INTRAINDUSTRY TRADE: ISSUES AND THEORY

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Forthcoming in James Melvin, James Moore, and Ray Riezman, eds., *Trade, Welfare, and Econometrics: Essays in Honor of John S. Chipman*, New York: Routledge.

I. Introduction

In a recent issue of the *Journal of Economic Perspectives*, two Stanford graduate students, Joshua Gans and George Shepherd (1993), write about the difficulties that eminent economists had in getting their ideas published in the mainstream professional journals. They focus on papers containing unfamiliar ideas that have yet no resonance for the profession trapped in "conventional wisdom". But they ignore the difficulty that sometimes attends publishing papers that challenge an orthodoxy that is newly established, no matter how penetrating and persuasive the critique is, simply because the challenge is seen as emanating from the "old and obsolete school".

This latter has been the fate of John Chipman's important work on intra-industry trade which refuted the new orthodoxy among the younger trade theorists working with models of imperfect competition, that perfectly competitive models could not generate intra-industry trade. Rejected by referees on grounds that Chipman's results were "uninteresting" or "wrong" or "obvious" or attacking "straw men," and published in consequence in volumes and exotic journals, this work remains a major contribution. This *festschrift* provides an appropriate place and occasion to resurrect that work, put it into context, and to reshape and extend it analytically.[1]

II. The Issues

A. Two Different Concepts of Intra-industry Trade

The phenomenon of intraindustry trade, which was propelled into center stage by the seminal empirical work of Grubel and Lloyd (1975), has been taken in the analytical literature to raise two wholly different questions.

1. Close Substitutes in Consumption: One set of theorists has taken the phenomenon to mean that there is two-way trade in "similar products" across countries, obviously thinking of intraindustry trade therefore as trade in products which are close substitutes in *consumption*, much the way industrial-organization theorists implicitly and typically define an industry prior to undertaking the analysis of oligopolistic or large-group market structure in partial-equilibrium.[2]

When Staffan Linder (1961) initiated the analysis of intraindustry trade, noting that countries at similar stages of development had a high degree of trade, evidently he had in mind trade in similar products, so defined. So did Bhagwati's (1964) survey of the theory of international trade where Linder's theory of trade was set alongside Ricardo's and the Heckscher-Ohlin theory as an alternative approach of significance.

In fact, while some of the writers on intra-industry trade have dismissed this trade in similar products by asserting that it simply reflects "categorical aggregation" (where the word "categorical" is used, not in the sense of the Kantian Imperative but simply as defined by categories of the SITC variety) and that therefore there is nothing more to be said about the matter, this is surely wrong. Linder himself attempted to explain why such two-way trade would arise (as with countries trading different varieties of cars, small and large), arguing basically from the demand side, allowing demand differences to obtain across countries and for there to be greater overlap between countries with closer per capita incomes than across poor and rich countries, and hence greater trade in similar products and in trade per se. Of course, this demand-side explanation is complete only when paired with a theory of location that accounts for the need for trade.

In a similar vein, Bhagwati (1982) also produced the outlines of a theory, based on differences in tastes and demands across countries which reflect essential differences in country "environment", which then lead to similar product developments, with characteristics differentiated so as to reflect the different country "tastes", in countries endowed with similar resources and broad know how.[3] With tastes diffusing quickly, and translating into demand for most such similar products, trade in similar products will break out. This was described as a "biological" theory of trade in similar products and its "dynamic" essentials detailed as follows (Bhagwati, 1982,pp.175-6):

> . . . just as in biological theorizing the 'environment' interacts with 'genetic factors' to produce a phenotype, we can think of an economic process whereby a specific choice of a product type emerges within a nation-society. Thus, think of the income level and the level of R&D in manufacturing as defining the capacity of the society to come up with technologically with a given set of characteristic product combinations, e.g. small, medium, and large cars. The United States and Japan share this "genetic" set of traits...But which phenotype is selected in the market depends on the interaction of this common set of 'genetic' traits with the specific 'environment' of Japan and the United States. Thus the land-man ratios, the size and structure of the family, etc. may lead to the evolution of 'gas guzzlers' in the United States and of smaller. fuel-economy cars in Japan, as, in fact, has been the case. At the next stage...the successful development of small cars in Japan and of gas guzzlers in the United States gets reinforced by localized technical change in precisely these types of cars with the result that one is now dealing with a situation of *ex ante* differentials in the know-how of producing and selling different types of

> cars. Next, since ‘cars’ represent a generic product, representing a certain manner of transportation, the taste for cars diffuses to the United States and for gas guzzlers to Japan as part of the Schumpeterian process of dynamic capitalism, aided by advertising in search of new markets. Thus, trade in similar products arises.”

