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The Rise of China and India and the Commodity Boom: Economic and Environmental Implications for Low-Income Countries

By

Ian Coxhead and Sisira Jayasuriya

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The rise of China and India and the commodity boom: economic and environmental implications for low-income countries[1]

Ian Coxhead[2] and Sisira Jayasuriya[3]

The rapid growth of China and, more recently, of India, is having major effects on every facet of the global economy. The supply of labor-intensive manufactured exports (from China in particular) has been accompanied by a huge expansion in their imports both of raw materials and of skill-intensive manufactured parts and components. This 'offshoring' of intermediates production by large, labor-abundant economies has economic and environmental implications for other developing economies drawn into their trade networks. We sketch a trade-theoretic model showing how the growth of the 'giants' generates adjustment pressures on their trading partners and competitors among developing economies. We discuss in particular how differences in relative factor endowments of resource-rich economies can produce quite different outcomes in the context of product fragmentation and expanding commodity trade. We also explore the effects on production, trade, environment and prospects for future growth, recognizing that commodity extraction and production can have strong environmental impacts, particularly in the context of weak institutions and other market failures. We illustrate these different impacts by considering the cases of Indonesia, Malaysia and Thailand and highlight implications for growth, development and policy.

Keywords: Fragmentation, Dutch Disease, Natural Resources, China, India, Southeast Asia

JEL: F14, F18, O13, O14, Q56.

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[1] University of Wisconsin-Madison, Department of Agricultural and Applied Economics Staff Papers No. 528. This draft: July 28, 2008.
[2] University of Wisconsin-Madison, USA, and Norwegian University of Life Sciences, Aas, Norway.
[3] La Trobe University, Melbourne, Australia.

1. Introduction

The rapid growth of China and India, the world's most populous countries and the two largest economies of developing Asia, is transforming the global economic and political landscape.[1] Their emergence as major economic powers, forcing other countries to 'dance with the giants' (Yusuf and Winters 2007) has already led to major changes in trade and investment patterns in Asia, producing an intensification of intra-regional trade and integration. In many ways, this sea-change in international economic organization has highlighted the complementarities among economies, rather than pit them as competitors. When China first began to attract large-scale foreign investment and expand its export-oriented labor-intensive manufacturing industries, the fear that it would become a major threat to the continuing economic growth of developing Asian economies was widespread. It is now clear, however, that for many economies the growth of China (followed by India) has generated a new dynamic, reflected in a pronounced acceleration in intra-Asian trade and regional economic integration.

Intra-regional trade in Asia has been growing much faster than global trade. It doubled during 1995-2004, and has now reached levels comparable to that within the EU (ADB, 2007). In this process, the role of China has been pivotal. China has attracted massive amounts of FDI on a global scale and sourced numerous intermediate goods (both components and commodities) as inputs to final assembly operations destined for export. In the same period, China's total trade grew at an average 14% per year, and its trade with countries in the region tripled. It is important to note however that within the region China is a net importer; given its large overall trade surplus, this means that it has become, indirectly, a key export outlet from Asia as a whole to the rest of the world. The resulting impact on neighboring countries has been twofold: on the one hand, they have experienced competitive pressures in external markets, particularly in labor-intensive manufactured goods destined for markets such as US and Japan; on the other, Chinese growth has attracted their exports, enabling them to benefit from complementarities with the growing Chinese economy.[2]

Production growth in China (and India) demands more than just manufactured components for assembly operations. Demand for all types of primary commodities (fuel, metals, agricultural goods, timber, etc.) has also increased very rapidly.[3] China is now the world's largest consumer of most of the main metals (accounting for a quarter or more of world imports), and a major consumer of energy and many other minerals and primary commodities (Streifel 2006). It is the largest consumer of a wide range of agricultural commodities: wheat, rice, palm oil, cotton and rubber; and the second largest in soybeans, soybean oil and tea. India—arriving later on the fast growth path and yet to embark on Chinese-style industrialization—is fifth in overall energy use (third largest in coal), 7th or 8th in many of the main metals, and a large consumer of agricultural goods (largest in sugar and tea, second largest in wheat, rice, palm oil and cotton). Between 1990 and 2003, Chinese demand for major metals grew at an average of 14.7% per year; since 1999, it has grown at over 17% and absorbed around two thirds of incremental global output. Chinese demand in particular has been the primary causal factor driving the current commodity price boom; if India were to emulate the Chinese growth path, it is not difficult to imagine the impact on global commodity demand and prices.[4]

