

08/08/2003

**TRADE INTEGRATION AND SHIFTING COMPARATIVE ADVANTAGE IN  
LABOUR-INTENSIVE MANUFACTURES**

Jörg Mayer  
United Nations Conference on Trade and Development (UNCTAD)  
[Joerg.mayer@unctad.org](mailto:Joerg.mayer@unctad.org)

**Paper prepared for the UNU/WIDER Conference on Sharing Global Prosperity  
Helsinki, Finland 6-7 September 2003**

**Abstract.** — A country's comparative advantage in international trade can vary significantly over time not only due to differing rates in the accumulation of production factors or changes in technology, but also due to increased trade integration of other countries. The move towards a more export-oriented development strategy in China and the heavily populated low-income countries in South Asia over the past few years has substantially increased the number of low-skilled workers that participate in world trade. This has contributed to a shift in comparative advantage in labour-intensive manufactures from middle-income towards the integrating low-income countries and may have intensified competition among developing countries for world market shares in labour-intensive manufactures.

Key words — trade, human capital, industrialization, Asia

**Acknowledgements:** An earlier version of some sections of this paper was prepared as background material for UNCTAD's Trade and Development Report 2002. The author is grateful to Nelly Berthault, Sonia Blachier and Arunas Butkevicius for making the export data available and for calculating the concentration indices, and to Enrique Aldaz-Carroll and in particular Adrian Wood for helpful discussion and comments on an earlier version. The opinions expressed are only those of the author and do not necessarily reflect the views of UNCTAD.

08/08/2003

Table of contents

- 1. INTRODUCTION**
- 2. THEORETICAL FRAMEWORK**
- 3. WORLD EFFECTIVE ENDOWMENTS OF HUMAN CAPITAL, LAND AND LABOUR**
  - 3.1 World endowments of human capital, land and labour
  - 3.2 World endowments of different categories of human capital
- 4. THE DISTRIBUTION OF WORLD EFFECTIVE ENDOWMENTS OF HUMAN CAPITAL, LAND AND LABOUR ACROSS COUNTRY GROUPS**
- 5. SHIFTING COMPARATIVE ADVANTAGE**
  - 5.1 Comparative advantage in exporting manufactures and primary products
  - 5.2 Comparative advantage regarding the composition of manufactured exports
  - 5.3 Actual export composition
  - 5.4 Revealed comparative advantage in manufactured exports
- 6. COMPETITION IN EXPORT MARKETS FOR LABOUR-INTENSIVE MANUFACTURES**
- 7. CONCLUSIONS**

References

**APPENDIX: Country coverage, data sources and product classification**

08/08/2003

## 1. INTRODUCTION

It is well known that comparative advantage in international trade shifts over time depending on differences across countries in the rate of factor accumulation and changes in technology. By contrast, it is less often acknowledged that an individual country's comparative advantage can change also due to an increase in the trade integration of other countries. To the extent that comparative advantage based on relative factor endowments depends on only the part of total world factor endowments that is actually involved in global trade, changing degrees of countries' export orientation affect comparative advantage. From this global standpoint, any country that raises its degree of trade integration changes the world's effective relative factor endowments, as well as all countries' effective shares of those endowments. The main contribution of this paper is to provide stylised empirical facts on the relationship between trade integration, effective world factor endowments, and comparative advantage, particularly in exporting labour-intensive manufactures with little skill content.

A large number of developing countries have shifted to more export-oriented development strategies over the past two decades and many of these countries have been increasingly integrated into global trade of labour-intensive manufactures. This applies especially to a number of strongly populated low-income countries, such as China and large South Asian economies including Bangladesh, India and Pakistan. These countries' integration into world trade has strongly increased the number of low-skilled workers that participate in world trade and, as a result, may have altered the comparative advantage of middle-income developing countries. This is because, prior to the late 1980s when low-income Asia started to realize its comparative

08/08/2003

advantage in manufactures of low skill intensity, world trade in manufactures consisted mainly of exchanges between developed and middle-income developing countries, where the middle-income countries had a comparative advantage in labour-intensive manufactures with low skill intensity.

This paper relates to three bodies of literature on differences across countries in the effects of increased trade integration. The first is research on the effects of the entry of the largest low-income countries into world markets on the trade performance of other countries. For example, Wood (1997) observes that the entry of the largest low-income countries into world markets in the 1980s is likely to have altered the comparative advantage of middle-income countries. He asserts that this shift in comparative advantage for middle-income countries partly caused that changes in Latin America's production and trade structure stemming from these countries' opening to trade after the mid-1980s has differed from the experience of East Asian countries after their move towards greater trade openness during the 1960s and 1970s. However, Wood (1997) does not explore empirically what effect the greater openness to trade of the largest low-income countries actually had on the world endowment of low-skilled workers that effectively participate in world trade. This paper contributes to this literature by attempting to fill this empirical gap.<sup>1</sup>

---

<sup>1</sup> There also is a multitude of studies on how China's accession to the WTO influences global trade flows (see, for example, Ianchovichina and Martin (2001)). Developing country policy makers have raised concern about China as a competitor as they fear that China's accession to WTO increases competitive pressure in world markets for labour-intensive manufactures, particularly clothing. Computable general equilibrium models, mostly in the form of GTAP models, have become the most commonly utilised technique for evaluating the effects of changes in market access barriers, such as tariffs and non-tariff measures, within multilateral trade negotiations. Among the most favoured closures of GTAP-models are the neoclassical assumptions of fixed factor endowments, letting factor prices adjust to maintain factor market equilibrium. These assumptions and the focus on the effects of changes in tariff and non-tariff barriers imply that such models are not

08/08/2003

The second body of literature to which this paper relates is empirical work on the development in the effective inclusion of factors of production into world trade. This paper adopts a measure similar to that developed by Spilimbergo, Londono and Szekely (1999) but with a number of modifications: (i) it does not use the per worker adjustment that Spilimbergo et al. (1999) adopted because of their focus on income distribution; (ii) it focuses on the period 1975–2000<sup>2</sup> to allow for a better assessment of the impact of increased trade integration over the past few years; and (iii) the measure concentrates on the effective world endowment of human capital, natural resources and labour.

Finally, the theoretical framework of this paper is based on a modified version of Heckscher-Ohlin trade theory that has recently been employed in, for example, Wood and Berge (1997) and Wood and Mayer (2001).<sup>3</sup> These studies concentrate on countries' relative endowments of human capital, natural resources and labour to explain variation among countries in the shares of manufactures and primary products in their exports and among developing countries in their exports of labour-intensive manufactures to developed countries in exchange for imports of skill-intensive manufactures.<sup>4</sup> The mentioned studies concentrate on a cross-country setting for a specific year (1990), while this paper uses a dataset for the period 1980–2000 to study the impact of shifts in relative factor endowments on comparative advantage and export performance over time.

---

well suited to examine the subject of this paper.

<sup>2</sup> The starting year is 1975 because no education data for China are available for earlier years.

<sup>3</sup> There are of course other trade theories, most importantly the Ricardian theory and the new trade theory. However, the relative attractiveness of the Heckscher-Ohlin theory in the context of this paper is that it focuses on the production function and its factor inputs.

<sup>4</sup> The theoretical underpinnings of this model were presented initially in Wood and Berge (1997) and fully developed in Aldaz-Carroll (2002) who introduces transaction costs, consumer preferences for diversity, and sectorally neutral technological differences across countries into the standard Heckscher-Ohlin-Samuelson model.

