Econ 580 - Lecture Notes 15

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April 28, 2009

These notes are based on Rodríguez-Clare (1996) - "The Division of Labor and Economic Development" (JDE), as captured in Appendix 2 in the paper "Positive Feedback Mechanisms in Economic Development" and (more directly) in "Multinationals, Linkages, and Economic Development" (AER, 1996).

Three key assumptions:

1. Production efficiency is enhanced by use of wider variety of specialized inputs - captured through CES and love of variety;

2. Spatial proximity between users and producers of inputs is important - captured in extreme form by assuming inputs are non-tradable;

3. Variety increases with scale of the market - captured by combination of free entry, monopolistic competition with CES preferences, and economies of scale.

Two goods: simple goods are intensive in labor and complex goods are intensive in inputs.

Backward linkages: complex goods increase demand for inputs and this leads to increased variety.

Forward linkages: increased variety leads to production of more complex inputs.

Backward and forward linkages together can generate multiple equilibria: one equilibrium has large variety, specialization in complex good, and high wages, whereas the other equilibrium has low variety, specialization in simple good, and low wages.

The Model

Two goods, z (simple) and y (complex), one factor of production in fixed and inelastic supply, L, continuum of intermediate goods indexed by j,

$$\begin{aligned} Q_s &= L_s^{\beta(s)} X_s^{1-\beta(s)} \\ X_s &= \left(\int_0^n x(j;s)^\rho \right)^{1/\rho} \end{aligned}$$

with $\beta(z) > \beta(y)$ and $\rho \in]0,1[$.

$x(j)$ is produced one-for-one from labor and a fixed cost of one units of labor, so that

$$x(j) = L(j) - 1$$

There is stronger love of variety in y than in z. Let $\phi(s) \equiv (1-\beta(s))(1-\rho)/\rho$ and $L_{xs} = x(s)n$ then

$$Q_s = n^{\phi(s)} L_s^{\beta(s)} L_{xs}^{1-\beta(s)}$$

Letting P_x denote the price index for X, the unit cost of good s is

$$c_s = \delta(s) w^{\beta(s)} P_x^{1-\beta(s)}$$

But we know that letting $\sigma \equiv 1/(1-\rho)$ then $P_x^{1-\sigma} = \int_0^n p_x(j)^{1-\sigma} dj$ and since $p_x(j) = w/\rho$ then this implies that

$$P_x = n^{1/(1-\sigma)} w/\rho$$

Plugging this above we see that

$$c_s = \delta'(s) n^{(1-\beta(s))/(1-\sigma)} w = \delta'(s) n^{-\phi(s)} w$$

where $\phi(s) \equiv (1-\beta(s))/(1-\sigma)$. This implies that

$$c_z/c_y = \lambda(n) \equiv A n^{\phi(y)-\phi(z)}$$

Since this is a small economy, $p \equiv P_z/P_y$ is exogenous.

Moreover, the PPF is linear. So we have complete specialization in z if $p > \lambda(n)$, complete specialization in y if $p < \lambda(n)$ and anything if $p = \lambda(n)$.

Since $\lambda(n)$ is increasing, there is a level of n^* defined by $p = \lambda(n^*)$ such that if $n < n^*$ then there is CS in z, whereas if $n > n^*$ then there is CS in y.

To complete the characterization of equilibrium we need to consider the zero profit condition to endogeneize n.

Let's derive the equilibrium level of n when there is complete specialization in s, $n(s)$. Given a fixed cost of w, an input supplier selling quantity x earns profits

$$\left(\frac{1}{\rho}-1\right)wx - w = w\left[\frac{x}{\sigma-1}-1\right]$$

The zero profit condition is then

$$x = (\sigma - 1) \equiv \theta$$

It is straightforward to show that if there is CS in s then the quantity sold by each input supplier is

$$\rho m(s)L_s(n)/n$$

where $L_s(n)$ is the total quantity of labor hired by firms producing final good s given n and

$$m(s) \equiv \frac{\beta(s)}{1-\beta(s)}$$

Proof: since $Q_s = L_s^{\beta(s)} X_s^{1-\beta(s)}$ then

$$\frac{L_s}{X_s} = \frac{\beta(s)}{1-\beta(s)} \frac{P_x}{w} = m(s) \frac{n^{1/(1-\sigma)}}{\rho}$$

Since $X_s = (\int_0^n x(j;s)^\rho)^{1/\rho} = n^{\sigma/(\sigma-1)} x_s$ then

$$\begin{aligned} \frac{x_s}{L_s} &= \frac{X_s}{L_s} \frac{x_s}{X_s} = \rho m(s) n^{1/(\sigma-1)} n^{-\sigma/(\sigma-1)} \\ &= \rho m(s)/n \end{aligned}$$

The full employment condition is

$$\begin{aligned}\rho m(s)L_s + L_s + n &= L \\ \implies L_s(n) &= \frac{L-n}{1+\rho m(s)}\end{aligned}$$

We know have that the total quantity sold by each input supplier under CS in s is

$$x_s(n) = \frac{\rho m(s)}{1+\rho m(s)}\,(L/n - 1)$$

If $n^* \in [n(z), n(y)]$ then there is multiple equilibria.

How do we know that the wage is higher in the y-equilibrium than in the z-equilibrium?

Multiple Pareto-ranked equilibria.

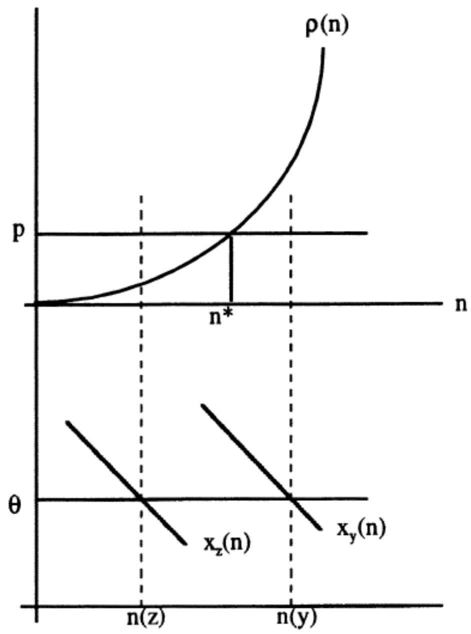

FIGURE 1. DETERMINATION OF EQUILIBRIUM LEVELS OF n FOR THE CASE IN WHICH $n(z) < n^* < n(y)$

Incentives to become a multinational: get inputs from rich country and labor in the poor country, but producing the complex good there.

Two opposite effects: since $m(y) > m(z)$ then higher demand for intermediate goods per unit of labor, but a share of these inputs will be bought in the multinational's home country.

The multinational's linkage effect could be higher or lower than that of domestic firms. If it is lower, then negative linkage (or enclave) effect, other wise positive effect and could even help the economy out of the bad equilibrium.

Key variables: "communications cost" between home and host country, "complexity" of multinational's production process, and similarity between home and host country.

In Alfaro and Rodríguez-Clare (2004, Economia) we show that foreign firms have a higher linkage coefficient than domestic firms, hence the model would imply a positive linkage effect.

Implication: backward linkages and horizontal externalities. Evidence is weak for horizontal externalities.

One possibility is Carluccio and Fally's "Multinationals, Technological Incompatibilities and Spillovers."