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INTERNATIONAL SPECIALIZATION AND TRADE IN MANUFACTURES:
AN EMPIRICAL ASSESSMENT*

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I. INTRODUCTION

1. The UNIDO publication 'Competing in a Global Economy: An empirical study on specialization and trade in manufactures' presents a comprehensive picture of international competitiveness in industry. The publication will appear in 1990 and will be published by a commercial publisher. The purpose of this paper is to summarize the study's major findings.

The major objectives of the study are (i) to provide an empirical map of the global landscape of international competitiveness in the various manufacturing industries, (ii) to identify the major sources of such competitiveness and analyze the relationship between these sources and observed patterns of production and trade and (iii) to assess implications of the prevailing patterns and trends of international competitiveness for the various countries, in particular the developing countries.

2. In order to assess the structure of international competitiveness, the changing patterns of production and trade of the various manufacturing industries in both the developed and the developing countries are analyzed. This approach presumes that the composition of manufacturing output and trade 'reveals' underlying competitive advantages of certain countries in certain industries. Consequently, the present analysis of international competitiveness is built around two major theories of international trade which seek to explain the product structure of specialization and trade in manufactures: the factor-abundance theory of trade between substantially differing countries and the economies-of-scale theory of trade between similar countries.

3. The study is divided in three parts which deal with different aspects of specialization and trade. In the first part the structure of manufacturing production and trade is described with the result of a comprehensive and up-to-date portrait of industry worldwide. In this portion of the study an assessment of the interindustry structures of output and trade of different country groups and countries is complemented by a concise account of intraindustry trade in manufactures. The second part draws an empirical picture of the major factors behind international competitiveness and attempts to identify the nature of the relationships between these factors and the patterns of output and trade. Finally, in the third part of the analysis some salient features of trade under imperfect competition are examined with the emphasis on the role of scale economies, industrial concentration and product differentiation.

II. THE STRUCTURE OF MANUFACTURING PRODUCTION AND TRADE

Interindustrial Trends in Manufacturing Production

4. The developed market economies' share of world MVA has fallen since 1970 from a level of over 74 per cent to 60 per cent in 1986. During the same period the shares of both centrally planned economies and developing countries have risen from 15.2 to 20.7 per cent and from 10.5 to 13.3 per cent, respectively. While the prominence of developed market economies has waned in manufacturing output as a whole, they continue to account for a disproportionate share of world output in many industries - notably paper, metal products, electrical machinery and transport equipment.

5. Somewhat surprisingly, the relative decline of the developed market economies' contribution to world MVA is not reflected by any noticeable change in the composition of output of the group as a whole. While specific industries in specific countries have contracted substantially, the interindustrial structure of total manufacturing output in this group has proven to be relatively stable. Several explanations for these results are offered. One of them has to do with the fact that the major source of competitive pressure is often competitors in other developed market economies and the resultant shifts are not reflected in group averages. Another reason could be that much of the structural change experienced by developed market economies has not been of an interindustry variety but rather intraindustry in character. Examples are the emergence of mini-steel plants at the expense of integrated producers or the success of specialized automobile producers at times when the major automobile firms were experiencing severe pressure.

6. As regards the developing countries, the structure of manufacturing output is relatively balanced in countries that are major exporters of manufactures like Argentina, Brazil, Hong Kong, Mexico and the Republic of Korea as well as in countries that are new exporters of manufactures such as Indonesia, Malaysia, Philippines and Thailand. Among the smaller and often poorer developing economies, a disproportionate amount of MVA is accounted for by only five industries - food, beverages, tobacco, textiles and petroleum - which supplied 55 per cent of MVA in 1986. Only one of the remaining 23 industries produced more than five per cent of MVA of the poorer developing countries.

7. In the developing countries significant interindustry shifts in manufacturing output took place over the studied time period - the most spectacular of these shifts being the substantial drop in the share of textiles in MVA. Thus, in the most industrialized of the developing countries the industry's share declined by roughly one-third. The relative reduction of textiles for the group as a whole was balanced by modest gains which were spread across several industries including chemicals, non-metallic mineral products, metal products, non-electrical machinery and electrical machinery.

