The long-term impact of trade in an asymmetric world

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Outline

- Motivation
- Related literature
- The model
- Results
- What's next?

1 Motivation

The conventional wisdom among trade specialists is that trade is welfare increasing.

This view has strong theoretical support. Most of the models supporting the idea show the static effects of trade, i.e. instant allocation of resources.

Even when considering the dynamic effects, terms of trade end up balancing the purchasing power of consumers $\Rightarrow$ the type of specialization doesn't matter.

Some works have shown that assuming non-homothetic preferences can change the picture (e.g. Matsuyama, 2000). Others even argue that non-homothetic preferences are closer to empirical evidence (e.g. Blundell, Browning and Crawford, 2003). But these functions are still rarely seen in economic growth theory.

In this model it is also possible to have divergent development and welfare between countries even with Cobb-Douglas preferences if differentiated products are introduced $\Rightarrow$ type of specialization matters.

2 Related literature

Empirical contributions: Sachs and Warner (1995 and 2001), Hausmann, Hwang and Rodrik (2007), Hausmann and Hidalgo (2011).

Many papers have evaluated growth in a Melitz-like setting: Baldwin and Robert-Nicoud (2008), Gustafsson and Segerstorm (2010) or Dinopoulos and Unel (2011). But these papers are not able to capture divergent development between countries as they all assume country symmetry.

Asymmetric static models: Demidova (2008), Bernard, Redding and Schott (2011) and Falvey, Greenaway and Yu (2011).

3 The model

- 3 Sectors
  - R&D sector
  - 2 final good sectors: one homogeneous good in a competitive market (C) and a differentiated good under monopolistic competition (M).
- 2 countries that differ in size (L) and technology ($G(.)$)

3.1 Consumers

- L_i inelastically supplying one unit of work at each t
- At each period they derive utility from: $u_i = Q_{M,i}^{\mu} Q_{C,i}^{1-\mu}$
- Welfare is defined as: $U_0 = \int_0^{\infty} e^{-\rho t} u_i(t) \mathrm{d}t$

- Assuming incomplete specialization $w = 1$.
- Income in country i at t is $Y_i(t) = L_i + \Pi_i(t)$.
- 2 strategic decisions solved backwards:
  - Static: consumers spend a fraction μ of their income in good M at every t.
  - Dynamic: they follow an Euler rule as $\frac{\dot{E}(t)}{E(t)} = \iota(t) - \rho$.

Demand conditions for the M-sector:

- $Q_M(t) = \left[\int_{\omega \in O(t)} q(\omega, t)^{1-1/\sigma} \mathrm{d}\omega\right]^{1/(1-1/\sigma)}$

- $P_M(t) = \left[\int_{\omega \in O(t)} p(\omega, t)^{1-\sigma} \mathrm{d}\omega\right]^{1/(1-\sigma)}$

- $e(\omega, t) = E_M(t) \left[\frac{p(\omega,t)}{P_M(t)}\right]^{1-\sigma}$

3.2 C-sector

Perfectly competitive sector with no trade costs and no country asymmetry.

- Production: $Q_C = L_C$ (i.e. technology is not country specific).

- $\phi_C = \tau_C^{1-\sigma} = 1$.

- Firms in this sector make zero profits.

3.3 M-sector

Firms produce differentiated goods under monopolistic competition (Dixit-Stiglitz) and stages follow Melitz (2003).

- $0 < \phi_M \leq 1$
- Firms pay fixed costs in terms of units of knowledge:
  - f_I to buy a blueprint and find out their productivity $1/a$
  - f_D to produce for the domestic market
  - f_X to export their production
- At country i, $f_{v,i} = \kappa_v.P_{K,i}$ for $v = I, D, X$.

Due to monopolistic competition:

- Pricing rule: $p(m,t) = \frac{m}{1-1/\sigma}$

- Operating profits: $\pi_i(m,t) = \frac{s_i(m,t)E_{M,i}(t)}{\sigma}$

- Aggregate operating profits in market i: $\Pi_i(t) = \frac{E_{M,i}(t)}{\sigma}$

Shares are defined as:

$$s_i(m,t) = \left[\frac{m}{\bar{m}_i}\right]^{1-\sigma}$$

with

$$\bar{m}_i^{1-\sigma} = n_i \hat{m}_i^{1-\sigma} + n_j \tilde{m}_i^{1-\sigma}$$

and

$$\begin{aligned} \hat{m}_i^{1-\sigma} &= w_i^{1-\sigma} \textstyle\int_0^{a_{D,i}} a^{1-\sigma} \mathrm{d}G_i(a|a_{D,i}) \\ \tilde{m}_i^{1-\sigma} &= \phi w_j^{1-\sigma} \textstyle\int_0^{a_{X,j}} a^{1-\sigma} \mathrm{d}G_j(a|a_{D,j}) \end{aligned}$$

3.4 R&D sector

Perfectly competitive sector producing only for the domestic market.