08/08/2003

The remainder of the paper is in six sections. The second section outlines the theoretical framework and documents the rise in openness that occurred across the developing world – but especially in China and South Asia – over the past few years. The third section introduces the measure of world effective factor endowments that is used throughout the paper and presents evidence on the evolution of world effective endowments of human capital, natural resources and labour, including of specific skill categories in the total adult population, for the period 1975–2000. The fourth section examines changes in the regional distribution of world effective endowments of these factors. Section five analyses the impact of these changes on comparative advantage in exporting manufactures and primary products and in the composition of manufactured exports distinguishing low-skill and high-skill intensive products. It also compares changes in comparative advantage based on relative factor endowments and a measure of revealed comparative advantage. Section six provides a brief assessment of changes in competition for labour-intensive exports. The concluding section discusses policy implications of the potential tendency towards increased competition among developing countries in exporting labour-intensive manufactures that the move of an increasing number of developing countries, especially large ones, towards an export-oriented industrialization strategy may imply. The Appendix discusses country coverage, as well as definitions and sources of variables.

## **2. THEORETICAL FRAMEWORK**

Heckscher-Ohlin (H-O) theory offers a simple and familiar way of analysing linkages

08/08/2003

between factor supplies and the composition of trade. Recent research (Wood, 1994; Aldaz-Carroll, 2002) shows that H-O theory has a lot of explanatory power if its domain is restricted to broad product categories (rather than specific goods, for which scale economies are often the main determinant of trade) and if capital – physical and financial – is excluded from the list of production factors, because of its international mobility. Empirical studies based on this insight (e.g. Wood and Berge, 1997; Wood and Mayer, 2001; Mayer and Wood, 2001) have found that this specific version of H-O theory explains much of the variation among countries in the shares of manufactures and primary products in their exports, as well as why many developing countries export labour-intensive manufactures to developed countries in exchange for imports of skill-intensive manufactures. The resources whose varying supply among countries causes this variation in export composition among countries are three broadly defined ones: skill (or ‘human capital’, acquired through education, training and experience), land (describing natural resources of all sorts), and labour (the number of people in a country’s labour force). While the essential distinction between manufactures and primary products arises from the differing proportions in which production of these two sorts of goods uses the two factors skill and land<sup>5</sup>, the essential respect in which high-price manufactures (e.g. chemicals and machinery) differ from low-priced manufactures (e.g. wearing apparel) is that the production of high-priced manufactures requires a more highly skilled labour force than the production of low-priced manufactures.

Standard H-O theory discusses the effects of a more rapid increase in the endowment of

---

<sup>5</sup> The econometric results of the empirical studies mentioned above suggest that the production of manufactures also requires somewhat more labour than the production of primary products but usually abstract from this in their graphical representation of the analysis assuming that production of manufactures and primary products is fairly similar in terms of the number of workers per unit of output. This simplifying assumption will also be made for the graphical exposition of the analysis in this paper.

08/08/2003

one factor than in that of the other factor in the context of the relationship between factor endowments and output. A factor-biased increase in resource endowments leads to an increase in the output of the good that uses the more rapidly increasing factor intensively in production. When this factor-biased increase in endowments is distributed equally across countries that participate in world trade, the countries' factor-specific relative endowment positions – and hence comparative advantage – are not affected. By contrast, comparative advantage changes when the endowment of a specific factor increases more rapidly in some countries than in others. Standard H-O theory assumes that countries are fully integrated into world trade so that a country-specific bias in the expansion of production possibilities can arise only on the basis of different rates in factor accumulation. But it is clear that from a global perspective such a bias can arise also by the integration into world trade of a previously largely autarchic country whose factor combination confers a strong comparative advantage on one specific product category and whose production factors account for a sizable share of the total world factor endowment.

This mechanism has received increased empirical relevance from the shift of many developing countries towards more export-oriented development strategies since the mid-1980s. In addition to a wide range of other developing countries, notably Malaysia and countries in the Middle East and North Africa, China and the strongly populated low-income countries in South Asia turned to more outward-oriented development strategies in the late-1980s and early 1990s. Table 1 shows the development of the share of exports in GDP over the period 1970 and 2000 for selected countries and country groups, suggesting that the process of trade integration accelerated significantly in both China and the South Asian countries between 1985 and 1990. While the export/GDP ratio of China almost doubled during this five-year period, it started its increase in

08/08/2003

the South Asian countries also during this period, but experienced and even more pronounced increase during the first half of the 1990s. The particular importance of this simultaneous increase in trade integration rests on the fact that Bangladesh, China, India and Pakistan account for about 40 percent of the world's labour force (as shown in the last column of table 1) and for an even higher proportion of the world's labour force with low skills. This, combined with the rapid accumulation of skills in the first-tier newly industrialised economies in East Asia that had integrated already in the 1960s and 1970s, implies that these countries' integration into world trade relationships is likely to have shifted the comparative advantage of the middle-income countries in East Asia and Latin America away from manufactures of low skill intensity. Prior to that, world trade in manufactures was largely confined to exchanges between developed and middle-income developing countries, thus giving the middle-income countries in East Asia and Latin America a comparative advantage in manufactures with low skill content.

**Insert table 1**

### **3. WORLD EFFECTIVE ENDOWMENTS OF HUMAN CAPITAL, LAND AND LABOUR**

A measure of the development of world effective factor endowments, i.e. the part of total world factor endowments that is actually involved in global trade, can be based on an assessment of countries' trade integration and of how changes in their integration influence the share of total world factor endowments that is actually included in world trading relationships. As such, the

08/08/2003

measure needs to take account of trade openness.

One difficulty with any such measure of world effective factor endowments is that there is no generally accepted measure of trade openness. Existing measures refer either to trade flows or trade barriers.<sup>6</sup> Trade flow measures are frequently used because they implicitly reflect the results of all sources of trade barriers and because the data on which they are based are readily available. One characteristic of trade flow measures that make them particularly attractive for the purpose of this paper is that they reflect the outcome of both structural characteristics of countries (e.g. their geographic location, physical infrastructure, etc) and external factors that affect their trading costs (e.g. external transport links). This means that a trade flow measure considers a country whose geographic location raises its trade costs such that it is cut off from international trade as having zero trade openness, and it does so whether or not the country maintains any policy-induced trade barriers, such as tariff rates or non-tariff measures.

The simplest openness measure based on trade flows is the GDP-ratio of either the sum of imports and exports or of exports alone expressed in US dollar. It seems preferable to concentrate on the GDP-ratio of exports, and this is the measure used in this paper, because the growing integration of some developing countries into international production networks has led to an increase in the direct import content of their exports. Thus, an openness measure based on the GDP-ratio of the sum of imports and exports tends to be biased towards a greater importance of those countries that are part of international production networks.

---

<sup>6</sup> The Sachs and Warner (1995) measure combines outcome and incidence-based measures. But given that it is a zero-one dummy variable, it does not reflect gradual changes and thus cannot be used for the purpose of this paper.

08/08/2003

Another difficulty is to determine whether the openness measure should be based on data in national currency rather than US dollar and whether it should be measured in current or constant prices. The Penn World Tables 6.1 include two trade openness variables: the first one is expressed as the ratio of the sum of exports and imports divided by GDP and measured in current local currency prices, and the second one is the constant price equivalent to the first variable. However, doing the analysis on the basis of these two data series does not alter the general pattern of the results.<sup>7</sup>

A final difficulty with a measure of world effective factor endowments is that there is no generally accepted formula for such a measure. This paper uses a formula that measures the world effective endowment of factor  $f$  by the ratio by the endowment adjusted for each country's trade openness:

$$E_{ft}^w = \sum_i [E_{ift} * OPEN_{it}] \quad (1)$$

where  $E_{ift}$  represents the endowment of factor  $f$  of country  $i$  in year  $t$ , and  $OPEN$  is the measure of trade openness. This means that the degree of a country's trade openness is used as a weight to

---

<sup>7</sup> Apart from the fact that the PWT measures include both imports and exports and hence show very high openness ratios for supertraders, such as Hong Kong (SAE) and Singapore, and that they are available for only 84 of the 90 countries (no data are available for Afghanistan, Iraq, Kuwait, Liberia, Myanmar, and Sudan), the main difference is that according to these measures, especially the current-price series, the increase in China's trade openness between 1980 and 1990 was concentrated in the first half of the decade, while the export/GDP ratio based on current US dollar prices registers this increase to be concentrated in the second half of the decade. However, this affects the country group trajectories of comparative advantage shown in figures 4b and 5b only marginally: regarding figure 4b, using the current-price PWT series results in China's strong move upwards to occur between 1980 and 1985, rather than between 1985 and 1990, and this move appears not to have had an effect on Latin America's trajectory, while using the constant-price PWT series results in all changes in the developing country groups' trajectories to be much smaller than in the figure based on export/GDP ratios measured in current dollar price data; regarding figure 5b, using the current-price PWT series gives a picture almost identical to that using the export/GDP ratio based on current dollar price data, while using the constant-price series results in a picture that is very similar to the one based on non-openness-adjusted data, as shown in figure 5a. The tables and charts based on the PWT series are available from the author on request.