Subsequently, Feenstra (1983) and Dinopoulos (1989) have formalized the essential elements of this “biological” theory.

2. Similar Factor-intensity in Production: In contrast to this way of thinking about intraindustry trade as trade in similar products, however, trade theorists in the 1980s defined intra-industry trade from the *production* side, as two-way trade in commodities whose production was *similar in factor-intensity*.

From an empirical, as against a theoretical, point of view, the latter definition does not seem to correspond to the way that the bureaucrats and experts who devised the SITC categories down to five digits at the United Nations were grouping commodities. There is no evidence of *ex ante* intention to do so, and research by Michael Finger (1975) shows in fact that capital to labor ratios varied less between 3-digit industries than within them.[4]

Why did this factor-intensity-based definition arise and come to dominate the analysis and arguments which Chipman and others have addressed? The principal reason is the dominance in this period of the Heckscher-Ohlin-Samuelson model, whose analytic framework emphasized factor proportions. Equally, it was believed that trade in goods of similar (or especially *identical*) factor intensity posed a genuine puzzle that could not be accounted for in this model (Helpman and Krugman, 1985, page 2).[5]

Any other way of getting to two-way trade in commodities of identical factor intensities, such that (say) homothetic symmetry of tastes or production functions across countries was abandoned while perfect competition was maintained, was not considered. In fact, many claims that imperfect competition was *necessary* to generate intraindustry trade may be found in the literature of the 1980s; and this gave a significant boost to the imperfectly-competitive theory of international trade (which, of course, is a major scientific achievement whose credentials do not depend on invalid arguments).[6]

B. The Aggregation Issue

Before we turn to a fuller analysis of the theoretical issues, it is necessary to note an altogether different, aggregation-based, critique of intraindustry trade that Chipman has done most to advance, which is orthogonal to the analytical issues as posed above.

Chipman (1992) has argued that the SITC-data-generated estimates of intra-industry trade reflect aggregation of different goods, and statistically demonstrates that disaggregation, carried down to multiple digits as far as is necessary, virtually eliminates such intraindustry trade. Note that this exercise simply fits an equation to the existing SITC categories, which have no clear correspondence to either of the two criteria which we discussed earlier, and which go down to five digits. Chipman shows that carrying the disaggregation down to 18 digits would reduce the share of intraindustry trade to negligible levels.

How should we look on this demonstration? Given the doubts that we have noted above about the correspondence between the SITC division into industries and the theoretical categories, which require aggregation by factor intensities, we find these results more interesting than compelling. Extrapolating by fitting an equation to SITC-groupings-generated data, where there is no identifiable principle by which these data are generated, seems to lack the necessary theoretical rationale on which to base any theoretically interesting conclusions.

Moreover, the theoretical work of Chipman and others, reviewed below, which shows that properly-defined intraindustry trade (i.e. aggregated by factor intensities, in contrast to the SITC data) is compatible with the conventional competitive HOS theory, also suggests that empirical questions about the share of intraindustry trade are less pertinent.

C. Key Theoretical Questions

In any event, the key theoretical questions are the following:

-- How do we account for trade in goods of similar factor proportions; and

-- Why is there such a large volume of trade between countries with similar endowments?

The primary presumption of the new trade theorists that these phenomena -- correctly observed or not -- require that the constant returns to scale and perfectly competitive HOS model must be abandoned, and the secondary presumption that this requires a turn to increasing returns to scale and imperfect competition (rather than alternative formulations) need to be reexamined. This is the task to which we now turn, in the spirit of Chipman's major theoretical contributions.[7]

III. The Theory

A. Introduction

In the remainder of this paper, we will review theoretical models of intraindustry trade in a competitive setting.[8]

1. In Section B, we focus on Chipman's (1988, 1991) demonstration that intraindustry trade can be generated in a competitive HOS model. We proceed, however, to re-prove his principal theorem in a simpler and more transparent way by resort to a generalized version of the celebrated Lerner diagram of trade theory.

