THE "CORE-PERIPHERY" MODEL OF THE NEW ECONOMIC GEOGRAPHY

Economics of European Integration, Marius Brülhart

1 Basic setup

- 2 regions/countries: 1, 2
- 2 sectors: M, F ("manufacturing", "farming")
- M: monopolistically competitive (horizontally differentiated products: "varieties")
- F: perfectly competitive (homogenous product)
- M: iceberg trade costs: for $T > 1$ units of the good shipped, 1 unit arrives
- F: freely traded
- 2 sector-specific production factors: L_M , L_F
  - $L = L_M + L_F = L_{M1} + L_{M2} + L_{F1} + L_{F2}$
  - $\frac{L_M}{L} = \gamma$
  - $\frac{L_{M1}}{L_M} = \lambda_1$, $\frac{L_{M2}}{L_M} = \lambda_2$
  - $\frac{L_{F1}}{L_F} = \phi_1$, $\frac{L_{F2}}{L_F} = \phi_2$
- L_M mobile across regions $\Longrightarrow \lambda_1, \lambda_2$ endogenous (main variable of interest!)
- L_F immobile across regions $\Longrightarrow \phi_1, \phi_2$ exogenous
- F assumed as numéraire sector: price per unit = wage rate = 1

2 Demand

Utility of the representative consumer:

$$U = F^{1-\delta} M^{\delta}, 0 < \delta < 1,$$

$$M = \left(\sum_{i=1}^{N} c_i^{\rho} \right)^{\frac{1}{\rho}}, 0 < \rho < 1, \tag{1}$$

where c represents the quantity consumed and $i \in \{1, ..., N\}$ denotes varieties of the differentiated good M.

Hence, with symmetric varieties/firms, there are external benefits to the size of the M sector:

$$M = (Nc^{\rho})^{\frac{1}{\rho}} = N^{\frac{1}{\rho}} c = N^{\frac{1}{\rho}-1}(Nc),$$

i.e. utility M increases faster than the claims on real resources from expansion of the sector, Nc (as $N^{\frac{1}{\rho}-1} > 1$).

The representative consumer's budget constraint for M:

$$\sum_{i=1}^{N} p_i c_i = \delta Y. \tag{2}$$

Demand for variety j by a representative consumer (maximise eq.(1) s.t. eq.(2), see Brakman *et al.*, 2001, pp. 70f.):

$$c_j = p_j^{-\epsilon}(I^{\epsilon-1}\delta Y),$$

where:

$$I \equiv \left(\sum_{i=1}^{N} p_i^{1-\epsilon} \right)^{\frac{1}{1-\varepsilon}}; \; M = \frac{\delta Y}{I}; \; \epsilon = \frac{1}{1-\rho} > 1.$$

Real wage:

$$w = \frac{W}{I^{\delta}},$$

where W is the "nominal" wage, in terms of F.

3 Supply

Production function for F:

$$F = (1-\gamma)L.$$

Firms' production function in the M sector:

$$L_{Mi} = \alpha + \beta x_i.$$

Firms' profit function in the M sector:

$$\pi_i = p_i x_i - W(\alpha + \beta x_i).$$

Constant price-elasticity of demand $\epsilon \Longrightarrow$ mark-up pricing (MR=MC):

$$p\left(1 - \frac{1}{\epsilon}\right) = \beta W, \text{ or } p = \beta \frac{W}{\rho}.$$

Free entry $\Longrightarrow$ zero-profits $\Longrightarrow$

- firm scale:
$$x = \frac{\alpha\,(\epsilon - 1)}{\beta},$$
- per-firm labour requirement:
$$l = \alpha\epsilon,$$
- no. of varieties i :
$$N = \frac{\gamma L}{l} = \frac{\gamma L}{\alpha\epsilon}.$$

4 Equilibrium

Six equilibrium equations, six endogenous variables:

- Incomes:
$$Y_1 = \lambda_1 W_1 \gamma L + \phi_1 (1-\gamma) L$$
$$Y_2 = \lambda_2 W_2 \gamma L + \phi_2 (1-\gamma) L$$

- Price indices:
$$I_1 = \left(\frac{\beta}{\rho}\right)\left(\frac{\gamma L}{\alpha\epsilon}\right)^{\frac{1}{1-\epsilon}} \left(\lambda_1 W_1^{1-\epsilon} + \lambda_2 T^{1-\epsilon} W_2^{1-\epsilon}\right)^{\frac{1}{1-\epsilon}}$$
$$I_2 = \left(\frac{\beta}{\rho}\right)\left(\frac{\gamma L}{\alpha\epsilon}\right)^{\frac{1}{1-\epsilon}} \left(\lambda_2 W_2^{1-\epsilon} + \lambda_1 T^{1-\epsilon} W_1^{1-\epsilon}\right)^{\frac{1}{1-\epsilon}}$$

- Wages:
$$W_1 = \rho\beta^{-\rho}\left(\frac{\delta}{(\epsilon-1)\alpha}\right)^{\frac{1}{\epsilon}} \left(Y_1 I_1^{\epsilon-1} + Y_2 T^{1-\epsilon} I_2^{\epsilon-1}\right)^{\frac{1}{\epsilon}}$$
$$W_2 = \rho\beta^{-\rho}\left(\frac{\delta}{(\epsilon-1)\alpha}\right)^{\frac{1}{\epsilon}} \left(Y_2 I_2^{\epsilon-1} + Y_1 T^{1-\epsilon} I_1^{\epsilon-1}\right)^{\frac{1}{\epsilon}}$$

  endogenous variables: Y_1, Y_2, I_1, I_2, W_1, W_2
  exogenous variables: L, α, β, γ, δ, ϕ, ρ, ϵ, T
  short-run exogenous, long-run endogenous: λ_1, λ_2

  $\rightarrow$ highly non-linear system $\Longrightarrow$ use simulations

Long-run equilibrium:

- $w_1 = w_2$ ("interior solution", symmetric equilibrium if regions 1 and 2 are identical),or
- $\lambda_1 = 1$, $w_1 \geq w_2$ (full agglomeration in region 1, "core-periphery outcome"), or
- $\lambda_2 = 1$, $w_1 \leq w_2$ (full agglomeration in region 2, "core-periphery outcome").
- Law of motion: $\Delta\lambda_1 = -\Delta\lambda_2 = \eta\left(\frac{w_1}{w_2}\right) > 0$, where η represents the "speed of adjustment"