08/08/2003

take account of the fact that factor endowments of closed countries do not compete on world markets with the production factors of open countries. The position of individual countries and country groups relative to the average world effective endowments can be assessed as

$$A_{ift} = \frac{E_{ift} * OPEN_{it}}{E_{ft}^w / n} \quad (2)$$

with the variables defined as in the first equation and  $n$  reflecting the number of countries in the sample.

This formula is closely related to that proposed by Spilimbergo et al. (1999) who study the empirical links between factor endowments, trade, and personal income distribution, based on the idea that income distribution and the impact of trade openness on inequality depend on a country's relative endowments of production factors with respect to the rest of the world. They develop a measure of world effective factor endowments and analyse the evolution of effective world per worker endowments of skilled labour, capital and arable land for the period 1965–1992. Given that this paper does not address income distribution, the measure used here does not use the per worker adjustment.

### 3.1 World endowments of human capital, land and labour

Variation among countries in their endowments of human capital, natural resources and labour rather accurately explains variation among countries in the shares of manufactures and primary products in their exports (Wood and Mayer, 2001). In this paper, a country's endowment

08/08/2003

of human capital is measured by its total number of person-years of schooling, using data from Barro and Lee (2001) and obtained by multiplying average years of schooling by the number of adults (persons aged 15 and above) in the population – the latter being the measure of a country's supply of labour. Total land area is the measure used for the availability of natural resources in each country.<sup>8</sup>

Figure 1 shows how these measures of world endowments of human capital, land and labour have developed over the period 1975–2000. The figure compares the trajectory of world factor endowments that comprise the total number of factors in the 90 countries that are included in the sample with world factor endowments that comprise only the parts of the production factors that actually participate in world trade. The evidence suggests that the increase in adjusted endowments have been much more pronounced than that in unadjusted endowments and that this increase has been particularly pronounced after 1985. The difference is relatively small in land endowments, with the rise in the index of the effective endowment exceeding that of the unadjusted endowment by about 50 percent. Given that the countries' total land area has not changed, this difference entirely reflects the rise in the export-GDP ratio of the 90 countries during the period 1975–2000 weighted by their share in the total land area of the sample. By contrast, for both endowments of human capital and labour the index of effective endowments increased almost twice as much as that of unadjusted endowments since the development in effective endowments of these factors reflect both increased trade openness and factor accumulation.

---

<sup>8</sup> For a detailed discussion of how these three endowment measures are defined, see the Appendix. Wood and Mayer (2001) discuss the limitations of the measures.

08/08/2003

### **INSERT figure 1**

One obvious reason that may explain why the difference between adjusted and unadjusted endowments of natural resources is small, i.e. why relatively little of the world endowment of natural resources has been integrated into world trade, is the varying suitability of natural resources for economic exploitation. This is true for both soil – whose natural fertility is influenced by climatic and geographic conditions, as well as the availability of fresh water – and mineral resources – whose economic value is influenced by resource-specific prospecting and mining techniques. It could also be argued that sub-Saharan Africa (SSA) is the most natural resource abundant region so that the low proportion of natural resources that is included in world trade is caused by the region's continued marginalization in world trade. However, what is much lower in SSA than elsewhere is the absolute level of trade while, allowing for differences in country size, trade-GDP ratios of SSA countries are on average similar to those of other countries (UNCTAD, 1998).

### 3.2 World endowments of different categories of human capital

Variation among countries in their endowment of human capital is a good proxy to explain the skill composition of their manufactured exports (Mayer and Wood, 2001). A country's endowment of human capital can be expressed as the total number of person-years of schooling (as above) or by the part of a country's labour force that has at least some formal

08/08/2003

schooling. The latter appears to be better suited for the purpose of this paper because it shows whether an increase in the skill level of a country's labour force over time is achieved by reducing the share of the labour force that has no formal education or by raising further the skill level of the population that already has basic education.

Thus, to analyse the impact of changes in the integration of the world labour force in international trade and in its skill composition on the pattern of comparative advantage regarding the composition of manufactured exports across countries, it is convenient to classify a country's labour force according to three skill categories: labour with no education (unskilled workers), with basic education (low-skilled workers), and with substantial post-basic education and training (high-skilled workers).<sup>9</sup> Workers with no education are generally not suitable for employment in manufacturing, because they lack literacy and numeracy, unless their lower productivity is offset by lower wages. Whereas the distinction between literate and illiterate workers is straightforward, the line between workers with high and those with basic skills is somewhat arbitrary, but it is most likely found somewhere between incomplete and complete secondary education. Therefore, two specifications of these two variables were used for this paper, based on the inclusion of complete secondary education in the low-skill category (specification 1) or in the high-skill category (specification 2), as discussed in the Appendix. In what follows, only the results referring to the first specification will be reported. However, the general pattern of the results is preserved when the second specification is used.<sup>10</sup>

---

<sup>9</sup> This classification follows Wood (1994). It is clear that equating the skill level of workers with their degree of formal education is not fully adequate because it ignores on-the-job learning and training. Moreover, cross-country comparisons of educational attainments ignore differences in the quality of formal education. However, comprehensive data that would take account of these shortcomings are not available.

<sup>10</sup> Given that educational attainment at the secondary level strongly increased throughout the world, the main effect of using

08/08/2003

While this classification reflects some essential features of reality, it is inevitably crude. Perhaps most importantly, it draws rigid lines between the three skill categories, while in reality there is likely to be scope for substitution among workers with different levels of education, provided that differences in their productivity levels can be offset by corresponding differences in wage levels.<sup>11</sup> Nonetheless, the classification is useful for expositional purposes, i.e. to visualize the general pattern of change in the skill composition of the labour force participating in world trade.

The absolute numbers of unskilled, low-skilled and high-skilled workers participating in world trade has steadily increased throughout the past 25 years, as shown in figure 2a. At the same time, the share of unskilled workers in the total labour force participating in world trade has significantly dropped. By contrast, there has been a strong increase in the share of low-skilled workers, in particular between 1980 and 1990 (rising from 65.9 to 69.5 percent), and in the share of high-skilled workers in the total labour force participating in world trade, in particular between 1990 and 2000 (rising from about 7.3 to 9.8 percent). While the former development roughly corresponds to the period when China and the strongly populated low-income Asian countries

---

the second specification – which allocates complete secondary schooling to the high-skill and incomplete secondary education to the low-skill category, while the first specification allocates all secondary schooling to the low-skill category – is that endowments of both low-skilled and high-skilled workers strongly increase during the period 1975–2000. As a result, the shares of both China and South Asia in world endowments of high-skilled labour increase, while among the other developing country groups the shares of Other East Asia and Pacific and Latin America decline. This means that the trajectory of China, Other East Asia and Pacific, and Latin America in figure 5a and especially figure 5b move more closely together and thus accentuate the tendency towards greater competition in world markets for products that are at the border on both sides of the line between low-skill and high-skill manufactures. The tables and charts based on the second specification are available from the author on request.