The growing demand for commodities from these fast-growing economies has led to a global search for suppliers. China in particular, has been reaching out not only to neighboring resource-rich countries, but to suppliers worldwide. Brazil, for example, has seen its exports to China grow by 800% in value terms during 2000-2004, while the value of its imports from China has more than tripled, making China its third most important export destination and its fourth most important import source. Chinese imports from Brazil are concentrated on a narrow range of primary commodities, with iron ore, soybeans, crude oil, wood pulp and bovine leather accounting for over 80 percent of imports (Willenbockel 2007). China signed a free trade agreement with Chile in 2005, and is now that country's second most important trading partner after the US. China's imports from Chile are dominated by copper, followed by wood pulp and fishmeal. China has also started to invest in Latin America, and half of its global FDI stock is now located in that continent. A similar development is seen in Africa, with China and, to a lesser extent India, emerging as major trading partners (Broadman 2007).[5] Though small as a share of total Asian imports, African exports to Asia—dominated by oil, metals and agricultural raw materials—have grown rapidly in recent years, accelerating from an average annual growth rate of 15% during 1990-1995 to 20% in 2000-2005. In 2005 Asia's share of African exports (27%) was nearly equal to that of the EU (32%) or the US (29%). Asian exports to Africa have also been growing rapidly, by an average 18% per year during 2000-2005. These trade links have been reinforced by increasingly strong investment links; Chinese and Indian FDI into Africa, particularly targeting extractive industries, has been growing steadily and the Chinese FDI stock in Africa is now estimated to exceed $1.1 billion. But despite the growth in Chinese and Indian trade and investment links with Africa and Latin America, it is their relationships with the rest of developing Asia that are preeminent. This is due in part to proximity and the historical strength of trade ties, and partly because in Asia—specifically, in Southeast Asia—these links involve dense networks of trade both in manufactures and in primary commodities.

Like the burgeoning trade in manufactured intermediates, trade in commodities (raw or partly processed) can be understood as a form of fragmentation trade—that is, trade in different "slices" of a product (Athukorala 2006). Both are driven by comparative advantage and are made possible by declines in transport costs and in policy-related impediments to trade—although trade in commodities obviously has a much longer history than that in manufactured intermediates. Both types of trade have expanded very rapidly with the integration into global markets of labor-abundant economies capable of specializing in final assembly. Despite these similarities in the two forms of trade, however, there are some fundamental differences. Most importantly, comparative advantage in commodities derives from immobile resources such as mineral-laden or forest-covered land, climate, and so on. By contrast, comparative advantage in manufacturing depends largely on past investments in infrastructure, physical plant and human capital; it is, therefore, something that evolves more quickly and more directly as a result of policy and international market conditions. Comparative advantage in manufacturing sectors can be influenced by domestic policies, and by policies adopted by other economies, when the latter are large enough to move international markets. In this context it seems important to consider the impact of

Chinese and Indian growth on the manufacturing sectors of other developing countries separately from that on commodity sectors.

The literature on product fragmentation is concerned almost exclusively with manufacturing; the analytical models that support it ignore natural resources and primary production. Its growth and welfare implications outside may have limited applicability outside secondary and perhaps tertiary sectors. Even with this caveat, however, there are controversies over the welfare consequences of the growth of fragmentation trade. In an important early contribution, Jones and Kierzkowski (2001) predicted that vertical unbundling with falling trade costs would lead to losses for countries that are 'all-rounders' in integrated production processes, since in a ranking of trading countries they are intermediate in terms of relative factor endowments and lack clear comparative advantage in either skill-intensive production or labor-intensive assembly. Accumulated evidence now indicates that relative factor endowments remain central to outcomes of international integration, but that the prediction that countries with intermediate factor endowment ratios will lose manufacturing industries is an artefact of a model in which only a limited number of goods are produced. In reality, manufacturing lends itself to finer divisions along the value chain through product fragmentation. This is facilitated by trade and investment liberalization, and production networks—often established by multinational enterprises—have profitably exploited international complementarities based on location and factor cost differences to engage in FDI and expand production by specialized parts and components industries; this has been a key factor leading to intensified regional integration and enhanced economic growth, even among 'intermediate' countries.[6]

In reality, of course, manufacturing and associated industries seldom account for more than one fourth of GDP in low income developing economies; in most, agriculture, fisheries, natural resource extraction and the basic processing of raw materials share is much larger. This creates the possibility that a commodity boom may have differential impacts on countries that differ significantly in relative factor endowments and in the initial structure of production and trade. Since the growth of China and India stimulates demand for primary products as well as for manufactured parts and components, these differences are important to our understanding of the economic and environmental impacts of international integration on low-income countries. Until very recently, the trade and growth implications of commodity booms have been analyzed primarily through the lens of Dutch Disease models, but these typically incorporate too little detail on the structure of manufacturing industry to yield insights relevant to fragmentation trade. There is a need for analytical models that can simultaneously address commodity booms and fragmentation trade.

Finally, most activity in resources industries has direct environmental implications, yet the full environmental consequences of growth of the 'giant' economies are only now beginning to be examined. Winters and Yusuf (2007) address environmental impacts of Chinese and Indian growth, but only in terms of the likely impact of growth-related damages *within* those economies. That is indisputably important, but does not account for environmental changes (often with major cross-border spillovers) within the resource-rich developing countries whose trade is now much more closely aligned with the fortunes of the 'giants'. These are typically countries in which market and government failures and weak institutions create a predisposition to excessive rates of environmental degradation. The scale of resource extraction, moreover, is such that the consequences for the global environment are huge. Land use change alone accounts for 18% of global greenhouse gas emissions, most from tropical deforestation; Indonesia is estimated to contribute 30% of emissions from this source, and Brazil another 20% (Stern 2007). Therefore, a commodity boom that stimulates large-scale land use change in the tropics—for instance, the growth of oil palm area discussed later in this paper—will have global as well as local environmental impacts.