8. Structural trends and interindustry specialization are, of course, partly determined by the overall performance of the world economy. Dramatic increases in the price of oil and of other commodities in the early 1970s and the following rapid inflation led to slower growth of investment, productivity and income. In all industries the growth of output was affected by the overall slow-down with food products being the only field that did not experience a substantial absolute fall in rates of growth after 1973. Electrical machinery, on the other hand, continued to be one of the most dynamic industries although in some countries growth rates fell by almost one-half after 1973. In general, the deceleration of growth in the developing countries' industries was milder than that in the developed market economies. Some of the more rapidly expanding developing countries seem to have avoided the effects of the overall slow-down in that output growth in several industries - e.g., food products, metal products and electrical machinery - actually accelerated after 1973.

9. It is a widely accepted proposition that increasing similarity among countries in terms of national resource endowments and demand patterns should lead to greater similarity in the countries' interindustry structures too.

This hypothesis, however, finds little empirical support in the data for the 1970s and 1980s. While there was substantial agreement between the industry structures of the developed market economies, patterns of change between 1970 and 1986 showed no tendency for these structures to converge further. By comparison, similarity in the interindustry structures of output was considerably less among the most industrialized of the developing countries, although it had somewhat increased during the above period. Other developing countries showed a consistently low degree of similarity in their interindustry structures with virtually no signs of structural convergence.

10. The lack of any evidence of increasing similarity among interindustry patterns of output may imply that these patterns are moving toward greater specialization in particular industries. As regards the developed market economies, the tendency towards increasing specialization was strong in eight out of the 28 surveyed industrial branches. Among these eight industries - whose contribution to MVA is distinctly higher in the developed market economies than in the world as a whole - are non-electrical machinery, electrical machinery, transport equipment and scientific equipment. Interestingly, the last three of these industries are also areas of specialization for the developing countries that are major exporters of manufactures while other groups of developing countries specialize in tobacco, rubber products and non-metallic mineral products.

11. On the whole the dynamics of interindustry change revealed notable complementarity between the developed market economies and the developing countries. There were only few industries where the direction of change (relative expansion or contraction) agreed between the two country groups. Of the 28 industries in the manufacturing sector, the developed market economies had ten which were expanding in relation to world trends. Eight of these (among them non-electrical machinery, electrical machinery and transport equipment) were found to be contracting in the developing countries. Similarly, among the developed market economies' 18 contracting industries, 15 appeared in the list of expanding industries of the developing countries.

12. If not only the direction of structural change is considered but also its pace is taken into account, interindustry shifts are seen to have proceeded most rapidly in those developing countries that are major exporters or new exporters of manufactures. Nevertheless, patterns of change in these two country groups were quite erratic: periods of rapid growth of an industry were often preceded or followed by periods of contraction.

13. When industries are classified by factor intensities, a number of interesting results emerge for the various country groups. Between 1970 and the mid-1980s manufacturers in the developed market economies have rather quickly moved out of labour-intensive industries. However, in these countries there has not been a concomitant rise of industries that are especially large users of capital. For the developing countries the growth of capital-intensive industries has been rapid, particularly so in several of the larger countries like India, Pakistan and Turkey. Such a result is surprising since the relative prices of investment goods are thought to be high in these countries. Direct government action rather than differences in relative factor prices would seem to be the most likely explanation for this particular result.

Interindustry Trade in a Global System

14. A survey of long-term trends in world trade reveals the dynamic nature of trade in manufactures. A comparison of data on the growth of GDP, MVA and trade shows that manufacturing has provided much of the impetus for overall growth and that exporting has been a major reason for this sector's prominence. Both in the developed market economies and the developing countries growth of MVA was higher than that of GDP between 1960 and the present. Over the same time period growth of manufactured exports in both country groups exceeded growth of manufacturing production. Finally, the growth of manufactured exports has been stronger than the growth of other (non-oil) exports throughout the world. Manufactures accounted for two-thirds of the world's non-oil exports in 1970 but, by the mid-1980s, more than three-quarters of the total were in this form. The increase of the share of manufactured exports in non-oil exports was particularly high in the developing countries. By 1985 these countries' share had exceeded 60 per cent, a value that comes near to the 75 per cent attained by the developed market economies in the same year.