<sup>11</sup> The scope for substitution depends on the degree to which skills are sector specific, i.e. the result of experience accumulated ‘on the job’. Where this is the case, moving from one sector to another implies that workers lose part of their skill and thus part of their earning capability.

08/08/2003

started to increasingly integrate into world trade, the latter is likely to reflect mainly the increased importance of intra-industry trade, including in the context of international production networks, that has boosted export value growth of many countries that are relatively well endowed of high-skilled labour without necessarily leading to a concomitant increase in these countries' GDP.<sup>12</sup> A comparison of the openness-adjusted skill composition of the world labour force (figure 2a) with the unadjusted composition (figure 2b) also highlights the mid-1980s and mid-1990s as the two periods when world effective endowments of low-skilled and high-skilled labour changed most.

### **Insert figures 2a and 2b**

Table 2 provides the summary statistics of the position of individual countries relative to the average world effective endowments of human capital, land, labour, and the three specific skill variables for the period 1975–2000. It shows that the distribution of country-specific positions relative to the average world effective endowments of human capital, land and labour – particularly of the unskilled and low-skilled parts of labour – has become less equal over the past three decades. While the standard deviation of the position of individual countries regarding the effective endowment of land has risen only slightly, the same measure for endowments of human capital and labour rose strongly between 1975 and 1995, and indicates a slight move back towards a more equal distribution for the latter half of the 1990s. It is also interesting to note that most of the increase in the standard deviation for the labour variables occurred between 1985 and 1990

---

<sup>12</sup> Horizontal intra-industry trade has usually been confined to the group of developed countries (but sometimes also included parts of the first-tier NIEs), while vertical intra-industry trade with developing countries has usually concentrated on the developing countries that are relatively well endowment of human capital, such as the first-tier NIEs, Malaysia and Mexico. For the importance of intra-industry trade see Hummels, Ishii and Yi (2001) and for a discussion of the impact of the involvement in international production networks on developing country exports and GDP, see UNCTAD (2002,

08/08/2003

and that the strongest increase during this period is for low-skilled labour. Indeed, the measure for low-skilled labour more than doubled between 1975 and 1995 and more than half of this increase occurred in the second half of the 1980s alone. This suggests that the rapidly rising integration of strongly populated countries whose labour force includes a large share of low-skilled workers has played an important role in the distribution of world endowments of labour, and particularly that of low-skilled labour.

### **Insert table 2**

By contrast, the distribution of high-skilled labour shows an almost continuous tendency towards greater equality across countries. This is most likely due to the fact that the number of years that students spend in formal education does not rise indefinitely and that the proportion of the population that obtains a university degree has risen only slowly in developed countries over the past few years. As a result, in those countries that had a well-skilled population already in the 1970s the total number of person-years of schooling increased much less than in the other countries.

Taken together the evidence suggests that increased trade integration has led to an increase in the world effective endowments of all production factors but that the degree of this increase has differed strongly across the different production factors. There appears to have been a particularly strong increase in the integration of low-skilled labour. The fact that changes in the distribution of the adjusted variables are much larger than those in the unadjusted ones and that

08/08/2003

the changes differ across the specific variables indicate that countries' relative factor endowments have indeed changed over the past four decades and that most of the changes occurred in the second half of the 1980s.

#### **4. THE DISTRIBUTION OF WORLD EFFECTIVE ENDOWMENTS OF HUMAN CAPITAL, LAND AND LABOUR ACROSS COUNTRY GROUPS**

The previous section looked at the development of world effective resource endowments. This section examines how the distribution of the world effective endowment of skill, land and labour changed across country groups during the period 1975–2000, looking first at the factors associated with variation in the export shares of manufactures and primary products, and then at factors associated with the composition of manufactured exports regarding labour-intensive and skill-intensive goods. The analysis distinguishes China and eight groups of countries including land-abundant developed countries, land-scarce developed countries, the first-tier NIEs, Other East Asia and the Pacific (i.e. mainly South-East Asia), South Asia, Latin America, Middle East and North Africa, and sub-Saharan Africa. The composition of the country groups is given in the Appendix. All group averages are weighted.

The differences across country groups in the development of their share in unadjusted world factor endowments, which is shown in figure 3a, reflect the different rates of factor accumulation. There is of course no change in the distribution of the world land endowment. There is also little change in the distribution of the world labour force: the shares of the two

08/08/2003

developed country groups have slightly fallen, while those of the developing country groups have slightly risen, except for the first-tier NIEs and China whose shares have remained stable.<sup>13</sup> Cross-regional developments have been most uneven with respect to human capital, which refers to the total number of person-years of schooling and thus reflects differences in the rate of accumulation of both formal education and adult population. China accounts for the highest share and South Asia has moved into second place, while the share of the two developed country groups has fallen significantly over the period 1975–2000.

### **Insert figure 3a**

Contrary to the rather smooth changes in the distribution of unadjusted world endowments, changes in the distribution of effective world endowments were more pronounced, as shown in figure 3b. This is the case in particular for the distribution of the world effective endowments of human capital and of labour where China dramatically increased its share between 1985 and 1990, South Asia strongly increased its share between 1985 and 1995, and the group of Other East Asia and the Pacific increased its share between 1995 and 2000.<sup>14</sup> While the shares of most of the other groups declined somewhat, the two developed country groups saw their shares reduced by almost half between 1975 and 2000.

---

<sup>13</sup> The percentage shares of all country groups reported in figure 3a are slightly higher than those reported in table 1. The reason for this is that the data used for figure 3a refer to adult population (i.e. persons aged 15 and above), while data used for table 1 comprise people who meet the International Labour Organization definition of the economically active population, i.e. all people who supply labour for the production of goods and services.

<sup>14</sup> Part of the increase in the share of the group Other East Asia and the Pacific in world factor endowments of human capital, land and labour between 1995 and 2000 is due to a sizable increase in the export-GDP ratio of a number of countries in this group that reflects a decline in their GDP following the Asian crisis.

08/08/2003

**Insert figure 3b**

The distribution of unadjusted world endowments of the three categories of human capital is shown in figure 3c. The evidence suggests that there have been sizable changes only with respect to low-skilled labour where the share of South Asia almost doubled between 1980 and 2000 and the shares of the two developed country groups sizably declined between 1975 and 2000. China's share increased somewhat between 1985 and 1990 but overall remained fairly stable throughout the period. Again, changes in the distribution of effective world endowments have been much stronger and the most sizable changes occurred in the low-skilled labour category (figure 3d). However, while the openness-adjusted share of South Asia expanded at a rapid rate similar to that of its unadjusted share, its increase was concentrated in the period between 1985 and 1995. More importantly, rising from 22 per cent to 36 percent between 1985 and 1990 the increase in the openness-adjusted share of China in the world effective endowment of low-skilled worker was much larger than either its own unadjusted share or the share of South Asia.

**Insert figures 3c and 3d**

Thus, the evidence presents a rather complex and nuanced picture. While changes in the distribution across country groups of unadjusted world endowments were rather smooth, they were much more pronounced regarding openness-adjusted world endowments. These sizable changes were concentrated in terms of (i) factor specificity as they were strongest in the distribution of low-skilled labour shares, (ii) regional specificity as the strongest increase occurred

08/08/2003

for China and South Asia, and (iii) time as the strongest changes occurred for China between 1985 and 1990 and for South Asia between 1985 and 1995. However, the very strong and abrupt increase in the openness-adjusted share of China's low-skilled labour is much more the result of its rapidly rising trade integration than of upgrading in the educational level of its labour force (which nonetheless proceeded more rapidly than in most other country groups), while the somewhat slower and more continuous increase in the respective share of South Asia is the outcome of a more balanced influence of trade integration and educational upgrading.