In assessing the economic and environmental consequences of growth in the giants, then, it is important to distinguish among types of economy by endowments, economic structure, and associated patterns of trade and potential environmental degradation. Within Southeast Asia—the region with which our analysis is most closely concerned—Malaysia, Indonesia and, to a lesser extent, Thailand are often loosely described as resource-rich, but they obviously differ very significantly in relative endowments of skills, infrastructure and other forms of capital. This is partly due to previous investments and policy regimes. These factors influence how such countries now respond to 'threats and opportunities' emerging from Chinese and Indian growth. Among resource-rich developing countries in general, net changes in welfare emanating from global trade links depend on both the growth of manufacturing and on changes within the commodity and natural resource sectors—and on the intersectoral links between them. The recent literature on fragmentation and economic growth, by focusing on manufacturing in isolation from other sectors, has neglected these interactions. Once they are included, it can more readily be seen that while middle-income resource-rich countries are likely to be able to benefit greatly from both the commodity and the manufacturing boom, low-income resource-rich economies may be confronted with major threats to their longer-term development prospects.

2 Theory

The foregoing discussion has linked changes in trade to changes in the scale and structure of production in developing economies. How do these links operate, and how does the structure of production alter in response, in the short and long run? To explore this, it is important first to establish the determinants of changing patterns of trade in a multi-country context. We draw here on Deardorff (1987)'s two-factor, n-good, m-country model in which the pattern of trade is determined by comparative costs and transport costs or equivalent trade barriers.[7] In our re-interpretation of his model, manufactured goods (z) range over a Dornbusch-Fisher-Samuelson continuum (0,1) and are ranked by the skill-intensity of their production processes. In each country, define the relative factor price $v = w/r$, the ratio of wages for unskilled labor to returns on human capital, or skills. Then cost-minimizing unit input requirements are determined by $a_i(z) = a_i(z; v)$ for $i = K, L$, where K stands for skilled labor and L for unskilled, and

$$k(z; v) = a_K(z; v)/a_L(z; v)$$

is strictly increasing in z. Equilibrium factor prices in each country are determined as part of the global trading equilibrium, and need not be equal across economies due to specialization in production (if two countries had identical factor endowments, then for analytical purposes they could be combined and treated as a single entity). In the absence of transport costs the pattern of trade is determined by comparative production costs, where unit cost for each good in each country is:

$c(z; v) = wa_L(z; v) + ra_K(z; v)$.

In equilibrium, each country produces a range of goods that are contiguous in terms of skill-intensity. If preferences are the same in all countries and trade is unimpeded, then no good is produced in more than one country—the so-called 'neutral' case.[8] This is shown for the example of three developing countries, labeled *A* to *C*, in Figure 1 (adapted from Deardorff 1987), where by assumption, $v^A < v^B < v^C$, which yields the unit cost curves c^A, c^B, and c^C. Then *A* produces the set of the most labor-intensive goods, X_1, *B* the next most labor-intensive set X_2, and *C* the most skill-intensive set, X_3. The table beneath the figure shows the pattern of trade that results; the width of each column in the table corresponds to the segment of *z* along (0,1) occupied by each set.

The factor endowment ranking $k(z; v)$ corresponds to a per-capita income ranking, so we can think of *A* as a low-income country, *B* as lower-middle income, and *C* as upper middle-income. In the neutral case, the poorest country exports the most labor-intensive goods, and richest exports the most skill-intensive goods. In this initial specification of the model, each good is produced and exported only by one country, that in which unit costs are lowest.

In the real world, of course, similar but differentiated goods can be sourced from many countries, and two-way trade is widespread. The model generates somewhat more realistic outcomes once transport costs or equivalent trade restrictions are included. Suppose that transport costs take an iceberg form, so that only a fraction *g* ($0 < g < 1$) of each good exported arrives at its destination. (For simplicity, assume also that transport costs are the same for all goods and countries.) Then a country will import a specific product only if the landed price is less than the domestic cost of production; or (for importer *i* and exporter *j*) if $gc^i(z; v^i) > c^j(z; v^j)$. Comparative cost is now no longer the sole determinant of propensity to produce and export, and as a result, some countries produce some goods solely for home market consumption. This is illustrated in Figure 2, where dashed lines labeled gc^A, gc^B and gc^C show the transport-inclusive import unit costs faced by countries *A, B,* and *C*. The pattern of production and trade is again shown in a table below the figure. In this example some goods (those in the ranges covered by X_2, X_2, X_5, and X_6) are produced in two countries. One country is the sole exporter of each good, while the other produces only for its own domestic market. Production for the home market only occurs for goods at either end of a country's capital-intensity range. Thus, for example, country *B* imports goods in the sets X_1 and X_7, and exports those in $X_3 – X_5$. It also produces X_2 and X_6, even though its production costs are higher than in countries *A* and *C* respectively, because once transport costs are included, *B* can source these goods more cheaply from its own producers.[9]

The transport cost model is analytically useful for two reasons. First, we can mimic the effects of global market liberalization or reductions in other trade barriers by reducing or removing transport costs. It is a simple matter to show how trade patterns will alter in response to such changes. Second, we can simulate the effects of *ceteris paribus* productivity growth (or of policy reforms that have productivity-increasing effects) in just one country, by exogenously lowering its unit production costs relative to those in other countries. The model will then yield predictions about the resulting changes in the pattern of production and trade by each country. If production costs in one country fall, holding others constant, the range of goods produced by that country expands, and this alters the pattern of its exports and imports in predictable ways. It continues to export all goods that it previously exported; but now it adds to its exports those 'marginal' goods that it previously produced only for home consumption—and possibly also other goods that it did not previously produce at all. In doing so, it captures a larger share of the global market at the expense of countries that are adjacent in terms of factor endowments.

