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International Cooperation and Intra-industrial Transactions

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This paper examines the determinant factors of U.S. multinational corportaions' Foreign Direct Investment (FDI) and exports, and the dymamic interdependence between the two variables, in case of South Korean's electronics. To this end, the author has developed a series of predictive models for the possible interdependence between FDI and exports and two of them are chosen for the application. The relevant U.S.−Korean data are then applied to these models, and a graphic approach is used to compare the predicted trends (by models) with actual patterns of FDI and exports. Reasons for deviations are then explained.

I. Introduction

Casual observation of the international exchange of goods discloses the empirical reality that the import and export commodity structures among industrialized nations are becoming increasingly similar.[1] Important export branches of individual countries are simultaneously signficant import branches. The phenomenon of an increased intra-industrial exchange of goods is founded on the supply side of international markets through product differentiation as well as on the demand side of these markets through consumer wishes for product diversity, in contrast to traditional comparative advantage trade theories.[2] The origin of an increasing international intra-industrial exchange of goods among industiral countries evolves largely out of their similar levels of development as inherent in their standards of living.[3]

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1. see Balassa (1986).

2. see e.g. Broll and Gilroy (1986) concerning the traditional approach applied to higher dimensional anaysis.

3. Compare e.g. Greenaway (1983); Siebert (1985).

The political economical implications of intra-industrial commodity trade flows are far-reaching. The rising intensity of international trade flows—given that imports may rise quicker than exports—should not be judged alone simply from the perspective of international market segment distributions of egoistic countries. Intra-industrial trade rather express an intensive specialization effect within the various branches of the economy combined with an increasing expansion of the differentiated product sortiments of multinational firms.[4]

The approach focalized here allows one to examine theoretically the empircial observation of increasing levels of intra-industrial trade flows. The relationship between intra-industrial trade and consumer preferences in addition to product differentiation advanced by internationally active firms are discussed within the framework of a simple model of international trade in differentiated goods. It is demonstrated that in an international free trade scenario ranking high in product differentiation and monopolistic market structures the intensity of international trade activites steadily rises as the structure of consumer preferences exhibits demand pattern similarity; export and import levels rise simultaneously.

II. A Simple Trade Model With Differentiated Products

For simplicity, assume that the economy of a nation consists of two commodity producing sectors.[5] The agrarian sector Y produces a homoogeneous good, food, whereas the manufacturing sector X is the supplier of differentiated goods to prices $p_1,...,p_N$. Each consumer possesses a preference for some ideal differentiated good in the sense that individuals regard themselves to be beter off when they can consume a differentiated good which exactly fits their view of the ideal design for that class of products than when they do not. An individual thus decides to purchase one unit of his ideal good, given that it is available ;if the market price of the good does not exceed the consumer's subjective reservation price (β), he is willing to pay for one unit, If the market price of a consumer's ideal variety happens to be greater than β no transaction occurs.[6] The product space is such that there exists a one-to-one correspondence between the

4. see Helpman (1984), Broll and Gilroy (1985a), (1985b).

5. see Economides (1984).

6. The consumer's (indirect) utility function (when he consumes the variety x_j) $u(\cdot)=y-p_j+[\beta+(\alpha-x_j)^2]$; y is income and α is the ideal product; the part $[\cdot]$ of the utility function has a single peak at $\alpha=x_j$.

continuum of varieties and a circumference of a circle with radius $1/2\pi$.

Consumers are respectively distributed along the product circle with regard to their most-preferred specification of brand. The domestic population density, according to the peaks of the utility function, is ψ, the foreign being ψ^*. The market demand function facing a firm j is then simply the sum of demand over the firm specific market width interval [z, $\bar{z}$]. The relevant demand function Dj (·) of a firm j producing a differntiated product x_j is thus.

$$D_j(\cdot)=[\underline{z}-\bar{z}]\cdot\psi\cdot{}^{7} \tag{1}$$

Differentiated products are produced under a non-convex technology. Dual to the production function of firm j the cost function $C(D_j)=F+cD_j$ may be derived, exhibiting constant marginal costs c. It is assumed that such a smiliar cost function is applicable to all firms in the manufacturing sector. The firm's goal is to maximize its profit function π_j:

$$max\ \pi_j(\cdot)=p_j\cdot D_j-F-c\cdot D_j \tag{2}$$

The profit function of a firm j is concave; that is for given product varieties $(x_1,...,x_n)$ there exists an optimal price $\tilde{p}_j$, as long as neighboring firms $(j-1\,;\,j+1)$ have positive market shares. It can be shown that there exists a non-cooperative Nash-equilibrium (compare Friedman [1977]). In such an international symmetrical trade equilibrium all firms are equispaced and the profit maximizing price is derived as $\tilde{P}_j=c+1/(n+n^*)$: with $1/(n+n^*)$ representing the well-known Herfindahl-Hirschman-Index of supplier concentration.