## **5. SHIFTING COMPARATIVE ADVANTAGE**

This section examines whether the bias in factor accumulation towards are greater importance of low-skilled labour and in its distribution across country groups towards a greater share of China and South Asia have led to shifts in comparative advantage. To do so, the section looks, first, at the development of relative positions in the endowments of human capital and land in order to examine shifting comparative advantage in exporting manufactures or primary products, and second at the development of relative positions in the endowments of low-skilled and high-skilled labour, in order to examine shifting comparative advantage in the composition of manufactured exports regarding labour-intensive and skill-intensive goods. These two parts of the section look at evidence based on both unadjusted and openness-adjusted endowments in order to distinguish between the influence of factor accumulation and that of trade integration. The section then, thirdly, examines the actual export composition distinguishing between primary products, low-skill and high-skill-intensive manufactures. Finally, the section assesses sectoral

08/08/2003

changes in the composition of manufactured exports on the basis of a measure of revealed comparative advantage. As in section 4, the analysis distinguishes China and eight country groups and uses weighted averages for all variables.

### 5.1 Comparative advantage in exporting manufactures and primary products

Figure 4a shows how the positions of China and the eight country groups relative to the weighted average world per worker endowments of human capital and land changed over the period 1975–2000.<sup>15</sup> The figure is based on data that includes all of the factors that are available in the 90 countries included in the sample so that the changes shown in the figure are due exclusively to different rates of factor accumulation. The evidence suggests that the position of China and the selected country groups with respect to each other in 2000 was still roughly the same as in 1975.<sup>16</sup> This means that the different country groups continued to have comparative advantage broadly in the same categories of products: for the country groups in the South-Eastern quadrant (Latin America, Middle East and North Africa, sub-Saharan Africa) in primary products, for those in the North-Western quadrant (First-tier NIEs and land-scarce developed countries) in manufactures<sup>17</sup> and for those in the North-Eastern quadrant (land-abundant

---

<sup>15</sup> The focus here is on per worker endowments of human capital and land following the finding in Wood and Mayer (2001) that these factors explain well cross-country differences in the share of manufactures and primary products in exports. Although a country size variable in the form of labour is an additional variable that is statistically significant in their regression analysis, the main thrust of the results is preserved if this variable is excluded. Hence, Wood and Mayer (2001) focus their graphical exposition on the per worker endowments of human capital and land, as is done here.

<sup>16</sup> As such the evidence broadly supports the point made by Wood and Mayer (2001) that there has been little change in the positions of broad country groups relative to one another over the past few years. They also plot regional endowments against each other but focus on unweighted averages and do not relate regional endowments to the world average.

<sup>17</sup> However, there appears to have been some change in the relative position between these two country groups. This suggests that comparative advantage regarding the share of manufactures and primary products in their exports has changed

08/08/2003

developed countries) in skill-intensive goods within the categories of both manufactures and primary products. The countries in the Southwestern quadrant (China, South Asia, Other Asia and the Pacific) do not have a comparative advantage in either primary products or skill-intensive products suggesting that their comparative advantage broadly lies in labour-intensive products.

#### **Insert figure 4a**

Another noteworthy feature is that, apart from two main exceptions, there was no major break in the pace of accumulation of per worker endowments of either human capital or land, i.e. the production factors whose relative endowments explain comparative advantage in the share of manufactures and primary products in exports. The two major exceptions are (i) the fact that China's move towards the world average of per worker endowments of human capital started only in the mid-1980s, and (ii) the interruption of the move of Other East Asia and the Pacific towards the world average of the per worker endowment of human capital between 1985 and 1990. However, this latter feature is likely to be strongly influenced by a data problem given the fact that Barro and Lee (2001) report no increase in the number of person-years of schooling for Indonesia for this period, which given Indonesia's weight in the group has a strong impact on the group's average.

The figure also suggests that accumulation of human capital has been very strong in Asia (and particularly so in South Asia and the first-tier NIEs), as well as in MENA, and much faster than in Latin America and sub-Saharan Africa. The two developed country groups stand out

---

to some extent between the first-tier NIEs and land-scarce developed countries.

08/08/2003

because they have accumulated human capital at a sizably lower rate than the world average (a feature already discussed in relation to figure 3a) and because they are the only groups whose positions moved to the right indicating their slow rate of growth in labour endowments relative to the world average.

Figure 4b presents the same evidence as figure 4a but for the effective per worker endowments of human capital and land. This means that contrary to figure 4a, the data are weighted by the degree of countries' trade openness. As a result, changes in the position of the country groups reflect both different rates in factor accumulation and different degrees of trade integration. The picture is largely the same as in figure 4a but with two important differences.<sup>18</sup> The first major difference is that the country groups are distributed more closely around the world average regarding endowments of both human capital and land, except for the group of land-abundant developed countries whose move towards the right is much more pronounced. The fact that the countries are more closely bunched together around the world average may be interpreted as indicating that differences in comparative advantage with respect to the ratio of manufactured to primary exports have become smaller and hence competition on world markets for manufactures has become stronger.

### **Insert figure 4b**

The second major difference is that the move upwards, i.e. more closely towards the

---

<sup>18</sup> Another difference is that sub-Saharan Africa moves to the right indicating that this country group's trade integration weighted by its share in world land endowment has increased less than that of any other country group, as already noted in

08/08/2003

world average in the endowment of human capital, of both China and South Asia was particularly strong between 1985 and 1990 when these countries started to integrate more closely into world trade. Further, this move appears to have had a sizable impact only on the trajectory of Latin America whose comparative advantage moved at least temporarily further towards primary products. While it appears that this effect was small and that its impact quickly lost strength, this finding supports the hypothesis of Wood (1997) who argues that the entry of the largest low-income countries into world markets in the 1980s has altered the comparative advantage of the middle-income countries in Latin America.

## 5.2 Comparative advantage regarding the composition of manufactures exports

The previous section focused on endowments of factors associated with the relative shares of manufactures and primary products in exports, while this section gives a more detailed picture of the shift in comparative advantage regarding the composition of manufactured exports between labour-intensive and skill-intensive manufactures. This product split is important because a major consequence of the increase in the number of low-skilled workers that participate in world trade is likely to be a change in the comparative advantage of middle-income countries in East Asia and Latin America regarding the composition of their manufactured exports. As shown in figure 3c above, these middle-income countries tend to have an average ratio of high-skilled to low-skilled workers above the average of developing countries, though below that of developed countries. This gives them a comparative advantage in low-skilled manufactured exports as long

---

connection with figure 1.

08/08/2003

as the developing countries with a relatively abundant endowment of labour and a low ratio of high-skilled to low-skilled workers, i.e. particularly China and South Asia, are not strongly integrated into world trade. However, once these countries with an abundant supply of labour start to raise the share of low-skilled workers in their labour force and in particular their participation in world trade faster than the middle-income developing countries, the latter tend to experience a weakening in their comparative advantage regarding low-skilled manufactured exports. More importantly, these countries may experience a squeeze as attempts to shift to high-skill manufactured exports run up against the comparative advantage of the developed countries and the first-tier NIEs.

Figure 5a, which focuses on different rates of changes in the endowments of low-skilled and high-skilled labour, suggests three patterns. First, the two developed country groups, the first-tier NIEs and Latin America moved towards the left, i.e. they experienced a decline or even a loss in comparative advantage in low-skill-intensive manufactures. All of these four country groups have a comparative advantage in high-skill manufactures, although for Latin America this appears to have been the case only since 1985. Second, China, South Asia and MENA moved towards the right, i.e. they experienced an increase in comparative advantage in low-skill-intensive manufactures. However, contrary to South Asia and MENA, only China has had a ratio of low-skilled to high-skilled labour above the world average. Third, the group Other East Asia and Pacific shows an S-shape trajectory and thus is the only country group that has experienced several major changes in its endowment combination relative to the world average. While specific

08/08/2003

features of the data that Barro and Lee (2001) report for Indonesia<sup>19</sup> influence the strength of the move towards the left between 1985 and 1990, the change in the group's relative position between the period before 1985 and the period after 1990 is remarkable. It is also interesting to note that the first-tier NIEs had by far the largest increase among all the country groups in the ratio of high-skilled to low-skilled labour.