This is a comparative static analysis of how enhanced productivity in a country can impact on its trading partners. But we can also use the same intuition to understand the consequences of fast(er) growth driven by improved efficiency in such an economy. In the example of growth in China relative to its trading partners, this model suggests that such growth would cause China to begin producing and exporting new products at *both* the labor-intensive *and* the skill-intensive ends of the range of goods that it produced in the initial equilibrium.[10] Moreover, China's import demand for adjacent 'marginal' goods produced in other countries would also diminish as unit costs fell in its own domestic industries. Meanwhile, any country that is slightly more labor- (skill-) abundant than China will lose global market share at the skill- (labor-) intensive end of its range of exports, as China both expands the range of its own exports and also reduces its own import demand in those sets of goods.

This experiment is illustrated in Figure 3, which shows the effects of a *ceteris paribus* uniform lowering of production costs in country *B*. Country *B*'s new unit cost curve is $c^{B\prime}$; its trading partners face unit costs of imports from *B* as shown by the line labeled $gc^{B\prime}$. The pattern of production and trade specialization is again shown in the table beneath the figure; the reader is invited to compare the width of columns in this table with those beneath figure 2. There it can be seen that the range of *z* covered by X_1' is both smaller and less skill-intensive than X_1 in figure 2; the range X_3–X_5 exported by *B* expands to X_3'–X_5', and so on. If China is equivalent to country *B*, then its growth relative to that in other economies results in a loss to low-income economy *A* of its most skill-intensive exports, and a loss to *C* of its most labor-intensive exports. However, China's *imports* of goods outside of the range of its comparative advantage would increase (we assume that trade must be balanced both before and after any exogenous change). Increased exports from other countries to China could include intermediate products—that is, the parts and components trade discussed earlier—as well as final goods. Thus, a country that is slightly more skill-abundant than China—country *C*, for example—will lose export market share in its most labor-intensive goods, and at the same time see increased export demand for those more skill-intensive goods where it has retained comparative advantage.

This model generates helpful insights for trends in international trade. For the purpose of analyzing developing country outcomes, however, its applicability is limited in that its input side is restricted to two factors of production, while the issues with which we are concerned involve endowments of land or other natural resources in addition to labor and capital. We can augment the basic continuum of goods model, in which manufacturing industries produce a range of goods of differing skill-intensity, by the addition of a resource sector (*y*) (Kreuger 1977). Focusing now on the case of a single price-taking country, the specific factors (SF) model (Jones 1971) provides a convenient starting-point for thinking through the structural implications of trade shocks. The SF model divides capital into two sector-specific stocks, with labor used in each sector and freely mobile between them. For our purposes, one sector can be assumed to produce the resource good; the capital in that sector is composed of an underlying natural resource stock (e.g. soils, forests, fisheries or mineral-laden land) together with the plant and equipment required to exploit or extract it. The other sector uses labor and its own endowment of specific capital (which we refer to as skills) to produce some subset of manufactured goods along the (0,1) continuum. The exact subset of *z* produced will depend on the economy's factor endowments, the scale of production in the resources sector, and international prices. So long as production technologies exhibit constant returns to all factors and diminishing returns to each factor, *v* will reflect the availability of labor relative to skills in manufacturing and will determine the subset of *z* that is produced.

Assuming a flexible wage such that full employment holds in each economy, or $L = L_y + L_z$, we can immediately begin to distinguish country types based on factor endowments. Countries with relatively small endowments of manufacturing sector capital (i.e., skills) will tend to export mainly resource products and to import manufactures; since aggregate skill-labor ratios and per capita incomes are correlated, these are mainly low-income economies. Other low-income countries may have relatively sparse natural resource stocks as well as low stocks of skilled workers in relation to labor; they are likely to have low *v* and to produce mainly labor-intensive (i.e. low *z*-value) manufactures. Resource-poor middle-income economies will have higher *v* and will produce little *y*, but manufactures with higher *z*-values. Resource-rich middle-income economies will initially produce some mix of resource products and more skill-intensive products.

An important observation about this structure is that for given international prices, the structure of manufacturing production in each country depends not only on comparative costs in *z*, but also on conditions in the natural resource sector, since these influence *v* through intersectoral competition in the labor market. A rise in the price of the resource sector's output[11] will raise the value marginal product of labor in that sector, and labor mobility will cause *v* to rise and L_z/K_z (= $[L - L_y]/K_z$) in manufacturing to fall. In response to a shock of this kind, a country previously producing manufactures at the lowest end of the skill-intensity continuum might initiate production of a slightly more skill-intensive good, and could even cease production of its most labor-intensive good. Further increases in resource prices may spur continued movement up the scale of skill-intensity in manufacturing—with corresponding changes in the pattern of trade (Krueger 1977). Thus a resource-rich, wealthy (i.e. skill-abundant) economy, with high v, will export a mix of resource products and skill-intensive manufactures and import labor-intensive manufactures (Norway and the United States are examples). As in the earlier exposition, the range of manufactures produced will depend in part on transport costs, which inhibit international specialization.

