New Economic Geography and the City

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New Economic Geography

Paul Krugman (JPE, 1991) explains the riddle of **uneven spatial development** in a 2 x 2 x 2 trade-like model that owes much to the New trade theories

- Under constant returns, firms find it profitable to disperse their production to bring it closer to customers, as this will reduce transport costs without lowering productive efficiency. Such a space-economy is the quintessence of self-sufficiency.

- If the distribution of factor endowments is uniform, the economy reduces to a Robinson Crusoe-type economy where each person produces for his or her own consumption.

- Under these circumstances, only differences in endowments of immobile production factors can explain the marked differences in the spatial distribution of activities, and hence the need for interregional and international trade.

- The main accomplishment of NEG has been to highlight how market size interacts with scale economies internal to firms and transport costs to shape the space-economy by allowing market size to be determined endogenously.

Cumulative Causality à la Myrdal

"manufactures production will tend to concentrate where there is a large market, but the market will be large where manufactures production is concentrated"

(Krugman)

- However, the difference in the economic performance of regions is, to some extent, explained by the behavior and interactions between households and firms that are located within them. Here NEG has nothing to say.

- Any sizable human settlements takes almost inevitably the shape of a **city**

→ travelling from NEG to urban economics

or,

to be more precise, NEG + UE

- Michael Storper: "urbanization is itself a form of extreme unevenness: it packs people, firms, information, and wealth into small territories."

Urban Economics

- From von Thünen (1826) to Alonso, Mills, Muth and the others in the 1960s.

- The prototype of UE is the model of the monocentric city, which assumes the existence of a Central Business District (CBD) where jobs are concentrated

Do big cities matter?

- According to Price Waterhouse Coopers, the top 30 cities account for around 18% of world GDP in 2008.
- In 2000, the 38 largest cities of the EU-15 produced 29% of its GDP.

- In the Republic of Korea, the capital region covers 11.8% of the country's surface area and includes 48.6 percent of the population, produces 47.8% of Korea's GDP in 2008.
- In Brazil, the world's fifth-largest country in surface area, 33.9% of GDP is produced by 21.6% of the population in the state of Sao Paulo, which occupies only 2.9% of the country's area.
- In France, the metropolitan area of Paris, which accounts for 2.2% of the country's area and 18.2% of its population, produces 28.3% of its GDP.

Why do we care about large cities?

"density economies"

$$\log lp = \alpha + \beta \log den + \varepsilon$$

β ranges from 3 to 11%

endogeneity → simultaneity & omitted variables

Even when we account for a large number of explanatory variables and econometric issues, density economies remain important

β is about 3%

The elasticity of wages with respect to density is largely explained by differences in workers' skill

In what follows, the focus shifts from nation-states to city-regions

A warning is in order

- Large cities need not be vibrant, whereas small ones need not be dormant
- Big need not be beautiful

How big is commuting in big cities? Well, it's pretty big.

- For example, the Parisian spends on average about one working month in commuting per year, while the commuting time spent by an adult working in Manhattan amounts to losing between three and seven weeks of work.

So we are not talking about small numbers

- I'll discuss only NEG-like models which take into account both the internal structure and industrial mix of urban agglomerations.

A tale of two cities

- 2 cities having each a CBD
- Commuting costs (**t** units of the numéraire)
- A unit population of mobile workers who display love for variety
- A differentiated good produced in the two cities
- Shipping varieties of the manufactured good is costly (τ units of the numéraire).

