

THE “CORE-PERIPHERY” MODEL OF THE NEW ECONOMIC GEOGRAPHY

Economics of European Integration, Marius Brühlhart

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 $\implies \lambda_1, \lambda_2$ endogenous (main variable of interest!)
- L_F immobile across regions $\implies \phi_1, \phi_2$ exogenous
- F assumed as numéraire sector: price per unit = wage rate = 1

2 Demand

Utility of the representative consumer:

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

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

where c represents the quantity consumed and $i \in \{1, \dots, N\}$ 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 :

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

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:

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

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 $\epsilon \implies$ mark-up pricing (MR=MC):

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

Free entry \implies zero-profits \implies

- 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:

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

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

- Wages:

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

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

endogenous variables: $Y_1, Y_2, I_1, I_2, W_1, W_2$

exogenous variables: $L, \alpha, \beta, \gamma, \delta, \phi, \rho, \epsilon, T$

short-run exogenous, long-run endogenous: λ_1, λ_2

→ highly non-linear system \implies 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”