2. In Section C, we extend this argument to show, as did Chipman (1992) and Rodgers (1988), that a large share of trade in this model being intraindustry is not anomalous.

3. In Section D, we review the contributions of Bhagwati (1964) and Davis (1992, 1993) which account for intraindustry trade instead by departing from the conventional HOS model, not by allowing imperfect competition, but by allowing for international differences in production functions.

4. Finally, in Section E, we address a different, but related, issue which was considered by Chipman (1992) and has been addressed more fully by Davis (1994): in a multilateral world, with the competitive HOS model in place, would one be able to account for the presumed fact that there is more trade between countries that are similar rather than dissimilar in factor proportions? The answer again is in the affirmative.

In combination, therefore, these contributions present a powerful argument that the competitive trade theory in general, and the HOS factor proportions theory in particular, cannot be rejected based on evidence of the large share of intraindustry trade in world trade, or the large share of the major developed countries in world trade.

B. Intraindustry Trade and the Theory of Aggregation: Proving the Compatibility of the HOS Model with Intraindustry Trade

Chipman (1988, 1991) argues that the oft-cited statistics on the large share of intraindustry trade in total trade provide no basis for rejecting the HOS factor proportions model of trade, and develops a theorem that it is always possible to find endowments for which 100 percent of trade is intraindustry trade. In this section, we will provide an intuitive development of his theorem, and discuss its importance for the broader problem of intraindustry trade.

It proves convenient to think about the Chipman argument in a framework that focuses on trade as the implicit exchange of factors. Accordingly, we develop two points of analysis. The first reviews the conception of trade in the Samuelson-Dixit-Norman-Helpman-Krugman “integrated equilibrium” framework. The second develops what we call the Lerner technology matrix, which generalizes the familiar Lerner diagram to a many-dimensional setting.

The integrated equilibrium is defined to be the allocation of resources that would occur if there were barriers neither to the movement of goods nor factors. We then ask what divisions of factors between countries is consistent with replicating this equilibrium via trade in goods alone. The set of such partitions of the world endowments is referred to as the Factor Price Equalization (FPE) set. In the conventional setting with two countries, goods, and factors, this is represented as a parallelogram in factor space (see Figure One). The slopes of the sides of the parallelogram reflect the factor intensities employed in the integrated equilibrium in the respective sectors. The length of the sides of the parallelogram reflects the allocation of factors to each of the sectors in the integrated equilibrium.

In this setting, the implicit trade in factors is simply the difference between the factor content of production, given by the endowment, and the factor content of consumption. The latter is proportional to the world endowment (so on the diagonal of the factor box), with the factor of proportionality being the country's share in world spending. Under balanced trade, the endowment and the factor content of consumption lie on an isoincome line, whose slope is minus the factor rental ratio. The crucial point for our purpose is that trade here consists of the export of factor services in the proportion that they are used in the exportable sector, and the import of factor services in the proportion that they are used in the importable sector, subject to meeting the previously described net factor trade (see Figure Two).

Now we turn to thinking about this in a setting that will be convenient for problems that require higher dimensionality of goods, factors, and perhaps countries. We develop a tool that we call the Lerner technology matrix,[9] which generalizes the Lerner diagram to many dimensions:

$$A^{L}(w) = \left[A_1^{L}\, A_2^{L} \ldots\, A_N^{L} \right] = \left[a_{ij}^{L} \right]$$

Columns of this matrix represent the factor input coefficients for the respective goods sufficient to trade at integrated equilbrium prices for a unit of the numeraire. The utility of this construct -- following our earlier discussion -- is that trade then consists of the one-for-one exchange of columns of this matrix.

We will now use this framework to prove a theorem developed in a more general setting in Chipman (1988, 1991).