15. Another prominent feature of world trade in manufactures is the dominance of the developed market economies which have accounted for at least four-fifths of the value of world exports of manufactures in every year between 1970 and 1982. By contrast, the developing countries' share of world trade in manufactures (13 per cent in 1985) remains small, although it has more than doubled since 1970. The centrally planned economies' share of world trade in manufactures has steadily declined. By the early 1980s, the value of this group's manufactured exports had fallen below that of the developing countries. The dominance of the developed market economies in world trade of manufactures is further underlined by the fact that in every year since 1970 more than one-half of the world's exports of manufactures was intra-trade among developed market economies.

16. More insight into patterns of trade in manufactures can be gained, if traded goods are grouped in a few broad categories. One of these categories is that of resource-based (Ricardian) goods, i.e., goods that contain a high proportion of natural resources. The direction of world trade in these goods is generally expected to be from developing to developed countries, because much of the world supply of natural resources is found in the former countries. However, this expectation is not corroborated by data for the period between 1970 and 1985. Both for the developed market economies and the developing countries trade in resource-based goods was largely balanced over the studied time period.

17. Another broad category of manufactures is that of so-called Heckscher-Ohlin (H-O) goods. These goods lack the resource dependency associated with Ricardian goods. Their production is based on technologies that are the same everywhere. Furthermore, product specifications of H-O goods are simple or at least universally accepted. In other words, these goods represent a fairly orthodox set of manufactures where the ability to compete internationally depends on the country's availability of labour and capital. Accordingly, the developing countries - which are relatively labour abundant - are expected to be important exporters of labour-intensive H-O goods, whereas the developed market economies - which are usually well endowed with capital - should excel in the exports of capital-intensive H-O goods.

18. Data on net trade in H-O goods reveal a number of interesting facts. The developed market economies have long enjoyed a favourable - and relatively stable - balance of trade in H-O goods which attained its maximum value of \$34 billion in 1981. That situation was reversed in the 1980s and after 1984 the group became a net importer of H-O goods. However, the reversal did not apply to all developed market economies. Among the six largest of these countries, the United States and the United Kingdom were the only ones to experience a significant deterioration in their trading position for H-O goods. By 1985 the United States' net imports of H-O goods exceeded the corresponding net exports of France, the Federal Republic of Germany, Italy and Japan combined. The developing countries' trade in H-O goods was different. They were net importers of H-O goods throughout the 1970s and the size of their trade imbalance grew steadily during that period. However, the relationship changed in 1985 when the developing countries became net exporters of H-O goods. The turnaround was largely due to trade successes of the major exporters whose net exports of H-O goods increased from \$0.5 billion in 1975 to over \$31 billion ten years later.

19. The characteristics of a third category of manufactures, that carries the label product-cycle goods, involve production technologies that are neither stable nor universally available. Instead, they are possessed by those firms that have designed and developed the product or the crucial production process. Access to this knowledge is limited through patent protection or because the research costs required for duplication are great. The prominent role accorded to technology means that a third factor of production becomes an important determinant of competitive ability. In addition to unskilled labour and capital, a country's availability of skilled labour (managers, scientists, engineers etc.) will determine export prospects. Accordingly, it is mainly the developed countries which are expected to possess an international competitive advantage in product-cycle goods.

20. Empirical evidence on patterns of trade in product-cycle goods indicates a high degree of volatility compared to the previous two categories. In general, the developed market economies excel in the production and export of such goods. Net exports of product-cycle goods from the developed market economies rose almost six fold between 1970 and 1980 and attained a maximum value of over \$130 billion in 1981. In the 1980s the value of the developed market economies' net exports has fallen. This was largely due to circumstances in the United States (which is now a net importer) and a decline in the net exports of the United Kingdom. As expected, the developing countries' net trade in product-cycle goods has been negative throughout the 1970s and 1980s, where the maximum value of net imports (\$115 billion) was recorded for 1981. There was a steady increase in net imports of these countries in the 1970s but, again, the beginning of the 1980s marked a watershed. The developing countries continued to be net importers of product-cycle goods in the 1980s, but the deficit had fallen below the level recorded in 1980. The pattern of trade in product-cycle goods differed among various groups of developing countries. The major exporters among these countries recorded the lowest levels of net imports and these have declined since 1980. In large countries such as India, Pakistan and Yugoslavia, net imports of product-cycle goods have increased modestly, while in many of the smaller and generally poorer developing countries net imports of these goods have grown steadily.

