Lecture 4

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Follows Moretti (2010)

Rosen-Roback model typically assumes (among other things) the following:

- Labor is perfectly mobile
- Land is fixed
- Workers only care about nominal wages, cost of housing, and local amenities

Shocks to the demand for and supply of labor translate into housing prices.

We think that labor isn't perfectly mobile and that land isn't completely fixed. So what happens then?

Imagine two cities (among many), A and B. Each produces a good that is sold "internationally" and the price is the same everywhere. In Rosen-Roback worker i in city c has the following utility:

$$U_{ic} = w_c - r_c + A_c$$

where w is the *nominal* wage, r is the cost of housing, and A are all the nice (or bad) things in city c.

We want to limit the elasticity of labor, i.e. the ability or willingness of workers to move across cities. Any ideas?

Very simply, we can give workers preferences between cities:

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

where e gives worker i's preference for city c.

Then relative preferences between our cities A and B are given by $e_{ia} - e_{ib}$.

These preferences are distributed across all workers, so we need to specifiy this distribution:

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

What does s control?

So the model tells us that the decision to move between cities is a function of:

- Nominal wages
- Housing costs
- Amenities
- Individual preferences

Given this we know a worker will choose to live in city A iff

$$e_{ia} - e_{ib} > \underbrace{(w_b - r_b) - (w_a - r_a)}_{\text{Difference between real wage}} + \underbrace{(A_b - A_a)}_{\text{Difference in amenities}}$$

Now we can begin to discuss the labor market.

We want to determine the wages in both cities and the number of workers in both cities where $N = N_a + N_b$. The condition we want is that the *marginal* worker is indifferent between cities. So some workers will not be indifferent, i.e. they will have a preference for their own city.

The local labor supply curve is then upward sloping

$$w_b = w_a + (r_b - r_a) + (A_a - A_b) + s\frac{N_b - N_a}{N}$$

You can think of s as regulating how much the number of workers in city B changes in response to a change in the wage in city B.

We also need to specify labor demand

Assume that firms in each city use a Cobb-Douglas production function to generate output:

$$\log y_a = X_a + hN_a + (1-h)K_a$$

In a competitive economy factors are paid their marginal product so that wages in city B are given by:

$$w_c = X_c + (h-1)N_c + (1-h)K_c + \log h$$

Now we have supply of labor and demand for labor, but we are also interested in the cost of housing.

Housing demand is just a rearrangement of the labor supply equation:

$$r_b = (w_b - w_a) + r_a + (A_b - A_a) - s\frac{N_b - N_a}{N}$$

This equation gives us how the price of housing is related to the number of workers, but we need to now how the supply of housing varies with demand:

$$r_b = z + k_b N_b$$

This is not a structural equation, it is a reduced form attempt to acknowledge that the elasticity of housing supply k varies across cities.

We solve for the equilibrium in the labor market by equating labor supply and demand and in the housing market by equating housing supply and demand.

Doing that would be annoying. Instead we will analyze several extensions and experiments:

- Shock to labor demand
- Economies of agglomeration

Shock to labor demand

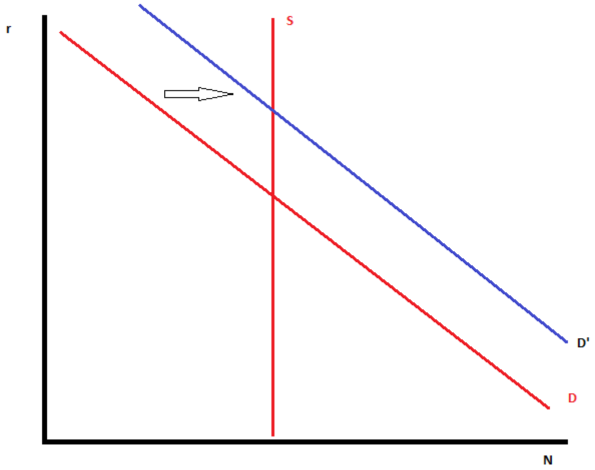
Assume that in the "next" period productivity in city b increases:

$$X_{b2} = X_{b1} + \Delta$$

Let's examine the effect under some special cases:

- $s = 0$: housing supply inelastic
- $s = \infty$: labor immobile
- $s = 0$: labor completely mobile, housing supply elastic
- $k_b = 0$: housing supply completely elastic

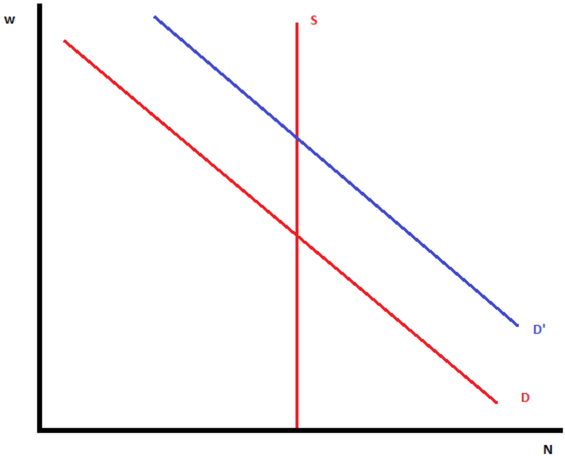
Inelastic housing supply



Inelastic housing supply

All of the increase goes to land owners (becomes absorbed in housing prices). So Rosen-Roback is a special case of this model.

Now let's examine what happens if labor is immobile ($s = \infty$).



w
S
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$s = \infty$: Labor immobile

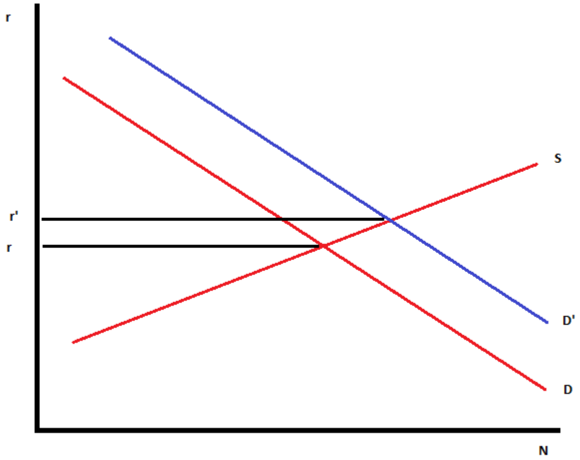
- Workers in B benefit.
- Housing prices unchanged (no one moves), so landowners see no difference.

Now let's see what happens when labor is perfectly mobile ($s = 0$) and housing supply is elastic.

Elastic Housing, Mobile labor

This case is a bit more complicated:

- Nominal wages go up in city B
- Housing prices increase in city B as workers flow in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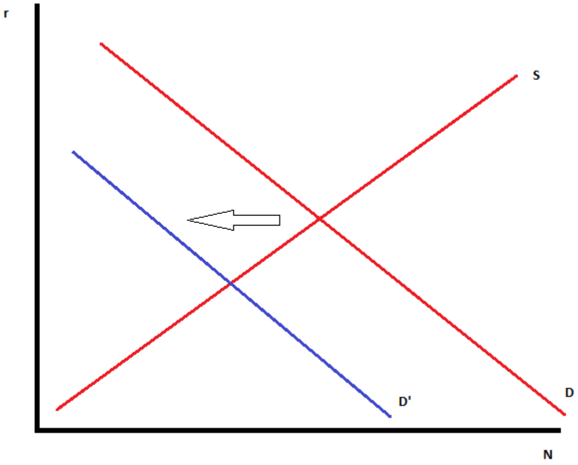
- Nominal wages go up in city B.
- Housing prices increase in city B as workers flow in to B.
- Housing prices decrease in city A as workers flow out to B.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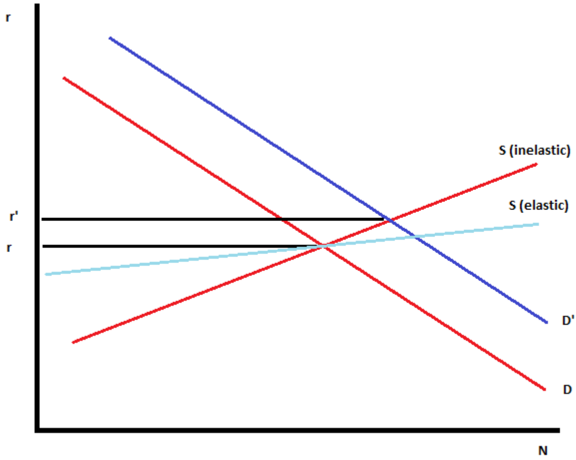
What matters is how housing prices change in B relative to A. The increase in real wages (to all workers, remember that real wages must be equal across cities) is given by