Theorem (Chipman)

Given an N-good, N-factor, K-country world, that satisfies the conventional assumptions of the Heckscher-Ohlin model, and in which the production techniques employed in the integrated equilibrium are linearly independent, and given ***any*** aggregation of the N goods into $\bar{N} < N$ industries, there exists an allocation of world factor endowments such that one hundred percent of trade is intraindustry trade.

The proof of this statement follows the suggestion of Chipman (1991), and is made more direct by the use of the Lerner Technology matrix. We show this for the case of two countries; the extension to more countries is straightforward.

Proof

Suppose, first, that the two countries have identical factor proportions, so $V^1 = \mu \bar{V}$ and $V^2 = (1 - \mu) \bar{V}$, where μ å (0,1) is a scalar reflecting country one's share in world income, and $\bar{V}$ is the vector of world factor endowments. The assumption that the techniques employed in the integrated equilibrium are linearly independent insures the determinacy of production patterns. Since each country has a fixed share of each of the endowments, it undertakes that same share of the production of every good, which is also the share of that good consumed. No trade occurs.

We now construct factor endowments that meet the requirements of the theorem. First, consider the Lerner Technology matrix. It is an N x N matrix of the input coefficients consistent with the integrated equilibrium techniques, where the quantities are chosen so that they yield equal value at integrated equilibrium prices. The theorem assumes that the N goods have been aggregated into some smaller number $\bar{N}$ of industries. Thus some industry has at least two goods. Consider such an industry, with goods we will label X and Y. A^L_X and A^L_Y are columns in the Lerner Technology Matrix. Consider the effect of taking factors measured by èA^L_X from country one and giving this to country two, while taking factors measured by èA^L_Y from country two and giving this to country one. The induced endowments would be:

$$V^1_{è} = V^1 + è\ (A^L_Y - A^L_X)$$

$$V^2_{è} = V^2 + è\ (A^L_X - A^L_Y)$$

So long as both goods are consumed in the integrated equilibrium, any è less than the minimum of the number of X produced initially in country one or Y in country two will leave the new endowments in the FPE set. Moreover, this exchange leaves incomes, so consumption patterns, unchanged. The only change is a shift in the location of production of è units of X from two to one, and è units of Y from one to two. With consumption unchanged, and initially no trade, the only trade that will exist is the export by country one of è units of good X in exchange for è units of good Y from country two. That is, this endowment pattern has generated trade, one hundred percent of which is intraindustry trade. This completes the proof.

It is evident from the construction of the proof that it is likewise always possible under the same conditions to find endowments for which zero percent of the trade is intraindustry trade. In fact, we can always find endowments for which the share of intraindustry trade is at any level that we desire. The implication, then, is that the share of intraindustry trade *per se* can provide no evidence for or against the factor proportions model.

The remarkable fact about this theorem is that it holds irrespective of the criterion used to aggregate goods into industries. It holds equally well whether actual aggregation is based on production attributes (such as similar factor intensity), consumption attributes, or even arbitrary characteristics such as color.

Recall that we have assumed that the number of goods equals the number of factors, and that the technologies employed in equilibrium were linearly independent (so that our technology matrix was non-singular). This excludes the case in which two goods use identical (as against similar) factor intensities. If we continue to hold the number of goods to equal that of factors, but want to allow two or more of the goods to use identical factor intensities, then it is no longer possible to use the integrated equilibrium framework, as the FPE set will have less than full dimension in factor space. This is effectively the same as the case in which the number of goods is smaller than the number of factors, since in production terms some of the goods are identical. We can also consider the case in which there are sufficiently more and technologically diverse goods that, in spite of some using identical factor proportions, the FPE set has full dimension. So long as there is some industry that has goods with diverse technical coefficients, the theorem will continue to hold without modification. Of course, in this case the level of trade in the goods with identical factor proportions will be indeterminate (there potentially being other indeterminacies as well).

