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: $L_M$, $L_F$
  \[
  \begin{align*}
  L &= L_M + L_F = L_{M1} + L_{M2} + L_{F1} + L_{F2} \\
  \frac{L_M}{L} &= \gamma \\
  \frac{L_M}{L_M} &= \lambda_1, \quad \frac{L_M}{L_M} &= \lambda_2 \\
  \frac{L_F}{L_F} &= \phi_1, \quad \frac{L_F}{L_F} &= \phi_2 \\
  \end{align*}
  \]
- $L_M$ 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:

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

\[ M = \left( \sum_{i=1}^{N} c_i^\rho \right)^\frac{1}{\rho}, 0 < \rho < 1, \]  \hspace{1cm} (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 \( M \):

\[ \sum_{i=1}^{N} p_i c_i = \delta Y. \]  \hspace{1cm} (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:

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

Real wage:

\[ w = \frac{W}{I^\rho}, \]

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

- Wages:
  \[ W_1 = \rho \beta^{-\rho} \left( \frac{\delta}{(\epsilon - 1)\alpha} \right)^{\frac{1}{2}} (Y_1 I_1^{-1} + Y_2 T^{1-\epsilon} I_2^{-1})^{\frac{1}{2}} \]
  \[ W_2 = \rho \beta^{-\rho} \left( \frac{\delta}{(\epsilon - 1)\alpha} \right)^{\frac{1}{2}} (Y_2 I_2^{-1} + Y_1 T^{1-\epsilon} I_1^{-1})^{\frac{1}{2}} \]

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: \( \lambda_1, \lambda_2 \)

\[ \rightarrow \text{highly non-linear system} \implies \text{use simulations} \]

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 \( \eta \) represents the “speed of adjustment”