In a world of many countries, *ceteris paribus* changes in a single economy that lower its production costs across the board will expand its z-sector production at both the labor-intensive and the skill-intensive ends of its factor endowment range, as already described. The range of manufactures that it exports will increase, and with positive transport costs, the range that it produces for home consumption will also change. This expansion will be fueled by increased imports of manufactures in which other countries have comparative advantage. In the case of growth in a labor-abundant country like China, the additional manufactured imports will tend to be more skill-intensive than that country's own endowments. The expansion will *also* increase the country's demand for imports of resource goods y from resource-rich countries. This will occur both because of the higher overall activity level in the expanding country, and also because growth in its production of z will reduce the amount of labor available to produce y domestically. The spread of fragmentation trade has allowed China to attract and benefit enormously from a surge of FDI by expanding the range of its labor-intensive operations from relatively low technology manufactures such as clothing, garments and footwear to the labor-intensive final assembly segment of much more sophisticated final goods. Thus China has emerged as 'the world's factory,' producing and exporting a variety of manufactures that ranges from highly labor-intensive to moderately skill-intensive. As is well known, this has been accompanied by huge increases in its imports of capital goods and skill-intensive parts and components from richer countries, and of energy, metals, timber, paper, rubber, vegetable oils, and other natural resources from resource-abundant countries.

What of the effects of this growth on other low or middle income economies? If the expanding economy is a 'giant' (that is, if it is large enough to influence world prices) then its growth will have effects on relative prices and resource allocation everywhere. From the foregoing it can now be seen that in the short run, its 'boom' affects the structure of trade and production in other countries through two distinct channels, the markets for *z* and *y*. In those countries, these two effects must also interact.

Consider first a middle-income economy with a higher skill to labor endowment ratio relative to the 'giant' economy. Growth in the latter economy results in the loss to the more skill-abundant economy of its most labor-intensive exports, and also generates an increase in demand for its exports of the resource good, *y*. Within an economy so affected, some labor is reallocated to *y* production. Increased intersectoral competition for labor reduces L_z/K_z, the factor endowment ratio faced by the manufacturing sector. As a result, the skill-intensity of *z* production increases. At the same time, this economy faces increased demand from the 'giant' for its more skill-intensive products. The two effects are complementary: the structure of production and trade should shift toward higher GDP and export shares of resource goods and skill-intensive manufactures alike. Production and export of this country's most labor-intensive manufactures will decline.

What remains unknown in this case is whether the relative factor price $v = w/r$ will rise or fall. The resource sector's expansion will raise the wage, while increased demand for skill-intensive manufactured exports will raise the return on skills. There are two potentially interesting stories. First, in economies where the *y* sector is relatively small, the latter effect will dominate. Since *v* is correlated with a measure of the skill premium in the domestic labor market, then this premium will rise and along with it, the returns on acquisition of education and skills will also increase. A second possibility is that the economy will respond by opening its factor markets. If the resource boom increases intersectoral competition for labor and the resulting rise in *v* would threaten to limit expansion in manufacturing, then it may be rational to open the borders to inflows of unskilled workers.[12]

Next, consider the case of a country with a somewhat lower skill to labor endowment ratio relative to the rapidly growing 'giant'. As the latter economy expands, the poorer economy loses an export market for its most capital-intensive manufactures (as seen in Figure 3), and also faces more intense competition for the same exports in global markets. This exogenous shift in manufacturing sector comparative advantage is accompanied by increased demand for the poorer country's natural resource exports. The expansion of its *y* sector draws out labor from *z*, raising the wage-rental ratio and lowering the *z* sector's labor-skill endowment, L_z/K_z. Consequently, its most labor-intensive manufactures will become less profitable, and some goods at the most labor-intensive end of its range might no longer be produced. But—and here, the similarities with the previous case of a more skill-abundant economy end—the possibilities of expansion at the *more* skill-intensive range of manufactures in the poorer economy are bounded by the expansion that has occurred in the 'giant,' whose unit costs for the poorer economy's most skill-intensive manufactures have fallen.

Even supposing policies to be the same across all economies, the contrasting development implications of different initial endowments are stark. In upper middle-income economies, growth in the 'giant' creates complementarities in manufacturing production and trade. In low-income economies, the same growth creates intensified competition. Moreover, whereas the giant's expanded import demand for *y* is complementary in the wealthier economies with their shift toward more skill-intensive manufacturing, in poorer economies the same change induces intersectoral competition for labor in their most labor-intensive manufacturing industries. Labor costs rise, but there is no offsetting mechanism to raise returns on skilled labor used in manufacturing. Faced with higher labor costs and lower returns to skills, the manufacturing sectors of poorer economies face a growth trap.[13]

3 Some country case studies

It is instructive to look at how the NIEs and other developing Asian economies have evolved during the recent surge of Chinese and Indian growth, and especially since the start of the commodity price boom (Figure 4). The changing composition of exports from selected Southeast Asian countries is shown in Figures 5-7 and summarized in Table 2. These data provide some indications about the way countries' exports have evolved during this period.