### **Insert figure 5a**

Similarly to the evidence discussed in the previous section on changes in comparative advantage regarding exports of manufactures and primary products, weighting the differences in changes of endowments of low-skilled and high-skilled labour by differences in the rate of trade integration, as shown in figure 5b, changes the picture in three important respects. First, China acquired a ratio of low-skilled to high-skilled labour higher than the world average only during the late 1980s when it strongly integrated into the world trading system. Second, China's move appears to have had a strong impact on two country groups in so far as it (i) pushed Latin America more strongly than would appear from the data that is not adjusted for trade openness (figure 5a) into a position characterised by a comparative advantage in high-skill-intensive manufactures regarding the composition of manufactured exports and (ii) pushed the ratio of low-skilled to high-skilled labour of Other East Asia and Pacific back to below the world average. Third, the positions of China, Other East Asia and Pacific and Latin America are closer together when their endowment combinations are weighted by trade openness in particular as far as low-

---

<sup>19</sup> According to the Barro and Lee (2001) dataset, in Indonesia the percentage of the population aged 15 and above that has some primary education dropped from 63.5 per cent to 30.4 per cent between 1985 and 1990. This drop was accompanied

08/08/2003

skilled labour is concerned. This suggests that (i) the higher degree of competition in manufactured exports noted in the previous section is due to stronger competition for the exports of low-skill-intensive manufactures, (ii) rising trade integration by China and South Asia is an important factor behind this rise in competition, and (iii) the middle-income countries in Latin America and in Other Asia and the Pacific are exposed most to the rise in competition on world markets for labour-intensive manufactures.

### **Insert figure 5b**

#### 5.3 Actual export composition

The remainder of this section examines the question as to whether this shift among different developing country groups regarding their comparative advantage in the composition of their manufactured exports between labour-intensive or skill-intensive goods has had an impact on the actual shares of the different groups in world exports. It is clear that a countries' actual export composition is influenced by several factors in addition to relative factor endowments and, as mentioned above, this is true in particular for more disaggregated analyses of export composition. Among the main additional factors are the importance of economies of scale that give rise to agglomeration effects and intra-industry trade, market access conditions in the main exports markets, and investment in physical capital, both infrastructure and machinery.

---

by an increase in the share of complete secondary education from 12.3 per cent to 24.2 per cent and by an increase in the share of no formal education from 23.6 per cent to 43.6 per cent.

08/08/2003

Investment in physical capital is of particular importance when comparative advantage shifts because exploiting comparative advantage in a new sector requires investment in additional production capacity.

The actual export composition of China and the eight country groups is presented in figure 6 for the breakdown between primary commodities, low-skill intensive manufactures and high-skill intensive manufactures and the period 1980–2000, except for China for which comprehensive export data are not available prior to 1987. All group averages are weighted.

Considering the finding of figures 4a and 4b that with respect to their endowments with human capital and land the position of the country groups relative to each another has not significantly changed over the past 20 years, the relatively strong changes in their actual export composition, particularly that of the developing country groups, is surprising. In fact, the evidence in figure 6 suggests that the share of primary commodities has strongly declined in all country groups, sometimes from an already low level as in the two developed country groups and the first-tier NIEs, with the notable exception of sub-Saharan Africa and MENA where the change has been much more modest and where the share of primary commodities has actually increased between 1990 and 2000.

The decline in commodity prices has clearly played an important role in this decline of the export share of primary commodities, even though only one of the country groups included in the figure experienced a decline in the absolute value of its primary commodity exports, namely the Middle East and North Africa, which experienced a sharp fall in the value of its petroleum

08/08/2003

exports. While Latin America (cereals, cocoa, coffee, tin and other non-ferrous base metals), Other East Asia and Pacific (natural rubber, tin, petroleum and wood), South Asia (cotton and natural rubber), and sub-Saharan Africa (cereals, cocoa, coffee, copper) also experienced strong declines in the absolute export value of individual commodities, higher earnings from their other primary commodity exports more than compensated for these declines. Some countries have been particularly successful in changing the composition of their primary commodity exports, particularly Chile where the increase in the share of food and other agricultural products in total non-oil exports has almost compensated the strong decline in the share of non-ferrous metals.

The strong decline in the importance of primary commodities contrasts with the strong increase in the share of high-skill intensive manufactures in many of the country groups and in China. However, a very important part of this increase is exclusively due to the rise in the value of exports in the electronics sector. Among the developing country groups, this is the case particularly for China where the share of other high-skill intensive manufactures hardly changed at all between 1987 and 2000. But the electronics sector also accounts for more than three-fourth of the increase in the share of high-skill intensive manufactures in the first-tier NIEs and Other East Asia and the Pacific, and for about half in Latin America. Such products have indeed experienced the strongest rise in export values between 1980 and 2000 and particularly so in developing country exports as shown by Mayer et al. (2003) who argue that much of this increase has been due to double counting and that developing countries, perhaps with the exception of the first-tier NIEs, have been involved mainly in the labour-intensive segments of production networks in the electronics sectors. To the extent that this argumentation is correct, exports in the electronics industry from most developing countries may be better classified as low-skill or

08/08/2003

labour-intensive manufactures.

Contrary to any other group in the figure, South Asia experienced a strong increase in the share of low-skill intensive manufactures in its exports and more than half of this increase occurred between 1985 and 1990. This means that South Asia's upgrading in the educational level of its labour force combined with the region's greater integration into the world trading system was associated with a sharp increase in the importance of labour-intensive products in its export basket. This is likely to be a main reason for the perception that through its greater trade integration, South Asia has realised its comparative advantage in low-skill intensive manufactures as expressed, for example, by Wood (1987). It is also noteworthy that the first-tier NIEs experienced a sharp decline in the share of low-skill intensive manufactured exports during the same period of time and the group experienced a strong upgrading of its export composition towards a greater importance of high-skill intensive manufactures, both from the electronics sectors and other products, between 1985 and 1995. This is probably the basis for the argument that export upgrading in the first-tier NIEs has facilitated the increasing participation of South Asia and China in the world trade starting from the mid-1980s, while there may be little such prospect for greater trade integration following China's accession to the WTO.

#### 5.4 Revealed comparative advantage

While the preceding section focused on changes in the share of broad product categories in the export composition of China and the eight country groups, this section examines the

08/08/2003

evolution of their structure of manufactured exports relative to the world average export composition. This examination is based on a revised version of the Balassa index of revealed comparative advantage<sup>20</sup> and provides evidence on the extent to which there have been changes in the patterns of specialisation over time and to which economies have progressively specialised in one set of industries and reduced their specialisation in another set of industries. The analysis refers to 21 manufacturing sectors – as listed in the Appendix, 11 of these sectors may be classified as low-skill intensive and nine as high-skill intensive, ‘other manufactures’ being a residual category – and to the period 1980–2001. Export data for China are reported only from 1987 onwards because earlier data are incomplete.

Comparing the sector-specific indices of revealed comparative advantage (RCA) based on export data for the periods 1980–1984 and 1997–2001, table 3 shows that there have been relatively small changes in revealed comparative advantage in the two developed country groups in both low-skill and high-skill-intensive industrial sectors. The largest change in the measure occurred in computers and office equipment of land-abundant developed countries where this group lost its revealed comparative advantage. It is also interesting to note that with a revealed comparative advantage in 10 of the 21 sectors the group of land-scarce developed countries performs best among all the groups in the table with regard to manufactured exports as a whole. By contrast, with a revealed comparative advantage in six of the nine high-skilled sectors the land-abundant developed country group performs best with respect to the composition of manufactured exports. Moreover, South Asia is the only group in the table that does not have a

---

<sup>20</sup> The approach used in this section follows Proudman and Redding (2000). The measure of revealed comparative advantage used by these authors evaluates an economy’s export share in a given sector relative to its *average* export share

08/08/2003

revealed comparative advantage in any of the high-skill intensive sector. All three of these features are in line with the findings based on endowment-based comparative advantage shown in figures 4 and 5.