Two-way Trade in Similar Products

21. Much of world trade in manufactures takes the form of exchange of goods produced by different industries in different countries. Nevertheless, a large and growing portion of this trade takes place within industries. Known as two-way trade or intraindustry trade (IIT) this is the fastest growing component of global trade in manufactures. More specifically, IIT is defined as the simultaneous export and import of products that are close substitutes, either in terms of factor inputs, consumption or both. According to this definition the following product categories are likely to exhibit IIT: products with different input requirements but high elasticities of substitution in demand, products being produced by industries that transform identical inputs into a range of outputs with different end-uses, and similar products made by similar processes from similar materials.

22. An examination of bilateral trade for developed market economies and a sample of developing countries shows that IIT is most important among the former group of countries where it accounted for more than two-fifths of all trade in manufactures in 1985. This figure is substantially higher than the average recorded for developing countries (about 16 per cent) or any subset of these countries for the same year. The analysis of the pattern of IIT suggests that a positive relationship exists between a country's level of development and the share of IIT. Furthermore, similarity between trading partners fosters IIT. Support for these hypotheses is found in calculations of IIT shares in world trade, in the trade within each country group, the trade between different country groups and in the figures for individual countries. In addition, an examination of trade growth shows that almost without exception IIT has been growing more rapidly than its interindustrial counterpart.

23. Further insight into the nature of two-way trade is obtained when an industry-specific view of IIT is adopted, i.e., the two-way trade of each industry is considered separately. Although the extent of product differentiation is probably greatest in consumer goods industries, producers of capital goods are the most heavily involved in IIT. The prominence of capital goods producers results from their large share in the two-way trade of developed market economies. By contrast, consumer goods figure most prominently in the IIT of developing countries. Finally, of the 90 industries examined in the study, more than two-thirds experienced increases in the share of IIT in total trade between 1970 and 1985. A general conclusion to be drawn from these results is that two-way trade has become an important phenomenon which is not restricted to any particular group of countries or industries.

III. SOURCES OF COMPARATIVE ADVANTAGE

International Patterns of Factor Endowments

24. A number of theoretical models are available to the analyst who attempts to explain comparative advantage. Among these models, the one based on factor endowments as determinants of comparative advantage is most frequently used in empirical work. The factor abundance or Heckscher-Ohlin (H-O) approach to explaining patterns of international specialization and trade deliberately neglects technological as well as demand-based sources of comparative advantage. As a consequence, the approach can only be expected to provide a partial explanation of international competitiveness. Any empirical

application of the factor abundance model should therefore be concerned with the question of how important factor endowments are as determinants of comparative advantage in comparison with other potential sources.

25. A first step towards assessing the role of factor abundance is to select a number of crucial factors of production that are to be studied. The factors presently considered are physical capital, skilled labour, semi-skilled labour and unskilled labour. These factors are essential inputs to manufacturing production in general, where industries differ in respect of their relative requirements of each factor. While capital and the above three types of labour are used in different proportions by different industries, they are non-specific factors in that their use is not restricted to certain industries. This fact warrants the study of their role as general sources of comparative advantage in manufacturing.

26. The first step in the empirical analysis of factor abundance is to draw a picture of the international distribution of factor supplies and to assess changes over time in this distribution. As regards the relative size of factor supplies of the two broad groups of developed market economies and developing countries empirical information presents no surprise. The developed market economies are overwhelmingly rich in physical capital: they commanded about 85 per cent of the world total in 1985. Their shares of skilled labour and semi-skilled labour are smaller, but 1985-levels of 63 and 47 per cent, respectively, were still high by international standards. By contrast, the group has only a marginal share of the world supply of unskilled labour which amounted to three per cent in the mid-1980s. The endowment pattern of developing countries is characterized by the expected relative scarcity of both physical capital and skilled labour and abundance of unskilled labour.