The integrated market consists of $(n+n^*)$ firms which supply exactly $(n+n^*)$ product varieties, since it would not not be profitable enough for a firm to offer the same variety which already is available in the market. In the following section the individual and aggregate export functions will be derived.

III. Export Activity and Demand Pattern Similarity

The export activity of a domestic firm j is defined through its foreign demand

7. $\bar{z}(\underline{z})$ are the marginal consumers of the firm j; we have

$\bar{z}=[\frac{\bar{p}-p_j}{\bar{x}-x_j}+\bar{x}+x_j]/2$ and $\underline{z}=[\frac{p_j-\underline{p}}{x_j-\underline{x}}+x_j+\underline{x}]/2$

within the interval $[\underline{z}, \bar{z}]$. A representative export supply function for an indiviual firm j is derived as:

$$EX_j=[\bar{z}-\underline{z}]\cdot\psi^*/2=\frac{\psi^*}{2}\cdot\left[x-\underline{x}+\frac{\bar{p}-p_j}{\bar{x}-x_j}-\frac{p_j-\underline{p}}{x_j-\underline{x}}\right] \tag{3}$$

in which $\bar{x}$ and $\underline{x}$ designate the neighboring firms varieties and $\bar{p}$, $\underline{p}$ the respective prices of these brands. Evaluated for a symmetrical aggregate trade equilibrium for n domestic firms it follows:[8]

$$EX=n\cdot EX_j=\frac{n\psi^*}{(n+n^*)} \tag{4}$$

Accordingly, the foreign aggregate export function is derived as,

$$EX^*=\frac{n^*\psi}{(n+n^*)} \tag{5}$$

It is now possible to analyze the export supply functions of an economy, given that certain presumptions are made with regard to the distribution of consumer preferences along the product circle. Our objective is to demonstrate that similarity in demand preference structures generates higher volumes of trade. To demonstrate this effect we apply the Edgeworth-Box instrument in which world factor allocations (labour and capital) are plotted.[9]

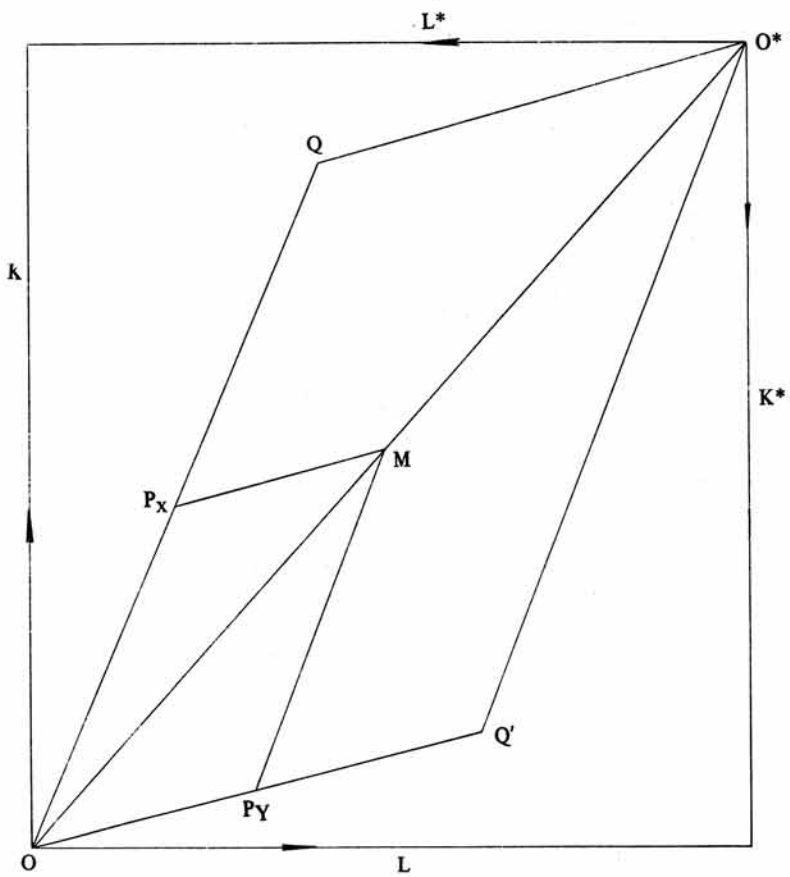
Both economies possess the production factors capital and labour (K, L). According to the assumption that the technology for both sectors is identical in both countries, the relative and absolute allocations are also equivalent, i.e. the world may be characterized by the factor allocation point M in Figure 1.