### **INSERT table 3**

By contrast, revealed comparative advantage has changed much more in the developing countries where for most groups the table shows double-digit growth rates of the measure in either direction. This suggests that shifts in comparative advantage have been concentrated among developing countries. Most of the strong positive growth rates in the measure regard sectors of the electronics industry (computers and office equipment, communications equipment, and electrical machinery) and were particularly rapid in China and in Other East Asia and Pacific.

China, South Asia, Other Asia and the Pacific, and Latin America experienced the largest increase in the measure and/or have the largest number of sectors with a revealed comparative advantage in low-skill intensive manufactures. This is the case in particular if one considers that much of the export activities in the electronics industry of these countries are labour- rather than skill-intensive. China, South Asia, Other East Asia and Pacific and Latin America also continue to have a revealed comparative advantage in traditional labour-intensive sectors such as clothing and footwear, leather and travel products and China and the three country groups have increased their revealed comparative advantage in one of these two sectors between the 1980s and the late 1990s.

---

in all manufacturing sectors, rather than to the weighted sum of export shares in all manufacturing sectors. For the advantages of this modification see Proudman and Redding (2000, p. 394).

08/08/2003

These findings support the conclusion above suggesting that competition for export markets in low-skill intensive manufactures among these countries has increased.<sup>21</sup>

## **6. COMPETITION IN EXPORT MARKETS FOR LABOUR-INTENSIVE MANUFACTURES**

The ease with which exporters from developing countries can enter the world market for a specific product depends on a wide range of factors. One such factor is the degree of market competition. Off hand, it would seem that within the manufacturing sector barriers to entry in labour-intensive products may be relatively low because unit-labour costs and price-based competition are more important than in other manufactured products where innovation and hence quality-based competition are of greater relative importance. To the extent that an exporter is integrated into a global production network, factors in addition to comparatively low unit-labour costs play a role. For example, geographic location, i.e. proximity to one of the main developed countries, may be an important determinant in this respect but other factors such as a minimum level of skills of the labour force and a favourable and reliable business climate are clearly also of importance.

In order to assess the degree of competition in world markets for different manufactures, table 4 ranks products according to their degree of concentration in export markets in 1998–2001.

---

<sup>21</sup> MENA also has a sizable number of sectors with a revealed comparative advantage in low-skill intensive manufactures but the low share of manufactures in the group's total exports suggests that the pressure that this group exerts on competition

08/08/2003

It measures concentration in terms of shares of countries rather than firms, as is usually the case.

The table shows that, together with iron and steel (SITC 67) and manufactures of metals (SITC 69), the clothing industry (SITC 84) was the sector with the lowest degree of market concentration: four of the seven product groups of this sector were among the twenty products with the most equal distribution of market shares among exporting countries. It also suggests that the concentration in markets for products in the electronics industry was lower than – or only slightly above – the average for all manufactured products.<sup>22</sup> In other words, on this measure, markets for clothing and electronics have been more competitive than those for most other manufactures. Moreover, the decline in the concentration ratios for the goods in the electronics industry suggests that markets for these products became more competitive during the period 1985–2001.<sup>23</sup> Indeed, the decline in the degree of concentration in these markets was among the highest of all manufactured products. As noted above, the production of these otherwise technology-intensive products includes labour-intensive processes, in which developing countries have increasingly participated in recent years. By contrast, finished products from technology-intensive sectors in industries such as the machinery sector (for example, non-electric engines and motors, steam engines, etc) or transport equipment (for example, aircraft, ships and boats, motor cycles, passenger motor cars, etc) are among those for which the concentration of export market shares is highest. The vast majority of exporters from these industries are from developed countries.

---

in the world market is relatively small.

<sup>22</sup> The 141 manufactured products included in the analysis comprise all those of SITC 5 through 8 less 68 for which reliable data are available.

<sup>23</sup> The decline was calculated as the difference between the average ratio for the period 1984–1986 and that for 1999–2001.

08/08/2003

**INSERT table 4**

For the group of manufactured products taken together, the degree of market concentration appears to have declined and competition to have increased throughout the period 1980–2001, especially between the mid-1980s and the mid 1990s (figure 7). The distribution of export markets became more equal throughout the 1980–2001 period, with this tendency being most pronounced between 1986 and 1988 and during the first half of the 1990s. The timing of such changes in the clothing sector differs from that in the electronics sector. In clothing, market concentration changed little during the first half of the 1980s, but declined continuously between 1987 and 1991. For most of the products in this group, it started to increase slightly in the mid-1990s. By contrast, market concentration for the products from the electronics industry declined throughout the 1980–2001 period and this tendency was particularly pronounced during the second half of the 1980s.

It is clear that a more equal distribution of export market shares does not necessarily imply a higher degree of competition. This is because in sectors where vertical international production sharing has become important, the relocation of specific production processes to other countries implies that exports of the same product tend to be counted more than once, while the associated production processes are complimentary rather than in competition with each other. However, where this is the case competition is transferred onto another level, i.e. it rises with regard to being included into an international production network – be it on the basis of foreign direct investment or of contract-related outsourcing – which is likely to create a tendency towards offering more and more substantial concessions on taxation and trade issues to

08/08/2003

developed country firms in order to compensate shifting comparative advantage within the group of developing countries or cost-cutting and downsizing pressures of the developed country firms.

This means that taken together the findings are in line with the increased participation of developing countries in the production and export of labour-intensive manufactures.

08/08/2003

## 7. CONCLUSIONS

The preceding analysis of the relationship between trade integration, effective world factor endowments and comparative advantage shows a complex and nuanced picture. The increase in world endowments differs strongly across different production factors and was strongest for workers with basic formal schooling. China and South Asia experienced a particular strong rise in their share of the total world endowment of low-skilled labour where the strongest changes occurred between 1985 and 1990 for China and between 1985 and 1995 for South Asia, i.e. when these countries started to strongly increase their integration into the world trading system. Part of this shift is undoubtedly due to strong investment in education in China and South Asia that has caused their rate of accumulation of basic human capital to exceed that of the other country groups. However, the strength of this increased accumulation has been reinforced – and indeed could come to play in world trading relationships – only through the increased integration into the world trading economy.

This shift in the structure of world factor endowments and in the distribution across country groups of the shares in world endowments appears to have led to less differentiation among country groups regarding comparative advantage in manufactured exports, especially in the low-skill category. The middle-income countries in Latin America and in South-East Asia are likely to be exposed most to the rise in competition on world markets for labour-intensive manufactures that the greater integration of China and South Asia has contributed to bring about. This suggestion receives support from the examination of the development of comparative advantage based on relative factor endowments, actual export composition, and a measure of

08/08/2003

revealed comparative advantage. Evidence on changes in the distribution of market shares across countries for different manufactures also indicate that there might be a risk of excessive competition among developing countries in world markets for labour-intensive manufactures and for FDI through participation in the labour-intensive segments of international production networks.

Excessive competition among developing countries could disrupt the development process by causing significant terms-of-trade losses and create frictions in the global trading system. To what extent such potential problems can be avoided will depend on, firstly, the extent to which competitive pressure can be reduced by expansion of demand through faster growth of markets for labour-intensive manufactures in more advanced countries – both the developed countries and the first-tier NIEs. This, in turn, would depend on faster income growth and improved market access. But equally important, it will also depend on whether the building up of competitive pressure can be contained by limiting the growth in supply of labour-intensive manufactures produced for export. This could be achieved by both industrial upgrading in the export basket of the middle-income countries of Latin America and South-East Asia – which in turn depends, to a large extent, on the policies they pursue in such areas as trade, industry and technology – and a slowdown in the increase of reliance on foreign markets that large economies such as China entertain to create jobs and incomes for large segments of their population.