Manufacturing cities

Consumers

- **Preferences**

$$U = q_0 + \int_0^n q_i \mathrm{d}i - \frac{\beta}{2}\int_0^n q_i^2 \mathrm{d}i - \frac{1}{2n}\int_0^n q_i \left(\int_0^n q_j \mathrm{d}j\right)\mathrm{d}i$$

- **Budget constraint**

$$\int_0^n q_{ir} p_{ir} \mathrm{d}i + q_0 + R_r(x)/\delta + tx = w_r + \bar{q}_0$$

- **Demand**

$$q_{ir} = \frac{1}{\beta+1} - \frac{p_{ir}}{\beta} + \frac{1}{\beta(\beta+1)} \frac{1}{n} \int_0^n p_{jr} \mathrm{d}j$$

- **Urban costs in city r=A,B**

$$UC_r(x) = R_r(x)/\delta + tx$$

- **Land rent**

$$R_r^*(x) = \delta t\left(\frac{\lambda_r}{2\delta} - x\right)$$

$$UC_r = \frac{t\lambda_r}{2\delta}$$

Urban costs are the dispersion force

- population size
- commuting rate
- population density

Producers

- One input: labor
- Profits

$$\pi_r = p_{rr} q_r(p_{rr}) \lambda_r + (p_{sr} - \tau) q_s(p_{sr}) \lambda_s - \phi w_r$$

- Segmented markets

Bidding for workers

Wage

$$w_r^* = \lambda_r (p_{rr}^*)^2 + \lambda_s (p_{rs}^* - \tau)^2$$

Indirect utility

$$V_r(L_r) = CS_r + w_r^* - UC_r + q_0^*$$

Workers' mobility is driven by their utility differential

$$\Delta V(\lambda) = -\left[\frac{t}{\delta} - \frac{\Lambda(\tau)}{\phi}\right]\left(\lambda - \frac{1}{2}\right)$$

$$\Lambda(\tau) \equiv \frac{\tau[4\beta(3\beta+2)-(6\beta^2+6\beta+1)\tau]}{2\beta(2\beta+1)^2}$$

$\lambda = 1/2$ is always an equilibrium

- When commuting costs steadily decrease, there is a transition from dispersion to agglomeration
- A drop in the cost of shipping commodities fosters the spatial decentralization of jobs and production: Krugman's prediction is thus reversed

The bell-shaped curve of spatial development

- Though economic integration has initially fostered a more intensive agglomeration of economic activities, its continuation is liable to generate a redeployment of activities that could lead to a kind of geographical evening-out

The decentralization of jobs within cities

- The emergence of Secondary Business Districts (SBD) or the city becomes polycentric
- Communication costs between the CBD and the SBDs: K > 0
- The city is polycentric iff

$$K < \frac{t\phi\lambda_r}{2\delta}$$

- Job growth in California's inland counties was nearly fi ve times larger than that of coastal counties between 1990 and 2005

- Many metropolitan areas in the 21st century will expand not only through greater employment density in their core, but also by replicating the polycentric metropolitan region model.

- When both cities are polycentric

$$\Delta V(\lambda) = -\left[\frac{t}{3\delta} - \frac{\Lambda(\tau)}{\phi}\right]\left(\lambda - \frac{1}{2}\right)$$

- When only one city is polycentric

$$\Delta V(\lambda) \equiv -2\left[\frac{2t}{3\delta} - \frac{\Lambda(\tau)}{\phi}\right]\lambda + \left[\frac{t}{\delta} - \frac{\Lambda(\tau)}{\phi} - \frac{4K}{3}\right]$$

Multiplicity of stable equilibria

- **(i)** dispersion with two identical monocentric cities;
- **(ii)** agglomeration within a single monocentric city;
- **(iii)** partial agglomeration with one large polycentric city and a small monocentric city;
- **(iv)** agglomeration within a single polycentric city;
- **(v)** dispersion with two identical polycentric cities.