27. More interesting than the distribution of resources between the developed market economies and the developing countries as a whole is the distinction between the various subgroups of the latter broad country group. The major exporters of manufactures have a fairly balanced resource structure with semi-skilled and skilled labour being most important. A similar pattern is found among new exporters of manufactures which are relatively better endowed with unskilled and semi-skilled labour than are the major exporters. A set of ten other developing countries that are of some importance as exporters of manufactured goods accounts for an overwhelming portion of unskilled labour in the entire sample of 47 countries.

28. Long-term shifts in the distribution of factor supplies reveal a significant trend which concerns the redistribution of factors between the two major country groups. Between 1970 and 1985 changes have not been great but have clearly favoured the developing countries. The largest shifts were in the shares of physical capital, mainly due to the rapid accumulation of this factor in several of the most industrialized developing countries. Changes in the endowment pattern for semi-skilled labour were also significant. In 1970, all the developing countries accounted for 46 per cent of the total supply of this resource in the country sample but by 1985 they claimed 53 per cent.

29. When the distribution of factors is linked to broad characteristics of trade in manufactures, a number of relationships that are in accordance with the factor abundance hypothesis can be observed. This is true in particular

for the association between endowments of skilled labour and trade in product-cycle goods and the association between endowments of semi-skilled or unskilled labour and trade in labour-intensive H-O goods. Thus, most of the countries that are net exporters of product-cycle goods are relatively well endowed with skilled labour, while most of the net exporters of labour-intensive H-O goods are characterized by abundance of semi-skilled or unskilled labour.

30. The results linking endowments of physical capital with net exports offer less support for the factor abundance hypothesis than those referring to labour. A possible explanation for this is the assumption required by the factor abundance theory that factors are not internationally mobile. Clearly, such an assumption does not apply to physical capital whereas it appears to be broadly applicable to semi-skilled and unskilled labour. On the whole, a 'weak' version of the factor-abundance hypothesis is not refuted by empirical data. The reason is that this version depends not on a robust relationship between factor endowments and net trade but merely an on-average association between the two elements.

Factor Requirements, Output and Trade

31. The factor abundance hypothesis predicts which country exports/imports which type of products. In this context the relevant characterization of products is in terms of the relative amounts of factor inputs required in production, i.e. in terms of factor intensities. Consequently, the assessment of the various industries' intensities in the use of the four broad factors listed previously is an essential part of gauging trends in international comparative advantage. Furthermore, empirical information on industries' factor intensities is valuable in itself insofar as it allows for an assessment of differences in production techniques between countries.

32. A first step towards categorizing industries on the basis of factor requirements is to calculate factor intensities on average over a large number of countries (in the present case 43). The ranking of industries in terms of the average factor intensities thus calculated were quite stable over the studied time period. Those industries that tended to be relatively heavy users of a particular factor during the 1970s remained so in the 1980s. Industry rankings by physical-capital intensity and human-capital intensity were also similar, suggesting a close relationship between the two inputs. In general, the cross-industry pattern of average factor intensities confirmed most casual impressions regarding relative factor requirements. Thus, industries typically regarded as being heavy users of physical capital - like petroleum refining, petroleum, coal and related products or chemicals - matched expectations. And the same was true for human capital and labour in general.

33. Contrasts were more apparent when variations in factor intensities across countries were examined on an industry-by-industry basis. The largest differences in factor intensity were found for labour with the maximum variation reported for industrial chemicals in the 1970s. A wide variation across countries in labour intensity was observed even among the most labour-intensive industries such as wearing apparel, leather and leather products, footwear and pottery. These results indicate the need for caution when categorizing industries as 'labour-intensive.' Variations among

industries in physical-capital and human-capital intensities were similar in magnitude but considerably lower than those for labour. Most industries that are extensive users of either factor of production reported a relatively narrow range for the corresponding intensities.