C. The Share of Intraindustry Trade in the Pure HOS Model

Chipman (1988, 1992) and his former student, Joan Rodgers (1988) have also gone on to demonstrate that a large share of intraindustry trade is compatible with the HOS model. Chipman (1992) addresses this problem by exploring the relations between similarity of factor endowments across countries, similarity of technologies, and the ratio of exports to output-of-the-exportable within a country. He develops his analysis within an example that restricts both technologies and preferences to be Cobb-Douglas, in addition to satisfying exact symmetry conditions. These strong restrictions are amply rewarded by the transparency of the results. Given these assumptions, he shows that as technologies symmetrically become more similar, there is a rise in the ratio of exports to output-of-the-exportable. This result flows principally from the production relations. As demonstrated by Lizondo, Johnson and Yeh (1981), making the technologies more similar tends to make the production possibility frontier “flatter,” or linear in the limit. As this suggests, this tends to promote greater specialization in production, and so for fixed consumption shares, both a greater level of exports and a larger share of the exportable actually exported. In fact, he shows that the sensitivity of the export to output ratio to growing similarity of technologies increases as the technologies become more and more similar. Or more plainly, as the goods come more and more to have similar input proportions, the share of the exportable actually exchanged rises. This suggests very strongly that a large share of intraindustry trade -- particularly in goods of similar factor content -- should not be surprising.

Rodgers (1988) extends Chipman's (1992) demonstration to a world with four goods and factors. While Chipman's paper is very much to the point in stressing the link between similar factor intensity of goods and the likely share of the exportable actually exported, one must strain to think of a two good model as one of intraindustry trade. To make progress on the question in the four by four model, Rodgers is obliged to impose a fairly stringent set of conditions on the set of technologies available and the way in which the two countries' endowments are allowed to differ. She groups the goods into industries based on a Euclidean metric operating on the Cobb-Douglas production elasticities, as developed by Chipman (1992). Granted these assumptions, she is able to develop three propositions. The first states that the industry in which the technologies are closer by the metric will have a larger share of trade which is intraindustry. This is interesting, as it again suggests that in a factor proportions world, important cross hauling of factor services may be the rule rather than the exception. Her second result relates more directly to Chipman (1992), and establishes that as the technologies within an industry become more similar in a specific way, the fraction of that industry's trade which is intraindustry rises. Finally, she shows that the same exercise also raises the share of total trade which is intraindustry.

The one caution we would raise about Rodgers' results is that the assumptions on which they are based are very restrictive. It is straightforward to demonstrate that proposition one fails once we remove the restrictions on the endowments of the countries. We simply use the Lerner matrix developed above to construct endowments for which the only intraindustry trade is in the industry whose technologies are further apart by the metric. This would also seem to cast doubt on the generality of the remaining propositions. Nevertheless, the examples she develops remain strongly at odds with the proposition that intraindustry trade is puzzling in a factor proportions setting.

Rodgers also sought to demonstrate that the possibility of substantial intraindustry did not depend on “cooked” assumptions on the pattern of endowments or technologies. In a separate exercise, she considered three varied patterns of endowments among three countries, and ran 500 simulations in which the Cobb-Douglas constant returns to scale production elasticities were selected randomly. Based on these elasticities, the goods were grouped into industries, and the Grubel-Lloyd index was calculated. The results verified that, depending on the particular technologies at work, and the specific pattern of endowments, both very high and very low indices of intraindustry trade could arise. In any case, the exercise did not suggest that high intraindustry trade in a factor proportions setting is an anomaly.

D. Relaxing Assumptions of HOS, While Maintaining Perfect Competition

Since the central concern was whether competitive constant-returns-to-scale models could generate intraindustry trade, it was natural to consider a relaxation of other asumptions of the conventional HOS model. For reasons that will be clarified below, the natural assumption to relax is that of identical technologies.

In fact the textbook one-factor Ricardian model should itself be considered as a paradigmatic model of intraindustry trade. With but a single factor, trade is necessarily in goods with identical factor "intensity." Of course, with constant returns to scale, this gives rise to flat production surfaces, so that even small technical differences suffice to drive the intraindustry trade. In fact, within this simple example lies much of the intuition of what drives intraindustry trade in a competitive constant returns setting.