The data are obtained from the UN Comtrade database and we use two-digit product divisions. The Standard International Trade Classification (SITC) taxonomy of products used in Comtrade, however, was established in an earlier, pre-fragmentation era when product characteristics, rather than factor content, were the primary determinants of trade flows. Thus the products grouped under SITC 7 (machinery and transport equipment) and SITC 8 (miscellaneous manufactures) display great diversity of capital-labor and skill-labor factor content ratios.[14] Our goal is to distinguish manufactured products by skill-intensity. Accordingly, we use a product breakdown that follows a different classification of industries, by skill intensity. This classification was based on the analysis of R&D expenditures and output of 12 OECD countries in the period 1991-99. (for details, see OECD 2007). The categories based on the OECD classification are summarized in Table 1 (we have combined the OECD categories of low tech and medium low tech into one, and deleted non-manufactures). This classification sharpens the distinction in aggregate data between products with different skill-intensities—subject to the caveat that this analysis relies on a relatively broad sectoral breakdown and, therefore, not all intra-category relative changes are captured. This issue can be especially relevant for products with an extremely high degree of heterogeneity, such as high-technology products.

In evaluating these data it is also very important to bear in mind that causation is not established; other changes besides the growth of trade with China (and to a much lesser extent, India) have of course occurred during this period. Nevertheless, the data suggest a high degree of consistency with the theoretical predictions of the model in section 3, at least as far as the composition of exports is concerned.

Within Southeast Asia, Thailand and Malaysia exhibit recent trends of industrial structure and trade that correspond very closely with the prediction for middle-income countries that have somewhat higher relative skill endowments than the 'giant' economy (in this case, China). In the past decade, their exports of skill-intensive manufactures have grown much faster than those of the labor-intensive manufactures that drove their growth in previous decades. This relative expansion of skill-intensive industries reflects responses both to pressures on their more labor-intensive manufacturing sectors due to the rapid expansion of China's labor-intensive exports, and increased Chinese demand for skill-intensive intermediates as inputs to its labor-intensive assembly operations. The positive effects of Chinese growth are not confined to manufactures, however. Both Thailand and Malaysia have also increased their exports of resource products, including energy, rubber, processed foods, and edible oils, to meet increased demand for these products both as intermediates in labor-intensive manufacturing and as final goods experiencing rapid consumer demand growth. Both countries, in addition, now play host to large stocks of unskilled workers from neighboring countries: Burmese in Thailand, and Indonesians in Malaysia (Manning and Bhatnegar 2004). These ‘labor imports’ have clearly helped dampen cost growth in the most labor-intensive industries, including food crops, plantation agriculture and fisheries, thus slowing the rate of their decline (Kulkolkarn et al. 2007).

Trends in Thai export data (Figure 5) appear strongly consistent with our model’s predictions for a country of type ‘C’. Thailand has considerable resource wealth in the form of agricultural land, but relatively little minerals, oil, gas, or forests. As early as 1990, manufacturing sectors accounted for half of the value of merchandise exports (Table 2), with labor-intensive manufactures and medium-high/skill intensive manufactures each worth about one-fourth. Over the subsequent sixteen years skill-intensive exports rose to 50% of the total, while labor-intensive exports fell to about 10%. Exports of chemicals (SITC 5), which are also capital-intensive, also rose from less than 2% of exports to about 8%. The most labor-intensive resource-based sectors—agriculture and fisheries—experienced sharply declining export shares, but less labor-intensive resource sectors (SITC 4) increased. These trends coincide with the rise of China in world trade and as a trading partner for Thailand (Coxhead 2007), though of course this is not the only factor responsible for observed export share changes. In 2000-06 Thailand experienced a continued slight decline in labor-intensive export share, matched by a modest increase in medium-skill export share, while other shares remained steady.

In a similar case, Malaysian export share trends since about 1990 were dominated by the decline of primary export shares and the rise of skill-intensive exports (Figure 6). Malaysia’s labor-intensive manufacturing exports peaked as a share of total exports in the early 1990s, and have since grown no faster or slower on average than total exports, maintaining a share of just less than 8%. As in Thailand, Malaysia’s high-tech sectors have been prominent beneficiaries of China’s growth (Coxhead 2007; Eichengreen et al. 2004). In Malaysia, however, the shares of medium and high skill manufactures in total merchandise exports have diminished somewhat—although the growth rates of total export values remain robust (Table 2, last column). These share trends reflect Malaysia's substantially greater natural resource wealth, on a per capita basis, compared with Thailand; in particular, the global boom in palm oil demand has had a very large effect on the composition of Malaysia's exports overall.

In contrast to its neighbors, Indonesia appears to fit better the prediction for an economy with a lower relative skill endowment than the 'giant'. With large resource sectors and relatively poorly developed skill-intensive manufacturing industry, Indonesian manufacturing as a whole is squeezed between increasingly intense competition from China, and the Dutch Disease effects of a sustained commodity price boom, itself driven in large part by growth in Chinese and Indian demand. Indonesian manufacturing export shares reveal a much less positive pattern than those for Malaysia and Thailand (Figure 7). The share of labor-intensive manufactures in total exports has diminished by almost one-third since the early 1990s. The shares of medium and high skill manufactures have risen, but not since 2000; in fact, these two categories of manufactures now account for only 19% of non-fuel exports, down from their 2000 peak of 24% (Table 2). Indonesia's manufactured exports overall have experienced a relative downturn since 2000. In that year, labor-intensive and skill-intensive exports together amounted to over 40% of merchandise exports, but the growth of these two categories since 2000 has been miserable, at 3% and 0.1% respectively (medium-skill exports have grown much faster, but from a low base of only 3.8% in 2000). Since 2000, natural resource sectors have once again become dominant in Indonesian exports, with palm oil (in SITC 4) leading the way. Among developing economies, and even within Southeast Asia, Indonesia and Thailand share fairly similar histories of educational attainment, FDI/GDP, and other indicators of potential productivity growth. Yet it seems that Indonesia has made far less progress toward greater sophistication in manufacturing (in the language of our theoretical model, moving rightwards along the *z* axis) than Thailand and its other regional neighbors (Coxhead and Li 2008), and that its progress in this direction has effectively come to a halt since about 2000.

