Bela Balassa

Intra-Industry Trade and the Integration of Developing Countries in the World Economy

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This paper reviews the experience of developing countries with intra-industry trade in manufactured goods and examines the prospects for such trade among developing, as well as between developed and developing, countries. The concepts and the measurement of intra-industry trade are described in Section I of the paper. Section II analyzes the pattern of intra-industry trade in the Latin American Free Trade Association and in the Central American Common Market. The welfare effects of intra-industry specialization among developing countries in the framework of regional arrangements are discussed in Section III while Section IV considers the past experience and the future prospects of intra-industry trade between developed and developing countries. Finally, in Section V the principal conclusions and the policy implications of the findings are presented.

I. Intra-Industry Trade: Concepts and Measurement

Having earlier noted that in the European Common Market "much of the increased trade in manufactures occurred within rather than between commodity groups" [Balassa 1963, p. 178]¹, the author suggested an explanation of this phenomenon in terms of product differentiation in consumer goods, machinery, transport equipment, and intermediate products² and introduced statistical indicators to measure the extent of intra-industry specialization [Balassa 1966]. Subsequently, additional evidence was provided on the extent of intra-industry specialization in manufactured goods among the EEC countries.

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¹ The paper expresses the views of the author alone and should not be interpreted to represent the opinions of the World Bank. An earlier version was distributed as World Bank Staff Working Paper, No. 312.
² A similar result was reached in regard to the Benelux by Verdoorn [1960].
³ The existence of product differentiation in trade among the developed countries was earlier noted by Linder [1961].
For purposes of empirical measurement, an industry has been defined to include commodities that have high substitution elasticities in production. In practice, limitations of data availability have led to the use of a 91 industry classification scheme consisting of 3-digit and 4-digit items in the UN Standard International Trade Classification (SITC), and combinations thereof.

The use of a technological definition of an industry is not open to the strictures Lipsey [1976] addressed to subsequent work by Grubel and Lloyd [1975], who employed 3-digit SITC categories in the calculations regardless of the technological characteristics of the product within each category. And although a further disaggregation of the data would be desirable in particular instances, Hesse [1974] and Willmore [1974], respectively, have shown that a high degree of intra-industry specialization is apparent in the European Common Market and the Central American Common Market, even if a very disaggregated commodity classification scheme is employed. At any rate, recognizing the limitations of the use of the statistical indicators to measure the extent of intra-industry specialization in a single country at a particular point of time, the author has used these indicators to make comparisons over time and among countries.

The measures employed by the present author for indicating changes in the extent of intra-industry specialization were the following:

1 The expressions "intra-industry trade" and "intra-industry specialization" will be used interchangeably, although it is recognized that the exchange of differentiated consumer goods without a change in the production structure does not affect specialization and that, in certain circumstances, intra-industry trade may also entail the exchange of identical products [Adler 1970, p. 177]. We will return to the latter point in Section III below.

2 In fact, in the latter case, the use of 7- and 9-digit items in the Central American trade classification scheme, based on the SITC, carried disaggregation too far by separating commodities which are good substitutes in production. In turn, apart from the excessive disaggregation used (e.g., iron or steel pipes with and without seams are considered separate industries), the relatively low degree of intra-industry specialization shown for Israel (see Pomfret, pp.115 ff.) may be explained by Israel's geographical isolation, its lack of participation in regional integration schemes, and relatively high tariffs on goods produced domestically [Balassa 1979, Ch. 9]. Similar comments apply to Australia [Grubel, Lloyd 1975, p. 67].
Rank correlation coefficients between the export structure of pairs of Common Market countries in intra-EEC trade and "representative ratios" of intra-EEC trade balances for the individual countries, defined as the ratio of the absolute difference between exports and imports in each industry to the sum of the exports and imports for the industry in question [Balassa 1966]. The latter measure is shown in (1).

\[
(1) \quad \frac{|X_i - M_i|}{(X_i + M_i)}
\]


The decline in representative ratios, calculated for the same benchmark years as the rank correlation coefficients, also indicate the trend towards increased intra-industry specialization in the European Common Market. The unweighted averages of these ratios for the individual EEC countries were in the .39 - .58 range in 1958; they ranged between .32 and .52 in 1967; and were between .27 and .41 in 1970. Between 1958 and 1970, the decline was the largest in Germany (.38 percent) and the smallest in Belgium (.26 percent), the average decline for the EEC countries being 30 percent [Balassa 1975, p. 111].