While accounting for intraindustry trade was not his intent, Bhagwati (1964, pp.9-10) contributed to this line of argument.[10] In surveying the literature on tests of the Ricardian theory of the pattern of trade, which had used comparative labor productivity ratios, he suggested generalizing the Ricardian theory to Hicks-neutral differences in production functions across countries. If one then assumes that both countries have identical factor endowment ratios, equal in turn to the non-substitution-theorem-implied unique factor-intensity observed in each country we again generate a Ricardian "flat" production possibility curve in each country but with different slopes.[11] It is immediately obvious that both goods in each country would be characterised in production by the same factor-intensity, equal to the common factor-endowment ratio of both countries, and trade with complete specialization by each country in commodities with identical factor-intensities would be observed. The generalized[12] Ricardian model used here then generates 100% intraindustry trade: each of the two countries exports a unique commodity that has the same factor-intensity in equilibrium. This demonstrates that giving up perfect competition is not necessary to generate intraindustry trade; giving up the assumption of identical production functions is sufficient.

The paper by Davis (1992) also departs from the conventional HOS setting by introducing Ricardian cross-country technical differences. He argues that this departure is not only defensible, but eminently reasonable given central characteristics of the problem of intraindustry trade. Two points are emphasized: first, the characterization of intraindustry trade as trade in goods of similar factor intensity; and second, the emphasis within this literature on the large number of goods being traded (large here being understood as large relative to the number of primary factors).[13] Both characteristics tend to make production possibility surfaces have “flats” -- precisely the setting in which Ricardian technical differences matter.

The approach of Davis has two advantages. First, it dramatically simplifies the demonstration of the consistency of intraindustry trade with a factor proportions view of the world. Second, since it is developed within the Dixit-Norman-Helpman-Krugman FPE framework, it facilitates direct comparison with the alternative hypothesis of increasing returns as the source of intraindustry trade. This includes a full graphic mapping of endowment patterns within the FPE set into trade patterns. Among the results is a demonstration in a factor proportions setting of 100 percent intraindustry trade among countries with identical endowment proportions. In the two-country setting, intraindustry trade is encouraged by two characteristics: (1) Similarity of endowments, so that the countries will have the same general industrial structure; and (2) Specialization within industries. Increasing returns at the firm level offers one reason for specialization, but it need not be the only reason. Ricardian technical differences offer an alternative.

E. The Volume of Trade in a Multilateral World

Chipman (1992) also breaks ground on a fascinating problem, that of the volume of bilateral trade in a factor proportions world with more than two countries. He notes that it is often claimed that if world trade were driven by factor differences, then most trade should be between dissimilar countries. He disputes this, and develops a counterexample based on a model with three goods, factors and countries. Technologies and preferences are again Cobb-Douglas. Two of the countries are designed to be broadly similar in their endowments, and a third different from the first two. Two of the goods are designed likewise to be similar technically, while the third is more distinct. In order to judge the similarity of technologies and endowments, he develops metrics for each. While the metric developed for the similarity of technologies is broadly plausible, there are greater difficulties with the metric on the similarity of endowments. Unfortunately, ordering by the metric is sensitive to the units in which factors are measured, and so the particular example developed is not compelling. Nonetheless, Chipman makes two important contributions here, first to recognize the importance of the problem of bilateral trade volume, and second to see intuitively that a large volume of trade between "similar" countries is not inherently problematic for a factor proportions model.

Davis (1994) likewise addresses the problem of bilateral trade patterns in a world of many countries. He begins by articulating the features of the conventional factor proportions models that apparently have convinced many that it would be surprising to find large volumes of trade between similarly endowed countries. In the case where factor prices fail to equalize, he shows that the conventional argument rests on the idea that countries in different cones will produce virtually disjoint sets of goods. He shows that this rests crucially on the conventional restriction to two factors. He also considers the argument in the case where factor prices are equalized. He extends the conventional argument, as per Helpman and Krugman (1985), to a world with many countries, factors and goods, demonstrating the robustness of the conventional exercise. Yet he also demonstrates that the conventional argument fails to address the right question, as is suggested by the fact that this account provides no measure of which countries are most similar. He suggests that the conventional accounts falter by confounding the net and gross factor content of trade. The traditional Heckscher-Ohlin-Vanek theorem gives results on the net factor content of trade, while trade volume is a measure of gross factor flows weighted by the competitive rentals. The possibility of significant implicit cross-hauling of factors in intraindustry trade can lead trade volumes to be large even when net factor trade is small. He illustrates these possibilities with a pair of striking examples, each with four goods, factors and countries. The examples developed are not vulnerable to the criticism that similarity of endowments depends on the units in which factors are measured. As elsewhere, strong symmetry assumptions are imposed to make the analysis transparent. In one case, trade patterns are conventional, the two Northern countries trading primarily with Southern counterparts. In the second example, trade patterns defy the conventional logic, each of the Northern countries having the other as the largest trading partner, and similarly for countries of the South.