The data strongly suggest that if Malaysia and Thailand are analogous to country 'C' in our model, Indonesia is analogous to country 'A'. Indonesia appears to be an example of a country 'on the cusp' in the sense of having resource wealth as well as considerable tradable manufacturing capacity. Thus the Indonesian case is an inherently interesting one, and raises large questions about optimal (or at least desirable) development strategy.[15]

4. Environmental and economic growth consequences

As far as a resource-rich developing economy is concerned, our model posits that an exogenous shock in the form of a productivity driven expansion in a large trading partner will undercut its most labor-intensive exports, but promote growth in the production and export of resource-based goods and more capital or skill intensive manufactures. Overall, to the extent that the positive income effects of the resource boom are larger, the country should experience a net welfare gain. However, it is possible that even a resource boom that generates such clearly positive direct and short-run income effects may have adverse long-term development consequences. This can be important, but does not emerge in our model because it omits a variety of phenomena associated with specific types of market failures, rigidities and externalities that are likely to be important in a developing country context. The literature on Dutch Disease and the 'curse' of natural resources considers a great number of these (e.g. Humphreys et al. 2007). In the remainder of this section we address three that seem to be of particular importance in the Southeast Asia context, and more broadly among resource-abundant developing economies.

First, the growth of manufacturing in general, and of specific sectors within manufacturing, is argued to generate dynamic productivity gains through a variety of mechanisms: learning-by-doing, inter-industry spillovers of skills and knowledge, and scale-related phenomena leading to endogenous increases in the marginal product of factors employed in manufacturing. The expansion of a resource-intensive sector such as oil or forestry, to the extent that it raises production costs or investment incentives in manufacturing, reduces the potential for these dynamic productivity gains. Thus long-run economic growth may be negatively affected, but more specifically, the economy's future structure will also reflect lower returns to capital (outside of resource sectors) and reduce investments in human capital. In van Wijnbergen 1984, for example, the level of activity in manufacturing raises factor productivity in the future through learning-by-doing effects.[16] A resource boom reduces manufacturing sector output through the familiar Dutch Disease mechanisms, and this in turn lowers the potential for endogenous manufacturing sector productivity growth in the future. The economy's capacity to diversify away from dependence on natural resources is reduced. This effect is enhanced to the extent that resource sector profitability is boosted above its social optimal level if negative externalities generated by the sector—such as adverse environmental and ecological impacts of deforestation or extractive industries—are not fully reflected in private costs. The resulting over-specialization can be important from a welfare point of view when natural resources are subject to increasing extraction costs or outright exhaustion, since in that case the economy's level of specialization in natural resource sectors cannot be sustained in the long run.[17] The capacity of a developing country to implement policies that fully internalize costs of resource sector expansion is often limited by weak institutions and poor governance.

A second possible consequence of the economy's response to higher resource prices and diminished manufacturing export opportunities is that it becomes more vulnerable to trade-based shocks. Because primary commodities usually have low price elasticities of supply, their world prices have much higher variance than do manufacturing prices, which creates volatility in export earnings for price-taking exporters. Volatility is exacerbated by Dutch Disease effects that reduce the size of non-resource tradable sectors and increase that of non-tradable sectors, since changes in demand for the latter are resolved in large part by price adjustments rather than through the intersectoral movement of factors. If investors are risk-averse, this real exchange rate volatility may lead to inefficient specialization; investment in non-resource tradables sectors will be reduced by the higher capital costs needed to cover additional risk (Hausmann and Rigobon 2002; Chen and Rogoff 2002).

Finally, a higher share of income from resource rents is associated with higher inequality (except in cases where ownership of the resource stock is widely distributed; see Deininger and Squire 1996) and weak or corrupt institutions (Mauro 1995; Auty 2001). Greater inequality need not be the source of inefficiency or reduced growth opportunities. However, the concentration of incomes may be indicative of a deeper problem, in which the allocation of resources to rent-seeking rather than to productive activities widens the gap in returns between the two, and so creates an undesirable equilibrium characterized by high returns to rent-seeking and low returns to productive activities and innovation (Murphy et al. 1993). In this equilibrium, entrepreneurial activity is limited to rent-seeking activities, highlighting an interaction effect between resource rents and sectoral allocations of investment and effort that arises when institutions are not robust enough to tax resource rents or to prevent corrupt behavior.

In each of these cases, Dutch disease or related mechanisms reduce returns on investments in the tradable manufacturing sector below socially optimal levels, when long-run welfare growth is the criterion. They are longer-term consequences of a resource boom in a typical developing economy. In general, in the longer run the distribution of investment across sectors will shift to match the changing pattern of comparative advantage, falling in z as a whole and rising in y. Capital will seek to move into y, increasing its output and the corresponding rate of depletion of the underlying natural resource stock. Whether increased activity in the y sector raises or lowers welfare in the long run depends on the rate of exploitation, potential for exhaustion, and the uses to which the revenue stream is put. At the same time, the resource boom contributes in more than one way to reduced investment growth in non-resource sectors, an additional source of foregone growth opportunity.

