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Developing Countries in Light of Intra-Trade

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This paper examines one possible explanation for these intra-trade flows derived in light of an international environment characterized by product differentiation, economies of scale, and monopolistic competition. The analysis may be structured within a more general formulated Heckscher-Ohlin framework, in which intra-trade flows may be explained through product differentiation while conventional explanations apply to inter-industry trade (see e.g. Helpman (1981), (1984), Kierzkowski (1984)). The model analyses the relationship between the total volume of trade, the share of intra-trade on cross-country differences in relative factor endowments and relative country size in a simple integrated two country world.

II. The Volume of Trade

As demonstrated by Helpman (1984), there exist two production sectors, a sector producing differentiated products under relatively capital-intensive methods and another sector which manufactures a labour-intensive homogeneous good. It is assumed that production functions and preferences are homothetic and equivalent in both

DEVELOPING COUNTRIES IN LIGHT OF INTRA-TRADE

Udo Broll

B. Michael Gilroy*

I. Introduction

Recent evidence (see Havrylyshyn and Civan (1983)) suggests that for a number of rapidly industrializing developing countries the intensity of 'trade overlap' in similar products between the same industrial sector is quite high. In addition to this observation, it has recently been noted (see Loertscher and Wolter (1980), Erzan and Laird (1984)) that a clear and strong positive relationship between the level of intra-industry trade and the stage of development, i.e., measured by national income exists. Furthermore, membership in a successful trade-integration scheme seems to be an important factor when examining intra-industrial trade levels (compare Greenaway (1983)).

What are the underlying reasons for the large volume of international trade in these goods? What are the implications for a growing number of developing countries as they move up on the escalator and as their patterns of comparative advantage evolve along this path? These questions deserve close attention since this kind of trade represents one alternative in which developing countries can participate as well as contribute to the growth of world trade without being perpetually locked into a pattern of labour-intensive industrial development (compare Erzan and Laird (1984), UNCTAD (1980), Broll and Gilroy (1985)).

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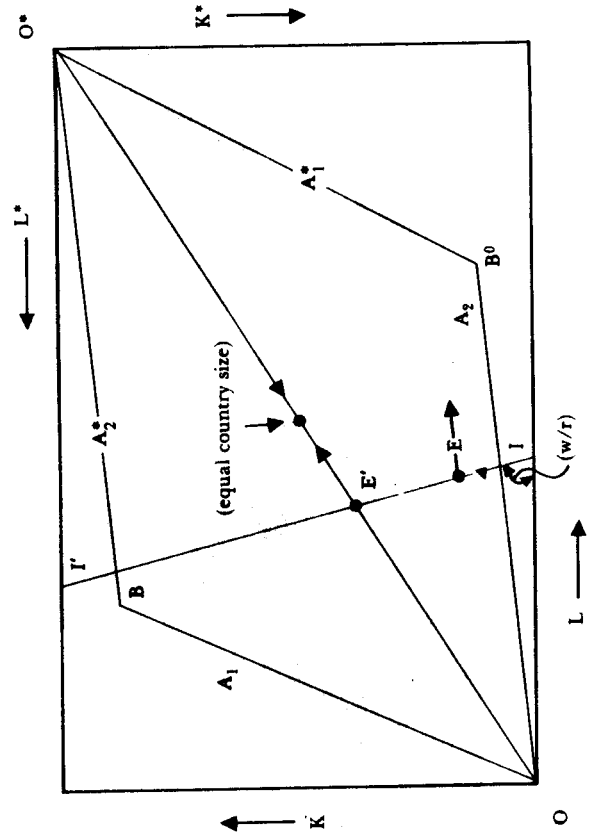


Figure 1.

economies. Now consider two trading countries which may be illustrated by endowment points within the parallelogram OBB^*O^* in the factor box diagram presented in Figure 1 below.¹⁾

Domestic and foreign(*) expansion paths $A_1(A_1^*)$ and $A_2(A_2^*)$ respectively, represent the necessary factor input requirements for the differentiated product sector (X) and homogeneous good sector (Y). Π' represents the national net product (NNP) line, or simply income line.

Before examining the model further it is convenient to summarize the symbols used (see Table 1).

Table 1.

	Domestic	Foreign	Combined
homogeneous good	Y	Y^*	$Y + Y^* = \bar{Y}$
differentiated good	$X = nx$	$X^* = n^*x$	$X + X^* = \bar{X}$
commodity prices (in free trade)	p	p	p
volume of trade	-	-	T
number of firms producing in the X-sector	n	n^*	$n + n^* = \bar{n}$
(Herfindahl-) Index of supply side market concentration	$\frac{1}{n}$	$\frac{1}{n^*}$	$\frac{1}{n + n^*}$
share of world income (NNPW)	μ	μ^*	$\mu + \mu^* = 1$

The total volume of trade (T) for the world as a whole is simply the sum of all exports over countries and sectors (see Figure 2).

1) For a detailed discussion of the application of the factor box diagram in an international trade context see Dixit and Norman (1980), Chapters 4 and 9.

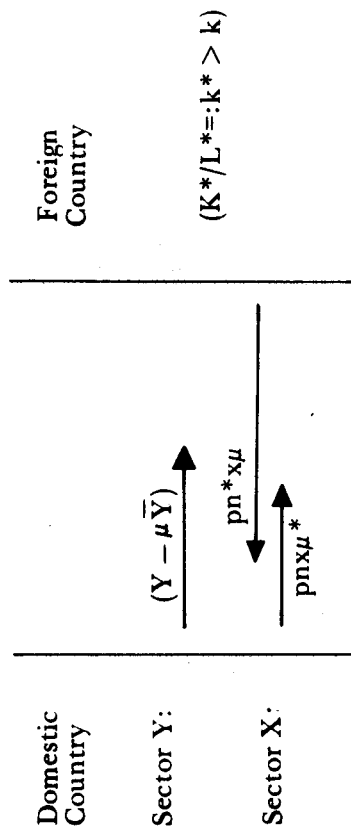


Figure 2.