- Production: $Q_K(t) = \frac{L_K(t)}{P_K(t)}$.
- Firms in this sector make zero profits.

$P_{K,i}(t) = c_i[\overrightarrow{a_i}, n_i]$ and allows the introduction of many different engines of endogenous growth, i.e.:

$$c_i[\overrightarrow{a_i}, n_i] = \frac{w_i}{n_i + \lambda n_j} \qquad or \qquad c_i[\overrightarrow{a_i}, n_i] = \left[\frac{n_i^{1/1-\sigma}\bar{m}_i}{1 - 1/\sigma}\right]^{\sigma-1}$$

3.5 Country asymmetries

- $L_i \neq L_j$ and $\delta_i \neq \delta_j$

- More importantly: $G_N(a) \succ_{hr} G_S(a)$

where $\succ_{hr}$ defines hazard rate order domination, i.e. for any given a firms from i have a better chance of obtaining a lower cost level in their draw.

3.6 Static-equilibrium

Main assumptions

- At eq. only firms producing in the domestic market can export (f_X is large enough).
- At eq. there is no full specialization (the technological difference is not large enough to cause full specialization).

Cut-off conditions

$$\frac{s_i(m_{D,i},t)E_{M,i}}{\sigma\gamma_i} = P_{K,i}\kappa_D \quad ; \quad \frac{s_i(m_{X,j},t)E_{M,i}}{\sigma\gamma_j} = P_{K,j}\kappa_X$$

Free-entry conditions

$$\frac{d_i E_{M,i} + x_i E_{M,j}}{\sigma \gamma_i} = p_{K,i} \bar{\kappa}_i$$

where d_i is the aggregate share of market i served by domestic firms, x_i is the aggregate share of the same market owned by foreign firms and $\bar{F}_i$ is the expected fixed cost that a firm from country i would face which can be defined as

$$\bar{F}_i = P_{K,i} \bar{\kappa}_i$$

with

$$\bar{\kappa}_i = [\kappa_D G_i(a_D) + \kappa_X G_i(a_X) + \kappa_I]/G_i(a_D)$$

3.7 Consumption and growth

Growth in this model is defined as:

$$\dot{n} = \frac{Q_K}{\bar{\kappa}}$$

As opposed to the symmetric country model:

$$E_{M,i} = \frac{\sigma L_{M,i} + x_i E_{M,j}}{\sigma - d_i}$$

3.8 Balanced growth path

The Balanced Growth Path in this model is characterized by a fixed allocation of labour among sectors (i.e. constant $L_{K,i}$ and $L_{M,i}$), constant cut-off thresholds $a_{D,i}$ and $a_{X,i}$ and aggregate shares d_i and x_i, and all endogenous variables (i.e. n_i, E_i and P_i) growing at a constant rate $\forall i = N, S$.

Assumption: firms extract productivities from a Pareto distribution $\Rightarrow$ $G_i(a) = \left(\frac{a}{a_m}\right)^{\alpha_i}$

Main implications:

- $g_{E_{M,i}} = g_{E_{M,j}} = 0$
- $g_i + \delta_i = g_j + \delta_j$
- There is a crossed-relationship between country's thresholds:

$$\frac{a_{X,j}}{a_{D,i}} = \left(\frac{\phi P_i}{T}\right)^{\frac{1}{\sigma-1}}$$

  where $P_i = \frac{P_{K,i}}{P_{K,j}}$ and $T = \frac{\kappa_X}{\kappa_D}$

- $a_{X,S} < a_{X,N} < a_{D,N} < a_{D,S}$
- Terms of trade are constant.

4 Growth results

$$g_i = \left[\frac{1 + \Omega_i P_i^{\frac{-\alpha_i}{\sigma-1}}}{1 + A_j \Omega_j P_j^{1-\frac{\alpha_j}{\sigma-1}}} \right] \frac{E_i}{\sigma P_{K,i} \bar{\kappa}_i} - \rho - \delta_i$$

where $A_i = \frac{n_i \alpha_i (\alpha_j - \sigma + 1)}{n_j \alpha_j (\alpha_i - \sigma + 1)}$ and $\Omega_i = \phi^{\frac{\alpha_i}{1-\sigma}} T^{1-\frac{\alpha_i}{1-\sigma}}$.

Main conclusions

- Growth rate in i depends positively on its level of openness and negatively on openness of j.
- It depends negatively on the cost of knowledge in i and positively on that in j.

5 What's next?

- Introduce different endogenous growth mechanisms.
- Perform welfare analysis.
- Contrast main conclusions with data.
- Explore full-specialization in this context.
- Endogenize exit rates (δ's)?