With regard to Fig. 1, both countries are identical in all respects with exception of distribution of preferences for varieties of differentiated products. This has direct implication for the international pattern of trade: factor markets are characterized by factor price equalization; the international distribution of income is identical ($GDP=GDP^*$); no intersectoral trade occurs; and the international exchange of goods is limited to transaction

8. Symmetry in location we have $(\bar{x}-\underline{x})=\frac{2}{(n+n^*)}$ and $p_j=p=\underline{p}=p$ for all j.

9. For a detailed application of the factor allocation box in models of international trade theory see Dixit and Norman (1980) and more recently Helpman and Krugman (1985).

Figure 1 : The Factor Allocation Box and Factor Price Equalization Set OQO^*Q'



in differentiated products between the sectors X and X^*.[10]

For example, applying the following specific forms of the distribution functions for ideal product varieties (see Economides [1984]) :

$$g(\alpha)=X+a\cdot\cos(2\pi n\alpha) \tag{6}$$
$$g^*(\alpha)=X+a\cdot\cos(2\pi n\alpha+\pi)$$

The foreign distribution for ideal products differs only in the cosine term. The cosine

10. The line segment $\overline{OP}_X$ in Fig.1 represents the domestic capacity of differentiated goods $x=nx$; foreign capacity of differentiated goods is equal to $\overline{X}=n^*x$, graphically the line segment $\overline{P_XQ}$.

terms possess a phase difference of π, so that peaks of $g(\alpha)$ coincide with the troughs of $g^*(\alpha)$ and conversely.

The export supply functions may now be examined with the aid of these distribution function. It follows for the domestic export function i.e. that.

$$EX=\frac{n}{(n+n^*)}[\bar{X}+a\cdot\cos(2\pi n^*\alpha+\pi)] \tag{7}$$

and for the foreign export supply function that

$$EX^*=\frac{n^*}{(n+n^*)}[\bar{X}+a\cdot\cos(2\pi n\alpha)] \tag{8}$$

What reaction occurs concerning the volume of trade as represented by the sum of export for both countries increasing or decreasing divergences regarding the distribution of consumer preferences?

The Linder-Hypothesis, in attempting to answer the question, postulates that economies of scale are an important catalyst combined with the preference similarity view of trade in differentiated goods. Linder (1961) argues that initially industries expand to satisfy domestic consumer demand, and export once the home market is large enough to permit the industry to achieve economies of scale and competitive unit costs.[11] Since the products were orginally intended for the preferences and income levels of the domestic market, exports will flow to countries with a similar demand pattern as intrinsic to their standard of living. Increasing equivalence of international consumer preferences generates a higher volume of international trade.

In the present framework the voulme of trade (T) is defined as:

$$T=EX+EX^*=\bar{X}-\frac{a\cdot(n^2+n^{*2})}{(n+n^*)} \tag{9}$$

whereas the parameter 'a' may be interpreted as the degree of preference similarity. Valuing the volume of trade at its equilibrium level for identical preference structures of countries i.e. $a\rightarrow o$, the volume of trade will be maximal. Differences in consumer's preferences lead to lower volume of trade.

11. Compare i.e. Hood and Young (1979), p.141. The Linder approach is similar to that adopted in export base theories of growth. See further the interesting applied Linder/Hurfbauer Approach article of Kellman/Cahn/and Glass(1986) in this journal.

Similarity in international demand patterns on the other hand elicits a trade expansion in which the volume of exports and imports simultaneously grow. This effect is an important characteristic of the rising levels of intra-industrial trade flows (compare Broll/Gilroy [1985a]).

IV. Summary

It has been demonstrated in an international trade model with differentiated products and non-convex technologies that international demand pattern similarity as expressed through consumer preferences is an important aspect in explaining the increasing empirical intensity of international intra-industry trade flows. As may be observed from the export-equations above, the degree of international demand pattern similarity is expressed in the parameter 'a' and the phase difference π. Both parameters lead to the same result, namely similarity in comsumer preference structures between countries induces higher trade volumes, which increase the levels of international cooperation among nations. Polachek(1980) has empirically observed for example that there exists a strong negatively correlated relationship between international trade and conflict ; rising intensive trade relationships as expressed in high transactional levels of intra-industrial transactions lower the potential for conflict among nations. As such intra-industrial commodity exchanges as well as investment cross-haulings of multinational enterprises are an important instrument leading to a better understanding among nations.[12]

The policy implications are evident : an increase in the international division of labour according to the intra-trade scenario does not imply that nations have to negatively compete for high export quotas, rather their international interdependence is highly beneficial for both world and domestic economic development. The international division of labour must not thus be a zero-sum game in which one land wines at the expense of another. It is much more the case that additional international transactions occur within industrial sectors which lead to a more favorable economic development beneficial to all concerned.

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12. Compare further Frey (1984).

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