $a$  and landowners are indifferent

2. If labor is perfectly mobile (and the elasticity of housing supply is the same in  $a$  and  $b$ )

$\rightarrow$  equal split

real wages in both cities increase by  $\frac{1}{2}\Delta$

land prices in  $b$  increase by  $\frac{1}{2}\Delta$



3. If the supply of housing in  $b$  is fixed ( $k_b = \infty$ )

→ all the benefit to landowners in  $b$ .

Workers get nothing

4. If the supply of housing in  $b$  is infinitely elastic

( $k_b = 0$ ) → All the benefit of the productivity

increase to workers

## Split Between Workers in City $a$ and Workers in City $b$

- The split between workers in city  $a$  and workers in city  $b$  also depend on the relative elasticity of labor supply.
- For a given relative elasticity of housing supply, more variation in idiosyncratic preferences (larger  $s$ )
  - lower workers mobility
  - lower local elasticity of labor supply
  - further increases the real wage in the city that receive the positive shock (city  $b$ )

## Supply Shocks

- So far, I have investigated what happens to a city following a localized shock to the demand for labor
- The same framework can be used to investigate what happens to a city following a localized shock to the supply of labor
- One way to model a localized increases in the supply of labor in city  $b$  is to increase the level of the local amenity in  $b$

## Spatial Equilibrium with Heterogenous Labor

- Consider now the case where there are two skill groups

- Tastes can vary by skill group. Skilled workers:

$$U_{Hic} = w_{Hc} - r_c + A_c + e_{Hic}$$

where  $e_{Hia} - e_{Hib} \sim U[-s_H, s_H]$

- Unskilled workers:

$$U_{Lic} = w_{Lc} - r_c + A_c + e_{Lic}$$

where  $e_{Lia} - e_{Lib} \sim U[-s_L, s_L]$

- $s_H$  and  $s_L$  represent the elasticity of local labor supply of skilled and unskilled workers

For example, it is possible that  $s_H < s_L$

## Effect of a Localized Shock to Productivity of Skilled Labor

- The productivity of skilled labor increases in city  $b$  by an amount  $\Delta$ .

- The number of skilled workers in city  $b$  increases by

$$\frac{\Delta N(kN + s_L)}{2h(kN(s_H + s_L) + s_H s_L)}$$

- The number of unskilled workers in city  $b$  declines

$$-\frac{\Delta N(kN^2 \Delta)}{2h(kN(s_H + s_L) + s_H s_L)}$$

- On net, city size increases

→ The cost of land in  $b$  increase by

$$r_{b2} - r_{b1} = \frac{s_L N k \Delta}{2h(kN(s_H + s_L) + s_H s_L)} \quad (6)$$

- The real wage of skilled workers in city  $b$  increases

by  $\frac{\Delta(2kN(s_H+s_L)+2s_Hs_L)}{2h(kN(s_H+s_L)+s_Hs_L)}$

- The real wage of the unskilled workers who stay in

in city  $b$  decreases by  $-\frac{\Delta kN s_L}{2h(kN(s_H+s_L)+s_Hs_L)}$

- The decline in the real wage of unskilled labor is small if the the elasticities of labor supply ( $s_L$  and  $s_H$ ) are large

- A large  $s_L$  implies that unskilled workers have strong idiosyncratic preferences for location

→ few move in response to the loss in real wage

With perfect mobility ( $s_L = 0$ ), no loss in real wage.

- A large  $s_H$  implies that skilled workers have low mobility

→ few move in response to the increase in their wage

→ the increase in the price of land is small

## **Bottom Line: Who Benefits From the Productivity Increase?**

- Skilled workers in both cities and landowners in city  $b$  benefit from the productivity increase.
- Unskilled workers lose.
- How much the former gain and the latter lose depends on the relative elasticities of labor supply



## Extension 1: Imperfect Substitution

- For simplicity, I have considered the case where labor market are segregated within a city
- In a more general setting, the new equilibrium also depends on the degree of imperfect substitution between skilled and unskilled labor
- The inflow of skilled workers in  $b$  makes unskilled workers in  $b$  more productive  
→ the real wage of unskilled workers does not decline as much as in the previous case
- This mitigates the negative effect for unskilled workers

## Extension 2: Firm Heterogeneity

- In the production function used here, I allow for a city-specific productivity shifter that is shared by all firms in a city
- It is easy to extend this framework to allow for an additional firm-city specific productivity shifter.  
Example: some firms may benefit more from the specific type of local infrastructure in a given city
- This would make firms less mobile, the same way that idiosyncratic preferences for location lower the elasticity of labor supply

## What Causes Productivity Differences?

- In the model, city  $b$  is more productive than city  $a$ .  
It is also has higher wages and land costs.
- So far, we have addressed two questions:
  - How can these differences persist in equilibrium?
  - Who benefits from these differences?
- We now turn to the following question: What ultimately causes productivity differences across cities?