- Consequence: different types of spatial patterns may coexist under identical technological and economic conditions

Cities as local service-providers

The size and industrial structure of cities

- A two-sector economy: a manufacturing sector whose output can be traded at zero cost ($t = 0$) and a service sector whose output is nontradable, which differs from housing

- Labor is mobile between cities and between sectors

Preferences

$$U = \sum_{j=1,2} \left[\int_0^{n_j} q_{ij} \mathrm{d}i - \frac{\beta n_j}{2(n_1 + n_2)} \int_0^{n_j} q_{ij}^2 \mathrm{d}i \right.$$

$$\left. - \frac{1}{2(n_1 + n_2)} \int_0^{n_j} q_{ij} \left(\int_0^{n_j} q_{kj} \mathrm{d}k \right) \mathrm{d}i \right] + q_0$$

the total number n_1 of good 1-varieties is available in both cities

n_2 is the number of good 2-varieties supplied in the city where the consumer lives

Demands

$$q_{1r} = \left(\frac{1}{1+\beta} - \frac{p_1}{\beta} + \frac{\bar{p}_1}{\beta(\beta+1)} \right) \left(1 + \frac{n_{2r}}{n_1} \right)$$

$$q_{2r} = \left(\frac{1}{1+\beta} - \frac{p_{2r}}{\beta} + \frac{\bar{p}_{2r}}{\beta(\beta+1)} \right) \left(1 + \frac{n_1}{n_{2r}} \right).$$

a growing service sector impacts positively the local demand for the tradable good

A spatial-sectoral equilibrium arises when no worker has an incentive to change place and/or to switch job

The utility differential is now given by

$$V_{ir} - \bar{V} = \frac{2\delta - \phi_2 t}{\phi_2 \delta}\left(\lambda_{2r} - \frac{1}{4}\right)\lambda_s - \frac{t}{\delta}\left(\lambda_{1r} - \frac{1}{4}\right)\lambda_s$$

Asymmetric equilibrium

$$\lambda_{1A}^{*} = \frac{1}{4} + \frac{(2\delta - \phi_2 t)\sqrt{\Delta}}{4\phi_1\phi_2 t} \qquad \lambda_{2A}^{*} = \frac{1}{4} + \frac{\sqrt{\Delta}}{4\phi_1}$$

$$\Delta \equiv \phi_1^2 + 2\phi_1\phi_2 - 2\phi_1\phi_2^2 t/\delta$$

Cities differ not only in size but also in their industrial structure

The urban system involves diversified but relatively specialized cities.

$$\lambda^*_{2A} > 1/4 > \lambda^*_{2B} \qquad \lambda^*_{1A} > 1/4 > \lambda^*_{1B}$$

The urban system displays a Christaller-like hierarchy: by supplying a larger array of services, city A attracts more consumers than city B.

Though the demand for the manufactured good is higher therein, this does not attract more manufactured workers because this good is shipped at very low cost. Thus, the process of cumulative causation comes to an end.

Cities in aging nations

- The old-age dependency ratio (the ratio people aged 65 and older to people aged 15 to 64) is projected to double by 2050 within the European Union, with four persons of working age for every elderly citizen to only two. This ratio is expected to be lower in the United States, with a rise from 19 to 32%, but higher in Japan, with a rise from 25 in 2000 to 72% in 2050.

Workers' welfare depends on local services, housing costs and wages, whereas the welfare of the elderly depends upon local services/amenities and housing cost

Workers and retirees are not attracted by the same city

- Though in an aging nation the relocation of consumption services weakens the supremacy of the working-cities, these ones maintain their primacy

- As the population gets older, cities diverge in their job and demographic structures

Are compact cities ecologically desirable?

- The transport sector is a large and growing emitter of greenhouse gases (GHG). It accounts for 30% of total GHG emissions in the US and approximately 20% of GHG emissions in the EU-15

- The agglomeration of firms and people in a few large cities minimizes the emissions of GHG stemming from shipping commodities, but increases those generated by longer commuting; dispersing people and firms across numerous small cities has the opposite costs and benefits

- Agglomeration or dispersion is not by itself the most preferable pattern from the ecological point of view
- The market yields either the best or the worst ecological outcome
- More compact cities need not be ecologically desirable
- More compactness favors the concentration of jobs at the city center

The bottom line

"UE and NEG is a good combination to study the future of our economic spaces"

The main challenge

How to explain the urban hierarchy in a multi-level urban system?

Thank you for your attention

Спасибо за внимание!