08/08/2003

REFERENCES:

Aldaz-Carroll, E. (2002). Heckscher-Ohlin in logs. Institute of Development Studies. University of Sussex. Mimeo. March.

Barro, R. and J.W. Lee (2001). International data on educational attainment: updates and implications. *Oxford Economic Papers*. Vol. 53 (3): 541–563.

Hummels, D., J. Ishii and K.M. Yi (2001). The nature and growth of vertical specialisation in world trade. *Journal of International Economics*. Vol. 54 (1): 75–96.

Ianchovichina, E. and W. Martin (2001). Trade liberalization in China's accession to WTO. *Journal of Economic Integration*. Vol. 16 (4): 421–445.

Mayer, J., A. Butkevicius, A. Kadri and J. Pizarro (2003). Dynamic products in world exports. *Weltwirtschaftliches Archiv*. Vol. 139 (4): forthcoming.

Mayer, J. and A. Wood (2001). South Asia's export structure in a comparative perspective. *Oxford Development Studies*. Vol. 29 (1): 5–29.

Proudman, J. and S. Redding (2000). Evolving patterns of international trade. *Review of International Economics*. Vol. 8 (3): 373–396.

Sachs, J. and A. Warner (1995). Economic reform and the process of global integration. *Brookings Papers on Economic Activity*, 1995,1: 1-118.

Spilimbergo, A., J.L. Londono and M. Szekely (1999). Income distribution, factor endowments, and trade openness. *Journal of Development Economics*. Vol. 59 (1): 77–101

UNCTAD (1998). *Trade and Development Report 1998*. (New York and Geneva: United Nations).

UNCTAD (2002). *Trade and Development Report 2002*. (New York and Geneva: United Nations).

Wood, A. (1994). *North-South Trade, Employment and Inequality*. (Oxford: Clarendon Press).

Wood, A. (1997). Openness and wage inequality in developing countries: the Latin American challenge to East Asian conventional wisdom. *World Bank Economic Review*, Vol. 11 (1): 33–57

Wood, A. and K. Berge (1997). Exporting manufactures: human resources, natural resources, and trade policy. *Journal of Development Studies*. Vol. 34 (1): 35–59.

Wood, A. and J. Mayer (2001). Africa's export structure in a comparative perspective. *Cambridge Journal of Economics*. Vol. 25 (3): 369–394.

08/08/2003

## APPENDIX

### Country coverage and data sources

#### *Country coverage*

The data set, containing 90 countries and economies, consists of all countries with populations of over 1 million for which a complete set of trade and resource data is available. In addition to China as an individual country, the countries and economies are grouped as follows:

South Asia (6 countries): Afghanistan, Bangladesh, India, Nepal, Pakistan, Sri Lanka.

East Asia (10 countries and economies): Hong Kong SAE, Republic of Korea, Singapore, Taiwan Province of China (first-tier NIEs); Indonesia, Malaysia, Myanmar, Papua New Guinea, Philippines, Thailand (Other East Asia and the Pacific).

Sub-Saharan Africa (21 countries): Benin, Cameroon, Central African Republic, Democratic Republic of the Congo, Gambia, Ghana, Kenya, Liberia, Malawi, Mali, Mauritius, Niger, Rwanda, Senegal, Sierra Leone, South Africa, Sudan, Togo, United Republic of Tanzania, Zambia, Zimbabwe.

Latin America (21 countries): Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Trinidad and Tobago, Uruguay, Venezuela.

Middle East and North Africa (MENA: 8 countries): Algeria, Egypt, Iran, Iraq, Jordan, Kuwait, Syria, Tunisia.

Land-scarce developed countries (16 countries): Austria, Belgium, Denmark, France, Germany, Greece, Ireland, Israel, Italy, Japan, Netherlands, Portugal, Spain, Switzerland, Turkey, United Kingdom.

Land-abundant developed countries (7 countries): Australia, Canada, Finland, New Zealand, Norway, Sweden, United States.

#### *Definition and sources of resource variables*

*H* total person-years of schooling of adult population (15 and over); from Barro and Lee (2001).

*N* total land area (square kilometres per 100 adults); from the World Development Indicators CD-ROM.

08/08/2003

*P* Total number of adults (15 and over); from Barro and Lee (2001).

*Unskilled labour* number of adults (15 and over) with no schooling; from Barro and Lee (2001).

*Low-skilled labour* number of adults (15 and over) with a basic general education; from Barro and Lee (2001).

*High-skilled labour* number of adults (15 and over) with substantial post-basic education and training; from Barro and Lee (2001).

It is not immediately clear where the dividing line between high-skilled and low-skilled workers should be drawn. Case study literature suggests that workers with basic skills require somewhere between four and nine years of schooling. Workers with advanced skills are a mixture of those with similar amounts of formal education, but more training (craftsmen), and those with substantially more formal education (professional and technical workers).

Therefore, two different dividing lines were applied to the data on educational attainment to separate between high-skilled and low skilled workers. The two definitions differ regarding their attribution of workers with complete secondary education to high-skilled or low-skilled *labour*. The acronyms refer to the number of adults for whom the given level is the highest attained:

TH = complete or incomplete higher education

CS = complete secondary education

IS = incomplete secondary education

TS = CS+IS = complete or incomplete secondary education

TP = complete or incomplete primary education

First specification: High-skilled labour 1 = TH and BAS-ED1 = TS+TP;

Second specification: High-skilled labour 2 = TH+CS and BAS-ED2 = IS+TP.

### *Product classification*

The export data are based on COMTRADE and estimates by the United Nations Statistical Office and are further discussed in Mayer et al. (2003). The following explains how the data based on the Standard International Trade Classification (SITC, Revision 2) at the 3-digit level were arranged and aggregated into the product groups used in the analysis. This classification differs slightly from that used in Wood and Mayer (2001) who in some cases used data at the 5-digit level. A precise description of the differences is available from the author on request.

08/08/2003

A. Division between manufactures and primary products

Manufactures (M) correspond to SITC categories 5–9, and primary products (P) to SITC categories 0–4, except that the following items in SITC 5–9 are classified as BP rather than NM:

Radioactive and associated material	524
Pearls, precious and semi-precious stones, other than diamonds (other than industrial diamonds) cut or otherwise worked	667
Non-ferrous metals	68
Live animals not elsewhere specified (including zoo animals, insects, etc.)	941
Non-monetary gold	971

B. Subdivision of manufactures

Manufactures (M) are subdivided into two categories, as follows:

B1. Low-skill manufactures (ML)	SITC
Leather and leather manufactures	61
Rubber articles	62
Cork and wood manufactures, paper and paperboard	63-64
Textiles, clothing, travel goods and footwear	65, 83, 84, 85
Non-metallic mineral products, excl. precious stones	66 less 667
Iron and steel	67
Fabricated metal products	69
Sanitary and plumbing equipment	81
Transport equipment other than road motor vehicles and aircraft	78 (less 781-784) + 79 (less 792)
Furniture and parts thereof	82
Miscellaneous manufactured articles	89
Commodities and manufactures not classified elsewhere other than live animals and non-monetary gold	9 (less 941, 971)
B2. High-skill manufactures (NMH)	SITC
Chemicals and pharmaceutical products	5 (less 524)
Non-electrical machinery	71-74
Computers and office equipment	75
Communication equipment and semiconductors	76, 776
Electrical machinery	77 (less 776)
Road motor vehicles	781-784
Aircraft and associated equipment	792

08/08/2003

Scientific instruments, watches and photographic equipment

87, 88