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

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

$$U_{ic} = w_c - r_c + A_c + e_{ic} \tag{1}$$

$w_c$ 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 $s$:

$$w_b = w_a + (r_b - r_a) + (A_a - A_b) - s + \left(\frac{2s}{N}\right)N_b$$  \hspace{1cm} (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

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

- The supply of housing is

\[ r_c = z + k_c N_c \] (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 $b$: \( \frac{k_a N + 2s}{N(k_a + k_b) + 2s} \Delta \)

• 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:

$$\Delta = \text{change in real wage in } a + \text{change in real wage in } b + \text{change in land price in } a + \text{change in land price in } b$$
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 \((s = \infty)\) → 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 \(b\)) → 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 ($k_b = \infty$)

$\rightarrow$ all the benefit to landowners in $b$.

Workers get nothing

4. If the supply of housing in $b$ is infinitely elastic ($k_b = 0$) $\rightarrow$ 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 $s$)
  
  $\rightarrow$ lower workers mobility

  $\rightarrow$ lower local elasticity of labor supply

  $\rightarrow$ 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:

\[ U_{Hic} = w_{He} - r_c + A_c + e_{Hic} \]

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

- Unskilled workers:

\[ U_{Lic} = w_{Le} - r_c + A_c + e_{Lic} \]

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
  \[
  \frac{\Delta N(kN+s_L)}{2h(kN(s_H+s_L)+s_Hs_L)}
  \]

- The number of unskilled workers in city \( b \) declines
  \[
  -\frac{\Delta N(kN^2\Delta)}{2h(kN(s_H+s_L)+s_Hs_L)}
  \]

- On net, city size increases

  \[
  \rightarrow \text{The cost of land in } b \text{ increase by}
  \]

  \[
  r_{b2} - r_{b1} = \frac{s_LNk\Delta}{2h(kN(s_H+s_L)+s_Hs_L)} \quad (6)
  \]
• 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 city $b$ decreases by \[-\frac{\Delta kNs_L}{2h(kN(s_H+s_L)+s_Hs_L)}\]

• The decline in the real wage of unskilled labor is small if 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 match are more productive in areas where there are many firms offering jobs and many workers looking for job.

- Thick labor markets provide insurance to workers and firm 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 depend 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 Gottleib (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

• 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