An alternative measure of intra-industry specialization, suggested by Grubel and Lloyd [1975, p. 21], is shown in (2).

\[
(2) \quad \left[ \frac{(X_i + M_i) - |X_i - M_i|}{(X_i + M_i)} \right] \cdot 100 = \left[ 1 - \frac{|X_i - M_i|}{(X_i + M_i)} \right] \cdot 100
\]

\[\text{In this connection, it should be noted that, during the same period, "representation ratios" declined considerably less in the United States [Balassa 1975, p. 112] that participated in negotiations on multilateral trade liberalization, which have led to reductions in tariffs but not to their elimination.}\]
It is apparent that, apart from taking 100 rather than 1 as the base, this measure equals one minus the measure introduced by the present author. Thus, while the measure used by the author assumes a value of zero in the case of complete intra-industry, and a value of one for complete inter-industry specialization, the Grubel-Lloyd measure shows the opposite pattern.

Grubel and Lloyd also calculated weighted rather than unweighted averages and made an attempt to adjust for trade imbalance. Aquino [1978, pp. 278-282] has subsequently shown that the Grubel-Lloyd adjustment for trade imbalance does not ensure consistent results and proposed an alternative for consistent measurement. Aquino's measure is equivalent to that earlier used by Michaely [1962], which was cited but dismissed by Grubel and Lloyd [1975, p. 28].

Several measures have been employed in the present paper. For comparability with the author's estimates for the EEC countries and with Willmore's earlier results for the Central American Common Market [Willmore 1972], use has been made of an unweighted average of representative ratios shown by (3). Furthermore, an (unadjusted) weighted average of these ratios has been calculated, the weights being the sum of exports and imports for individual industries (4). Finally, adjusted weighted averages have been derived by utilizing the adjustment procedure suggested by Aquino (5).

\[
\begin{align*}
(3) & \quad \frac{1}{n} \sum \frac{|X_i - M_i|}{(X_i + M_i)} \\
(4) & \quad \frac{\sum |X_i - M_i|}{\sum (X_i + M_i)} \\
(5) & \quad \frac{\sum |X_i^e - M_i^e|}{\sum (X_i^e + M_i^e)}, \quad \text{where} \quad X_i^e = \frac{\frac{1}{2} \sum (X_i + M_i)}{\sum X_i}; \quad M_i^e = \frac{\frac{1}{2} \sum (X_i + M_i)}{\sum M_i}.
\end{align*}
\]

However, utilizing expression (5), we have made adjustments for the imbalance in total trade rather than in trade in manufactured goods as Aquino has done; in the latter case, one overestimates the extent of intra-industry trade by abstracting from inter-industry specialization between primary and manufactured products.
Use has further been made of rank correlation coefficients calculated in the manner described above. Although, following Linnemann [1966, pp. 140-143], Grubel and Lloyd [1975, p. 28] have criticized the use of rank correlation coefficients on the grounds that their possible values ranged from -1 to +1, this should not discourage their use. Thus, apart from assuring comparability with results obtained for the European Common Market and the Central American Common Market, they provide a more familiar tool of analysis than the cosine measure suggested by Grubel and Lloyd [1975, p. 28].

II. Intra-Industry Trade in LAFTA and CACM

Aside from Willmore’s paper on Central America, efforts to measure the extent of intra-industry specialization have thus far been limited to developed countries. This paper presents the results of calculations on trade in manufactured goods for countries of the Latin American Free Trade Association (LAFTA) and the Central American Common Market (CACM). The results for the latter group of countries will further be compared to Willmore’s estimates.

In the absence of detailed data for a sufficiently long time period, calculations have been made for the latest year for which data are available. However, use has been made of a geographical breakdown separating trade with the world as a whole, with developed countries, with member countries in LAFTA or CACM as the case may be, and with other developing countries as well as an industry breakdown separating fifteen manufacturing industry groups. The comparison of these results offers interest, although it should be recognized that industry-group estimates made for the individual countries are influenced by the composition of their industries.