$$\Delta(\text{Real Wages}) = \frac{k_a}{k_a + k_b}\Delta$$

and the amount going to landowners in b is given by:

$$\Delta(\text{land values in b}) = \frac{k_b}{k_a + k_b}\Delta$$

If $k_a = k_b$ then real wages increase by $\Delta/2$ and housing price in B increase by $\Delta/2$. Workers win even though they are willing to move everywhere.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r'
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S (inelastic)
S (elastic)
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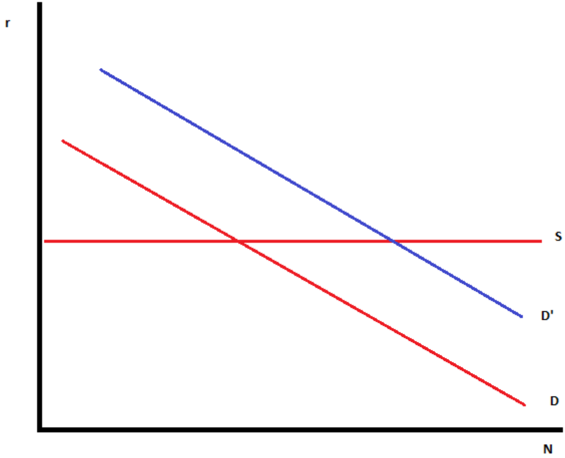
$k_b = 0$



To sum, the relative elasticities (across factors and across cities) matter in determining who wins and loses.

Policy

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Busso, Gregory, and Kline (2009) find that "Empowerment Zones" definitely benefited local landowners, but also increased local real wages. They take this as evidence that location preferences are strong enough.

Remember our production function:

$$\log y_a = X_a + hN_a + (1-h)K_a$$

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$$X_c = f(N_c)$$

where $f'(N_c) > 0$.

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Workers become more productive when there are more workers.

Agglomeration Economies

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- Thick labor markets
- Thick markets for intermediate goods
- Knowledge spillovers
- other things?

Why might productivity increase if there are lots of firms offering lots of jobs and lots of workers looking for jobs?

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- Firms can invest in special technologies
- Workers can invest in human capital

This has some empirical implications:

- Should see more turnover for young workers in dense areas
- Should see less turnover for older workers in dense areas

We tend to see these results, but evidence is not definitive.

Thick markets for intermediate goods work in a similar way:

- Special repair services (airplanes, trains, sophisticated scientific equipment)
- Financial services like capital financing, accounting
- Legal services
- Software engineering

Evidence indicates that firms located near similar firms make more intensive use of specialized inputs than similar firms located far away from other firms.

It's also possible that firms share knowledge with each other and this makes everyone better at what they do. It does seem to be the case that even controlling for firm-level human capital, firms in places with lots of educated people are more productive (Moretti 2004).

What can we say about states that try to subsidize education so as to increase state productivity?