34. While there were differences between countries in the factor intensities of a given industry, the country-specific rankings of industries by factor intensities were highly consistent. Statistical tests showed that the null hypothesis of no relationship between countries' industry rankings was clearly rejected. However, in spite of the strong concordance between country-specific industry rankings there was no instance (i.e. no factor and no pair of countries) where agreement between the rankings was perfect. This indicates that 'factor intensity reversals' of a generalized type - meaning the inversion of the order relationship between two industries in a ranking by factor intensity - are pervasive.

35. The results of the factor abundance theory imply a systematic relationship between factor intensity on the one hand and specialization and trade on the other hand. This relationship gives rise to a number of predictions about a country's structure of production and trade. Common to all of them is a certain degree of imprecision in that the knowledge of factor intensities is not sufficient to predict patterns of output and trade in detail.

36. If the factor abundance theory is relevant to the real trading world, a 'bloc hypothesis' may be expected to hold for the relationship between factor intensities on the one hand and output and trade on the other hand. This hypothesis states that, depending on a country's 'factor-abundance profile', comparative advantage is concentrated in the set (or bloc) of industries that use a given abundant factor most intensively. Predictions of this kind are found to be confirmed for the developed market economies. The competitive strengths of these countries are determined by ample supplies of human and physical capital, whereas they are at a substantial disadvantage in the production of labour-intensive goods. The results for developing countries are somewhat different: the expectation that competitive advantages in production would be concentrated in labour-intensive manufactures is not borne out by the data. However, when analogous tests are carried out with export data, some support for the bloc hypothesis is obtained for the developing countries too. Thus, there is evidence for the major exporters' competitive advantage in activities using intensively labour or physical capital. Furthermore, shares in world exports of labour-intensive products were particularly high for one-half of the new exporters of manufactures and for some other developing countries.

37. Another hypothesis from the realm of the factor abundance theory presumes the existence of an on-average relationship between factor intensity and the structure of output and trade. Those industries that employ a country's abundant factors intensively should receive relatively high weights in output and exports within the whole of manufacturing activities. And these industries will also tend to exhibit net exports. A regression analysis, linking net exports to factor intensities provided strong support for this view, in particular for labour-intensive industries. The developing countries excel in this type of exports, while the developed market economies have a pronounced competitive disadvantage. The results for physical and human capital revealed a much more diffuse pattern. The former type of capital was a more important source of the developed market economies' comparative

advantage than might be expected. By contrast, an analogous role of the latter type of capital was identified only for a handful of (mostly large) members of this country group. Among the developing countries, evidence of comparative advantage in industries using large amounts of capital was rare.

The Role of Country Differences and Similarities

38. Trade analysts have usually chosen to explain interindustry patterns of specialization and trade in terms of differences in the economic characteristics of trading partners. This approach is characteristic of the factor abundance theory which attempts to predict patterns of net trade on the basis of differences between countries in factor endowments. The hypothesized systematic relationship between factor supplies and net trade can be subjected to empirical testing. Such tests, carried out on the basis of data for 90 industries in 46 countries, create the overall impression that factor endowments do not exert an overwhelmingly strong impact on net exports/imports. Only less than half of the 90 industries tested showed a significant factor-endowment impact. That picture is altered somewhat when the volume of each industry's trade is taken into account. Industries with a significant impact of endowments on trade accounted for over one-half of all manufactured trade in the country sample and their share has been increasing over time.

39. Confirmation that factor abundance is an important determinant of trade patterns does not, by itself, provide much useful information to the analyst or policy maker. It is more important to know which factors have the greatest influence on trade and whether their significance is changing over time. This issue can first of all be considered for the manufacturing sector as a whole. A sector-wide investigation demonstrated that in the 1970s physical capital had the greatest influence on sectoral comparative advantage in manufactures. The situation changed during the 1980s, however. Skilled labour replaced physical capital as the most important of the factors considered here. The two remaining factors - semi-skilled and unskilled labour - were less conspicuous determinants of comparative advantage in manufactured goods.

40. When the relationship between factor endowments and net trade was analyzed for specific industries, a rather complex picture emerged. Nevertheless, the results allow for several generalizations. First, both the way in which each factor influences the trade of specific industries and the strength of such influence vary over time. Second, if the factor abundance proposition is valid, then its validity is most probably of a 'weak' kind. This is suggested by the finding that there are many industries for which the impact of factor endowments on trade runs counter to H-O expectations.