Data availabilities have permitted making calculations for six LAFTA and three CACM countries, utilizing the 91 industry breakdown employed earlier in estimates for the European Common Market. They are Argentina, Brazil, Chile, Colombia, Mexico, and Venezuela in LAFTA, and Costa Rica, Honduras, and Nicaragua in CACM. With the exception of Chile and Mexico, for which only 1974 data were available, data for the year 1975 have been used in the calculations.

Table 1 shows the results obtained for the total manufactured trade of the countries concerned, using the measures described in (3), (4), and (5), while results for fifteen industry groups are reported in Table 2, utilizing (5) alone. The latter measure has been selected be-
cause of the desirability of adjusting for trade imbalances that are of importance in some of the developing countries in question.

Table 1 - Measures of Intra-Industry Trade for Trade in Manufactured Goods\textsuperscript{a}, 1975

<table>
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<tr>
<th></th>
<th>World</th>
<th>DC</th>
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<th>LDC-LAFTA</th>
<th>World</th>
<th>DC</th>
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<tr>
<td>Unweighted average</td>
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<td>.871</td>
<td>.706</td>
<td>.889</td>
<td>.693</td>
<td>.711</td>
<td>.741</td>
<td>.913</td>
<td>.975</td>
<td>.847</td>
<td>.973</td>
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<tr>
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<td>.599</td>
<td>.916</td>
<td>.745</td>
<td>.864</td>
<td>.655</td>
<td>.766</td>
<td>.861</td>
<td>.935</td>
<td>.809</td>
<td>.976</td>
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<tr>
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<td>.908</td>
<td>.689</td>
<td>.928</td>
<td>.597</td>
<td>.796</td>
<td>.865</td>
<td>.935</td>
<td>.813</td>
<td>.973</td>
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<td>.987</td>
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<td>.888</td>
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<td>.980</td>
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<tr>
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<td>.990</td>
<td>.420</td>
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<td>.987</td>
<td>.647</td>
<td>.927</td>
<td>.752</td>
<td>.987</td>
<td>.565</td>
<td>.916</td>
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<tr>
<td>Weighted average, adjusted</td>
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<td>.988</td>
<td>.400</td>
<td>.406</td>
<td>.840</td>
<td>.987</td>
<td>.553</td>
<td>.500</td>
<td>.728</td>
<td>.987</td>
<td>.566</td>
<td>.910</td>
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</tbody>
</table>

\textsuperscript{a}Unweighted averages, and unadjusted and adjusted weighted averages have been derived by the use of equations (3), (4), and (5), respectively. Calculations have been made for trade with the world as a whole, with developed countries, with member countries of LAFTA or CACM, and with other developing countries, respectively.

\textsuperscript{b}Source: UN [various issues].

The results of Table 1 also show that, with a few partial exceptions, the extent of intra-industry specialization in the six LAFTA countries is greater in trade with their LAFTA partners than with other LDCs or with the developed countries. The exceptions are Mexican trade with developed countries, using the unweighted measure, and Venezuela's trade with non-LAFTA developing countries, using the unweighted and the adjusted weighted measures.

The evidence is mixed as far as comparisons of trade relations with developed and with non-LAFTA developing countries are concerned. All three measures show a greater degree of intra-industry specialization in the trade of Argentina with developed as compared to non-LAFTA developing countries while the opposite result has been ob-
tained for Brazil, Colombia and Venezuela, and the results vary de-
pending on the measure chosen for Chile and Mexico.

Given the small share of non-LAFTA developing countries in the manu-
factured trade of the individual LAFTA countries, not much can be
read into the latter comparisons. At the same time, it is noteworthy
that, irrespective of the measure used, the extent of intra-industry
trade with developed countries is the greatest in Mexico, Brazil, and
Argentina, which are at a higher level of industrial sophistication, and
the smallest in Colombia, Chile, and Venezuela, which are less indus-
trialized.