The total volume of trade is thus derived as

$$T = (Y - \mu \bar{Y}) + pnx\mu^* + pn^*x\mu \tag{1}$$

and due to the balance trade restriction may be written as

$$T = 2((Y + \mu \bar{Y}) + pnx\mu^*) \tag{2}$$

or in foreign export units as

$$T = 2pn^*x\mu. \tag{3}$$

where $nx(n^*x)$ denotes the number of product varieties times the quantity of the differentiated product (with $x=x^*$ in a symmetric equilibrium). $x\mu^*(x\mu)$ is the aggregate foreign (domestic) consumption of one variety of differentiated product produced domestically (abroad). The world supply of the homogeneous good is \bar{Y} .

Thus, for fixed relative country size (i.e. μ and μ^* are constant, located along the income line Π') the total volume of trade increases with the number of differentiated products (n^*) produced in the capital-rich country (compare equation (3)); for a fixed number of varieties the volume of trade increases with the relative country size μ . Arrows inside the set OBB^*O^* indicate directions in which the volume of trade increases.

At the endowment point E' located on the diagonal O^*O (implying $k=k^*$) it holds that $n=\bar{n}\mu$, where $\bar{n}=n + n^*$ represents the total number

of product varieties produced in the integrated world economy.²) Substituting into equation (3) follows that

$$T = 2\bar{p}n\chi\mu^* \quad (4)$$

Equation (4) implies that the volume of trade is largest when countries are of equal size ($\mu = \mu^*$). The following conclusion is obtained: *There exists a systematical relationship between a country's factor endowment and country size upon its volume of trade. Especially, given identical capital-labour ratios the volume of trade will be maximal when both nations are of equal size.*

III. Intra-Trade

In order to examine the dependence of the intra-trade share on differences in relative factor endowments (in the set $0BB^00^*$) and their interaction we use the Grubel-Lloyd-Index.³) The intra-trade index translates into

$$B = 1 - \frac{(Y - \mu\bar{Y}) + (pn^*x\mu - pn\chi\mu^*)}{(Y - \mu\bar{Y}) + (pn^*x\mu + pn\chi\mu^*)} = \frac{n/\mu}{n^*/\mu^*} \quad (5)$$

The measure B may vary between 0 and 1 with the former representing complete inter-industry trade and the latter complete intra-industry trade (i.e. equal capital-ratios implies $B = 1$ and all trade is intra-trade). Furthermore, it can be demonstrated that a reallocation of resources leads to a decrease in the share of intra-trade. If countries differ in their endowment ratios, a reallocation of labour and capital (which increases the gap in the countries global intensities without changing prices and country sizes) reduces the share of intra-trade (compare Figure 3).

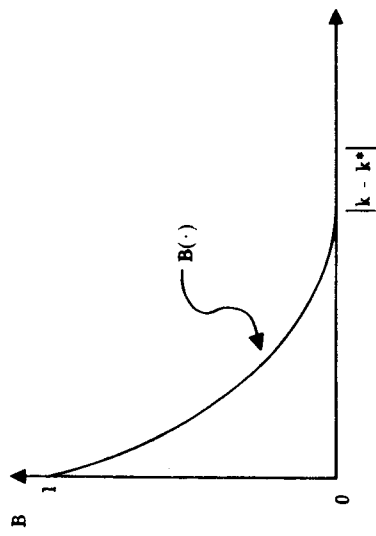


Figure 3.

Since the capital-labour ratio in the capital rich country increases, the number of varieties will increase. Thus, the ratio $(n/\mu)/(n^*/\mu^*)$ decreases and the intra-share measure B declines. This implies that dissimilarities in the relative magnitude of national endowments are associated with a lower share of intra-trade. *Thus, trade among nations with similar factor endowments will be dominated by intra-trade; dissimilarities in endowments result in trade characterized by inter-industry trade.*

IV. Conclusions

The following broad conclusions can be made. There is a great potential in intra-industry trade among developing countries. Certainly, the further industrialization of these countries will contribute to the volume of world trade. This suggests: 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 be a zero-sum game in which one land wins at the expense of another. It is much more the case that additional international transactions occur within industrial sectors which lead to a more favourable economic development beneficial to all concerned. Diminishing economic independence has its compensation in an increase in economic welfare in an integrated economic

2) Furthermore, $1/(n+n^*)$ indicates the well-known Herfindahl-index of market concentration.

3) Compare Helpman (1981), (1984), and Nobel (1983).

community.

As was demonstrated, there exists a relationship between the pattern of trade in terms of inter- vs. intra-trade and the distribution of relative factor endowments and national income levels. Trade between countries with similar endowments will be largely intra-trade, whereas countries with dissimilar endowments engage mainly in inter-industry trade. The share of intra-trade is declining when differences in the capital-labour ratio increase.

Increased levels of product differentiation may furthermore induce the mobilization of international capital bringing about an expansion in trade, both inter- as well as intra-industry trade, yielding an increased world efficiency and mutual benefits and creating employment opportunities in the developing countries. Exploitation of returns to scale in production, along with a greater variety of products will raise consumer welfare. Finally, an increase in developing countries' intra-industry trade will lead to diversification in national production and export structures and reduce possible adjustment costs and assistance needs. An increasing intra-industry trade index indicates greater economic co-operation and integration and a solid fundament for exploiting returns to scale and extending the world's division of labour.

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