41. Although factor endowments do not always yield a convincing or complete explanation of trading patterns, the results are sufficiently encouraging to attempt a more general application of the factor abundance model. In such an application a multidimensional version of the H-O model was used to assess the interaction between factor abundance, factor intensities and trade simultaneously. Empirical results derived in this framework support a weak (or on-average) interpretation of the H-O model - in accordance with the preliminary findings reported in the previous paragraph. Thus, even in a complex trading world of many factors, goods and countries, there is a tendency for net trade to be influenced by the interaction between factor endowments and factor intensities.

42. In particular, the results for semi-skilled labour matched quite closely with the predictions of the H-O model. Physical capital and skilled labour seem to be important determinants of sector-wide trading patterns, whereas their impact on comparative advantage of specific industries is ambiguous. There are a number of possible explanations for these findings. Semi-skilled labour represents a category of workers whose skills are closely related to the production process. The factor is a vital input for many industries and a large reservoir of internationally immobile semi-skilled labour would provide a solid basis for specialization and trade in many of the manufacturing industries. Physical capital and highly skilled labour may be even more crucial to the operation of industries. But their impact on the industry pattern of comparative advantage may be weakened by their high degree of international mobility.

43. In the factor abundance model, the differences between countries in factor endowments are shown to be major sources of international trade. However, similarities between countries have come to play an important role in international trade too. Studies based on models other than the H-O genre have concluded that country similarities actually contribute to the international exchange of goods. It has to be borne in mind though that the two interpretations are concerned with different types of specialization and trade. Interindustry forms of specialization and trade are the primary concern of the factor abundance model while explanations that stress the degree of similarity between countries focus on intraindustry forms of specialization and trade.

44. Bilateral patterns of trade in specific industries served to assess effects of country similarities. The underlying hypothesis is that greater country similarities will give rise to larger amounts of bilateral IIT. The empirical results confirmed that similarities in income, market size or relative endowments are positively associated with the level of IIT. In fact, there was no industry where country similarities proved to have a negative impact on the extent of IIT.

IV. TRADE UNDER IMPERFECT COMPETITION

Economies of Scale, Market Structure and International Trade

45. As mentioned earlier, the factor abundance model singles out one particular set of determinants of comparative advantage and therefore cannot claim to yield a comprehensive explanation of international specialization and trade. A number of theoretical models that have been developed in the recent past take account of trade-related issues other than factor abundance. Foremost among the issues associated with the new theories are economies of scale, product differentiation and (more generally) imperfect competition. While a full-fledged empirical assessment of these topics is usually beyond reach, there exists empirical information which can shed some light on alternative forms and sources of international competitiveness.

46. There are at least three empirical variables of interest in this context, namely indicators of scale economies, industrial concentration and product differentiation. While the relationship of the first and the last of these variables to the above-mentioned issues is obvious, industrial concentration is an important characteristic of market structure and hence of the mode of

competition. Industry-specific measurement of each of these variables and subsequent comparisons among industries are expected to put in relief some of the traits of international competitiveness.

47. Empirical measurement indicated that the extent of scale economies varies substantially between industries and generally tends to be greater in developing countries than in developed market economies. The distinction appears to reflect the greater disparities between large and small establishments in the developing countries. Another reason may be that large establishments in developing countries often operate in highly protected markets. Furthermore, scale economies may represent a barrier to entry. There is evidence of the fact that manufacturers in developing countries face the highest entry barriers. And this is especially true in industries requiring relatively large amounts of physical capital or exhibiting scale economies.

48. The results on industrial concentration revealed a much more consistent pattern than was found for scale economies. The same industries tend to be highly concentrated in both developed market economies and developing countries. The degree of concentration in developed market economies, however, is less than in developing countries. These results were derived from a set of industries that were defined in rather broad terms. Similar tests carried out on the basis of detailed data for over 400 United States industries provided additional evidence. The major finding of these tests was that industrial concentration is positively correlated with scale economies and also with capital intensity.