The extent of intra-industry specialization in intra-LAFTA trade, too,
is considerably greater in Argentina, Brazil, and Mexico than in Chile
and Venezuela, although Colombia now belongs to the first rather than
the second group. In this connection, the implications of the so-called
complementarity agreements for intra-LAFTA trade should be noted
(Table 3).

Under the Montevideo Treaty, complementarity agreements were to
provide a framework for specialization in particular product varieties
among LAFTA countries. Due to the difficulties of negotiating agree-
ments that constrain the freedom of action of private firms and the
requirement that tariff concessions be automatically extended to all
LAFTA members, only one such agreement was signed until 1963. At
the same time, negotiations on tariff reductions in intra-LAFTA trade
practically came to a standstill. In attempting to respond to this situa-
tion, in 1964 the rules governing the application of complementarity
agreements were modified. Under the new rules, these agreements
have become a vehicle for preferential tariff reductions among the
signatories and may or may not involve product specialization.

Nineteen complementarity agreements have been signed since 1964. As
shown in Table 3, these agreements are dominated by the industrially
more developed member countries of LAFTA. Among the countries
under study, by 1976 the number of such agreements entered into was
17 in Brazil, 14 in Mexico, 13 in Argentina, 6 in Chile, 4 in Venezuela,
and 2 in Colombia. Additional evidence on this point is available for
the early seventies, when the more industrially developed member
countries (Argentina, Brazil, and Mexico) were both the originators
and the recipients of concessions in regard to particular products in
47.1 percent of the cases; they supplied 78.6 percent of the concess-
sions and received 57.0 percent. By contrast, only 17.5 percent of
the concessions were both given and received by the remaining eight
LAFTA countries (Bolivia, Colombia, Chile, Ecuador, Paraguay,
## Table 2 - Measures of Intra-Industry Trade for Industry Groups

<table>
<thead>
<tr>
<th>Industry Group</th>
<th>World DC</th>
<th>LAFTA</th>
<th>LCD-</th>
<th>World DC</th>
<th>LAFTA</th>
<th>LCD-</th>
<th>World DC</th>
<th>LAFTA</th>
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<td>0.588</td>
<td>0.773</td>
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<td>0.907</td>
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### Notes:
- Estimates have been made by using equation (5).
- No exports.
- No imports.

**Source:** See Table 1.
over time than the U.S. sales of majority-owned foreign affiliates of American companies.

Moreover, as the U.S. Tariff Commission study [1970, pp. 6 f.] shows, imports of U.S. firms from foreign firms that use U.S. inputs represent a very small proportion of imports under tariff items 806.30 and 807.00. And, finally, there is no evidence that "trade which is associated with licensing agreements, management or marketing contracts with ostensibly independent foreign firms" (Helleiner, p. 165) would be of importance in the United States.

Correspondingly, we have to reject Helleiner's claim as regards the importance of U.S. intra-firm transactions in imports into the United States. Helleiner greatly overstates the extent of intra-firm trade, and he fails to recognize the fact that the share of this trade in U.S. imports from developing countries has been declining over time.

Part of the explanation for this trend lies in the fact that the exports of the two largest developing country exporters of manufactured goods, Korea and Taiwan, largely originate from national firms. In the case of Korea, the export share of multinational firms hardly surpassed one-tenth in the early seventies [Cohen 1973, pp. 180 f.], and, in 1976, imports by such firms into the United States from their majority-owned affiliates in Korea amounted to only $8 million [U.S. Department of Commerce, March 1978, p. 39].

The declining importance of multinational firms in vertical specialization between the United States and developing countries indicates that national firms in these countries are increasingly able to provide products that conform to the specifications of U.S. firms. The situation is similar as far as imports into Japan are concerned that originate largely from national firms in Korea and Taiwan. In Western Europe, however, this process is hindered by the fact that duty exemptions apply only if the following conditions are fulfilled: the product was imported by a domestic enterprise, it was processed abroad on account of this enterprise, and it incorporates inputs that had been exported by the enterprise [Finger 1975, p. 365]. We will return to this issue in the concluding section below.
V. Conclusions and Policy Implications

In this paper, it has been shown that integration efforts in the postwar period have contributed to intra-industry trade among developing countries. In the Central American Common Market, intra-industry specialization has occurred following the elimination of tariffs on practically all trade in manufactured goods; in LAFTA, this has taken place in the framework of complementarity agreements in machinery and chemicals and in response to tariff reductions in consumer goods.