## **Theoretical explanations for agglomeration of economic activity**

- Natural advantages
  
- Proximity to customers
  
- Agglomeration spillovers
  1. Thick labor markets
  
  2. Productivity and technology spillovers
  
  3. Human capital spillovers

## Thick Labor Markets

- In the presence of worker and firm heterogeneity, worker-firm matches are more productive in areas where there are many firms offering jobs and many workers looking for jobs
- Thick labor markets provide insurance to workers and firms against idiosyncratic shocks
  - Lower probability that a worker is unemployed due to an idiosyncratic shock to his employer
  - Lower probability that a firm can't fill a vacancy due to an idiosyncratic shock to an employee
- Both effects should be particularly important for specialized labor (for example: high tech)

- This is an area for future research

## Productivity Spillovers

- After the opening of large manufacturing plants in a county, incumbent plants experience significant increase in productivity (Greenstone, Hornbeck and Moretti, 2009)
- These productivity spillovers depends on the economic linkages between the new plant and the incumbent plant
  - Spillovers are larger for pairs of firms with high flows of workers
  - Spillovers are larger for pairs of firms with similar technologies

## **Human Capital Spillovers**

- Physical proximity with educated workers may lead to better sharing of ideas, faster innovation or faster technology adoption
- Manufacturing plants are significantly more productive in cities with higher human capital, holding constant plant own human capital (Moretti, 2004a)
- Wages are significantly higher in cities with higher human capital, holding constant worker own human capital (Moretti, 2004b)



## **Policy Implications: Equity Considerations**

- Consider an economic policy that transfer income from rich areas to poor areas
- These policies are widespread in Europe. For Example: EU regional transfers

They are less common in the US. Example: Federal Empowerment Zones.

- Glaeser and Gottlieb (2008): "The rationale for spending federal dollars to try to encourage less advantaged people to stay in economically weak places is extremely weak."

## High Mobility

- The model indicates that if labor is highly mobile, the average worker has the same level of utility in high nominal income areas and low nominal income areas  
  
→ location-based redistributive policies intended to help areas with low nominal income will have limited effect on the utility of workers
- The main beneficiaries are landowners in poor areas.

## Low Mobility

- If labor is not very mobile, then the *marginal* worker is indifferent across locations, but the *average* worker is not.  
  
→ location-based redistributive policies will affect the utility of the average worker
- The redistributive effect is complicated and unlikely to be ex-ante clear

## **Policy Implications: Equity Considerations 2**

- Workers with the same real income pay higher federal taxes in high-cost areas than in low-cost areas
- Example: wages in New York are 21% above the national average. This implies a 7% federal surtax on labor income
- \$270 billion each year are transferred from high-wage areas to low-wage areas (Albouy, 2009)

- In equilibrium, with high mobility wages and land prices will adjust to compensate workers.
- But the resulting geographic distribution of employment is inefficient: Lower employment levels and property values in high-wage cities

This reduces overall welfare.

- Solution: taxes should be independent of where workers live so that location-wise they are effectively lump sum.
- If labor mobility is low → redistribution of utility

## Policy Implications: Equity Considerations 3

- Significant increase in nominal earnings inequality starting in 1980.
- There are increasing differences in the geographical distribution of skilled and unskilled workers
- Skilled workers have increasingly concentrated in cities with high cost of land → Skilled workers have experienced higher increases in cost of living
- This geographical sorting is mostly due to relative labor demand shifts
- Earnings inequality measured in real terms has grown significantly less than inequality in nominal terms (Moretti 2009)

## **Policy Implications: Efficiency Considerations**

- Should local governments provide subsidies to firms to locate in their jurisdiction?
- Examples of location-based policies:
  - direct subsidies and/or tax incentives
  - subsidized loans
  - industrial parks
  - technology transfer programs
  - export assistance and export financing
  - provision of infrastructure
  - workforce training
  - area marketing

## **Efficiency Argument in Favor of Government Intervention**

- The main efficiency rationale depends on whether the attraction of new businesses generates some form of agglomeration externalities
- From the point of view of a locality, social benefit > private benefit
- Government intervention as a coordination mechanism
- The efficient magnitude of the incentives depends on the magnitude of agglomerations spillovers.



## Efficiency Argument Against Government Intervention

- From the aggregate point of view, it could be a zero sum game
- The jobs created in targeted areas may come at the expense of jobs elsewhere.
- Glaeser and Gottlieb (2008): the only rationale is for local agglomeration economies to be stronger on the margin in targeted areas.
- Efficient government policy requires knowledge of exact functional form of the spillover function. In practice, it is very difficult to know.

- However, in some cases this is known. Greenstone, Hornbeck and Moretti (2008) document large heterogeneity in productivity spillovers

## Who Should Pay for Location-Based Public Subsidies?

- Key question: Who benefits from the subsidies?
  - Workers
  - Landowners
- The model suggests that it depends on the elasticities of labor supply and housing supply
- If these elasticities are known, then the financing for the subsidies should come from a combination of
  - localized tax on land
  - localized tax on labor

## **Policy Implications: Conclusion**

- In a world with agglomeration spillovers, government intervention may be desirable from the point of view of a locality, although not necessarily from the aggregate point of view
- When it is desirable, localized taxes on land and labor represent a fair way to finance subsidies to firms
- The relative magnitude of these taxes should depend on the relative local elasticity of labor and housing supply