IV. Conclusions

Is a large share and volume of intraindustry trade surprising in a factor proportions setting? The theoretical arguments developed here strongly suggest that it is not. Chipman's aggregation theorem demonstrates that in principle any proportion of intraindustry trade can be reconciled with a factor proportions model. The work of Chipman, Davis, and Rodgers goes further in exploring the characteristics of factor proportions models that facilitate a large share of intraindustry trade in total trade. Finally, Chipman and Davis likewise suggest in a many-country setting, neither is it anomalous to find a large volume of trade between similarly endowed countries.

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Endnotes

1. In doing so, we draw extensively also on the research of Donald Davis (1992) on intraindustry trade as part of his dissertation at Columbia University and subsequently [Davis (1993)(1994)].

2. We may recall the questions raised by this procedure, unresolved to this date, when the Chamberlin-Robinson revolution broke out in the early 1930s, and particularly Robert Triffin's (1933) argument that there was no persuasive way to break and segment the chain of commodities into industry groups and that it was best to abandon the concept of industry. Evidently, while theorists are aware of this problem, they have had to proceed as if there was a satisfactory definition of industry as an agglomerate of commodities that are close substitutes in consumption whereas outside-of-industry commodities are less close substitutes with the intraindustry commodities.

3. This emphasis on localized technical change, based on local market conditions, as a source of advantage resonates in the current business school literature, as in Michael Porter's (1990) *The Competitive Advantage of Nations.* Of course, his aim was to account for concentration of activity, but is easily adapted to account for several centers, each based on local characteristics, with intraindustry exchange.

4. This finding of Finger's raises serious difficulties also for the economists who have used the factor-intensity definition of intraindustry trade while also citing SITC data to argue that there is a great deal of intrindustry trade today.

5. To our knowledge, however, any formal demonstration of a "larger" volume of trade between countries with dissimilar rather than similar endowments is not to be found in the literature for the simple reason that the theory of bilateral trade in a multi-country world is practically non-existent.

6. The first author of this paper recalls an argument with the research leadership of the World Bank

some years ago when the Bank appeared to be embracing the new trade theory (of imperfect competition) as more compelling, and this theory was even then being cited by the pro-import-subtitution lobbies and intellectuals in some developing countries as justifying their protectionist preferences. The main argument advanced in favor of the new theory then was precisely the existence of substantial intraindustry trade as shown by SITC data: an assertion that is both empirically irrelevant (as argued in the text) since the SITC data are not aggregated by factor-intensity similarities, and theoretically invalid if it is implied that such trade can be explained only by abandoning the perfectly competitive assumption in the HOS model. Chipman (1991) has made the latter criticism trenchantly.

7. We may note here that, as analyzed in section III.B below, Chipman's (1992) major contribution has been to show that it is indeed possible to account for intraindustry trade even while maintaining all of the assumptions of the HOS framework, denying this core presumption of the new theorists.

8. The most elegant and insightful treatment of intraindustry trade in an imperfectly competitive setting is Helpman and Krugman (1985).

9. A similar exposition of this result appears in Davis (1992).

10. This aspect of the generalized Ricardian model was not remarked on by Bhagwati simply because no one at the time would have thought of defining intraindustry trade (which Bhagwati discussed in the context of Linder's 1961 work in the same survey) as trade in commodities using identical factor-intensities in production.

11. Thus, for example, in the Edgeworth-Bowley box diagram, the box would be identical between countries, the contract curve would be on the diagonal, and one country (say) had a Hicks-neutral absolute and comparative advantage in good X, leading to her production advantage in good X and her exports thereof, if all other fundamentals were identical across countries.

12. It is generalized in the sense that, instead of one factor, we allow for two factors, as in the 2x2x2 HOS model.

13. As suggested by the classic, but neglected, analysis of Vanek and Bertrand (1971).