Apart from the increased exchange of consumer goods by reason of national product differentiation, intra-industry trade may entail horizontal or vertical specialization. In the first case, product variety is reduced in national firms, leading to cost-reductions through the lengthening of production runs and the exploitation of economies of scale; in the second case, an exchange of parts, components, and accessories permits exploiting economies of scale in the manufacture of these inputs at various levels of fabrication.

Intra-industry specialization through the exchange of consumer goods and through reductions in product variety assumes particular importance in countries at similar levels of development. The ease of adjustment in the event of intra-industry specialization, as against adjustment costs under inter-industry specialization, then, provides an argument for the economic integration of these countries.

In turn, differences in relative prices will contribute to inter-industry specialization, with concomitant adjustment costs, in a regional union consisting of countries at different levels of development. But, the liberalization of trade among developing countries that have industrialized behind high protection encounters difficulties even if these countries are at similar income levels.

These considerations point to the desirability of regional integration among countries at lower levels of development for the sake of efficient industrialization through increased specialization and greater competition. At the same time, in order to avoid the establishment of inefficient industries, it would be desirable to set external tariffs at low levels in the regional union or to provide for tariff reductions over time.

This is not to say that integration among the more industrialized developing countries may not be desirable. These countries would benefit from lengthening production runs and exploiting economies of scale while adjustment costs could be reduced if tariff reductions took place
over a sufficiently long pt. cd. At the same time, the adverse effects of integration in the form of replacing lower-cost products imported from third countries by the higher-cost products of the partner countries could be minimized through multilateral trade liberalization. Finally, in cases where governments enter into product specialization agreement, these should be subject to rigorous project evaluation.

The possibilities for intra-industry trade between developed and developing countries have also been noted in the paper. Horizontal specialization occurs through the exchange of consumer goods, with developing countries specializing in product varieties utilizing unskilled labor. Possibilities for horizontal specialization exist also in regard to intermediate products, whenever the labor intensities of particular product varieties differ.

Vertical specialization has taken the form of the developing countries specializing in unskilled-labor intensive operations, involving the production of particular parts, components, and accessories or assembly. While it had been assumed that vertical specialization takes place chiefly in the framework of multinational firms, with the increased sophistication of developing country producers, contractual relationships between independent firms have become of increasing importance over time.

Whatever its organizational form, vertical specialization represents a response to rising labor costs on the part of firms in developed countries. As a result, it strengthens the "lobby" for freer trade while easing the problem of adjustment in developed economies. For one thing, firms producing parts, components, and accessories can change their product composition; for another thing, the importation of low-cost inputs may be a condition for successfully competing with imports.

It would appear, then, that developing countries are well-advised to participate in the international process of vertical specialization. This may involve establishing free trade zones or avoiding discrimination against exports, when the latter procedure has the advantage of intensifying the links of exports with the rest of the economy and improving the efficiency of resource allocation.

Efficiency objectives would also be served if developing countries engaged in vertical specialization in regard to products oriented towards their own markets. This may take the form of the importation of capital-intensive and technology-intensive parts, components, and acces-
sories for combining them with labor-intensive inputs produced domestically. Apart from overall trade liberalization, it would require reducing domestic content requirements that have often increased costs to a considerable extent.

In turn, developed countries may encourage vertical specialization with developing countries by liberalizing existing rules on the duty-free treatment of domestic inputs that are re-imported in processed form. In Western Europe, it would be desirable to liberalize the restrictive provisions applied as far as the nationality of the supplier is concerned. In the United States, existing provisions requiring that the domestic components do not lose their physical identity in imported products would need to be changed [Finger 1975].

International vertical specialization brings gains to developed and to developing countries alike by permitting specialization to take place according to the relative labor-intensity of the production process. The liberalization of trade in developed and in developing countries would permit the exploitation of these differences and would also lead to inter-industry specialization. At the same time, adjustment policies would permit to minimize the cost of dislocation involved.

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