49. It is also of interest to examine the relationship between industrial concentration and export concentration. The major result obtained in this connection is that the two characteristics are positively correlated across industries. Furthermore, both domestic (industrial) and export concentration are high in resource-based industries but low among H-O industries. Export concentration is also high in product-cycle industries, although the degree of domestic concentration seems to depend on the nature of research and development expenditures and on the extent of scale economies.

Intraindustry Trade Revisited

50. Analysts have usually adopted a rather broad frame of reference by studying intraindustry trade in relation to total trade in manufactures. An industry-by-industry analysis can be expected to add to an understanding of these new forms of trade. Industry-specific results - which were based on data for 90 industries located in 47 countries - showed that only a moderate portion of the variation in IIT shares across industries can be explained by scale economies, product differentiation and industrial concentration. In the developed market economies, the share of IIT appears to be positively related to scale economies. The relationship is a weak one, however, and does not apply to developing countries. Nor does product differentiation exert a particularly strong influence on IIT. That result is partially discounted, however, since methods of measurement take account of vertical (rather than horizontal) forms of differentiation. By contrast, the relationship between industrial concentration and the share of IIT is much stronger. Higher levels of concentration significantly reduce the share of IIT in total trade.

51. The mixed results obtained for scale economies and product differentiation, together with the relatively strong influence of industrial concentration on IIT, suggested the desirability of modifying the hypothesis used in tests like these. A basis for such a revision is the expectation that low-concentration industries are likely candidates for the types of IIT which the new models (of monopolistic competition) attempt to explain. In tests of this narrower hypothesis scale economies performed much more impressively. Thus, in the developed market economies the share of IIT among industries with relatively low concentration is significantly and positively influenced by scale economies. A similar, though weaker, result was obtained for the major exporters of manufactures among the developing countries.

52. When the study of IIT was confined to the trade of the developed market economies, the results reported above were corroborated. More specifically, the negative influence of concentration on IIT intensity is most evident among the smaller developed market economies. In large developed market economies the effects of market size apply across a wide spectrum of industries but in smaller countries the intensity of IIT is more closely related to the characteristics of each particular industry. The analysis of IIT intensity also reconfirmed the importance of scale economies, particularly among industries that are not highly concentrated.

53. Despite expectations that the degree of product differentiation influences the share of IIT, no reliable quantitative measure of the independent variable can usually be constructed. Vertical forms of differentiation (for example, differences in product quality) are more easily quantified, however. Drawing on 'factor-abundance' models of IIT, several testable hypotheses can be formulated. Because these models emphasize differences in country endowments, they are best suited for an analysis of IIT between the 'North' (that is, the developed market economies) and the 'South' (developing countries). One hypothesis that can be stated in this context is that IIT between North and South consists of exports (imports) of high-quality (low-quality) versions of a product by the former country group to (from) the latter country group. Data on bilateral trade between pairs of individual countries in North and South served as the basis of a regression analysis to test this hypothesis. The empirical results indicated that conventional forces such as country similarities, income levels and market size influence two-way trade between the North and the South in the same way they affect all this trade. In addition, it became evident that substantial differences in the quality of the products traded by North and South are usually associated with larger shares of bilateral IIT. In other words, the 'distance' between qualities exerts a positive influence on IIT.

V. A RETROSPECTIVE VIEW

54. The main results reported previously can be summarized in a three-part thesis which deals with patterns of specialization and trade of the manufacturing sector in its entirety, of specific industries and among products within an industry. First, competitive abilities in the manufacturing sector as a whole depend mainly on the countries' endowments with physical capital. The availability of skilled labour is also important but the role of this factor is ambiguous. Second, at the level of specific industries a strong competitive position appears to be largely dependent on the availability of semi-skilled labour. Capital which can flow freely across

today's borders has a comparatively weak impact on the industry pattern of trade. It is people who, relatively speaking, are immobile and thus determine comparative advantage. How skilful they are seems to have become the most vital element of competitiveness in many industries. Third, the determinants of specialization within industries are somewhat more complex. Country characteristics such as market size and similarities in relative resource abundance are important but so are industry characteristics like scale economies and the extent of product standardization. While the former characteristics operate mainly on the level of IIT the latter are more important determinants of its share in total trade.