Some of these issues can be illustrated by considering the case of oil palm. Southeast Asia is the world's dominant producer and exporter of palm oil, a product whose price has recently risen to record highs due to rapid growth of demand, both from traditional sources such as food processors and from burgeoning markets for non-fossil fuel energy sources (palm oil is an ingredient in biodiesel production). Since the early 1980s oil palm area and production have grown tremendously in Malaysia and Indonesia (Figure 8); these countries account for the bulk of the world's commercial oil palm production and about 90% of palm oil exports. Malaysia's oil palm area covers one-eighth of the nation's land area, and its expansion has been claimed to be the cause for 87% of deforestation in that country from 1985-2000 (Wakker 2005). The area of oil palm planted in Indonesia now exceeds that in Malaysia, and is expanding much more rapidly; it has grown from 295,000 hectares in 1980 to 4,120,000 in 2005 (Figure 8, and see Zen, Barlow and Gondowarsito, 2005); oil palm plantations are now a leading cause of deforestation world-wide. This boom has been driven by long-term rises in palm oil prices, recently stimulated by a number of demand shocks, including the switch away from transfats in food preparation, the rapid growth of consumer demand for processed foods, particularly emanating from China and India, and most recently, the global demand for biodiesel as an alternative energy source to fossil fuels.[18] Concern about the national and global environmental effects of oil palm expansion is now widespread.[19]

An ongoing boom in palm oil price is likely to place even greater pressures on the capacity of countries like Indonesia to balance environmental consequences against private pressures for further plantation growth. How well they achieve this will depend critically on the quality of institutions and safeguards for natural resource management. The recent *World Investment Report* (UNCTAD 2007:xxv) conclusion on extractive industries can be readily extended more broadly to resource sectors in general:

> "The quality of government policies and institutions is a determining factor for ensuring sustainable development gains from resource extraction, with or without TNC involvement. The management of a mineral-based economy is complex, and requires a well-developed governance system and well-considered national development objectives. In some mineral-rich developing countries, however, government policy-making may be aimed at short-term gains rather than long-term development objectives. Furthermore, the distribution and use of a host country's share of mineral revenues may be determined with little attention to development."

Whether the development opportunities are exploited or wasted will depend on policy responses and quality of institutions. As demonstrated by Australia, Canada, and Nordic countries—and also by Botswana in more recent times—resource booms can have not only immediate positive effects but, with the right policies, can also pave the way for long term development. Thus growth in China and India offers developing countries both adjustment challenges and opportunities for growth.

Middle-income Southeast Asian economies like Malaysia and Thailand have flourished from the growth of fragmentation trade, in which ever-finer 'slices' of products can be produced in different locations. Some of their neighbors, however, have not—and Indonesia is the leading example. Like other resource exporters, Indonesia, has done well (in trade terms) from the commodity boom. But its manufactured exports—or more specifically, its more skill-intensive exports—have suffered. Once resource wealth is included in the analysis, it seems more likely that countries of the Indonesian type—resource-abundant but not rich in human capital or other inputs to skill-intensive production—rather than the 'all-rounders' identified by Jones and Kierzkowski, will be the real losers from vertically unbundled trade, especially if their resource stocks are vulnerable to overexploitation and exhaustion.

5. Conclusions

The rapid growth of China and India is having major effects on every facet of the global economy, including the environment, and this influence is projected to continue to expand. The growth of these two 'giants' in the developing world has produced a massive surge in manufacturing and services exports as well as in imports of both intermediates and primary commodities. In manufactures, even as competitive pressures have sharpened in labor-intensive export sectors, new growth opportunities have emerged for complementary expansion. Benefiting from trade and investment liberalization, international production networks closely tied to FDI and multinational enterprises have thrived. They have enhanced intra-regional trade and intensified Asian regional integration. The other dramatic impact on global markets has been the commodity price boom, a product of huge increase in demand for energy, minerals and other commodities. This too has had particularly strong effects on resource-rich Asian economies.

In this paper we sketched a model that highlights key economic forces operating on the resource-rich economies. We showed analytically how the growth of the 'giants' generates adjustment pressures on either side of the factor-intensity spectrum of their own factor endowment range. We discussed how differences in relative factor endowments can produce different outcomes in the face of new challenges to pre-existing patterns of comparative advantage. We then used insights from the model to explore the effects on production, trade, environment and prospects for future growth.

An economy's endowments of skills and other factors used in advanced manufacturing are of great importance in establishing comparative advantage when fragmentation trade dominates total trade growth. However, commodity extraction and production has strong economic and environmental impacts, particularly when regulatory institutions are weak, and a commodity boom may also undermine incentives to invest in skills and other factors needed to establish and maintain comparative advantage in the more dynamic areas of manufacturing industry. In resource exporting countries with weak institutions and poor governance, the interactions between low initial capital/skill endowments and a commodity boom could have serious consequences for growth, equity and the environment.

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Table 1: Product divisions used in calculating skill-intensity of exports

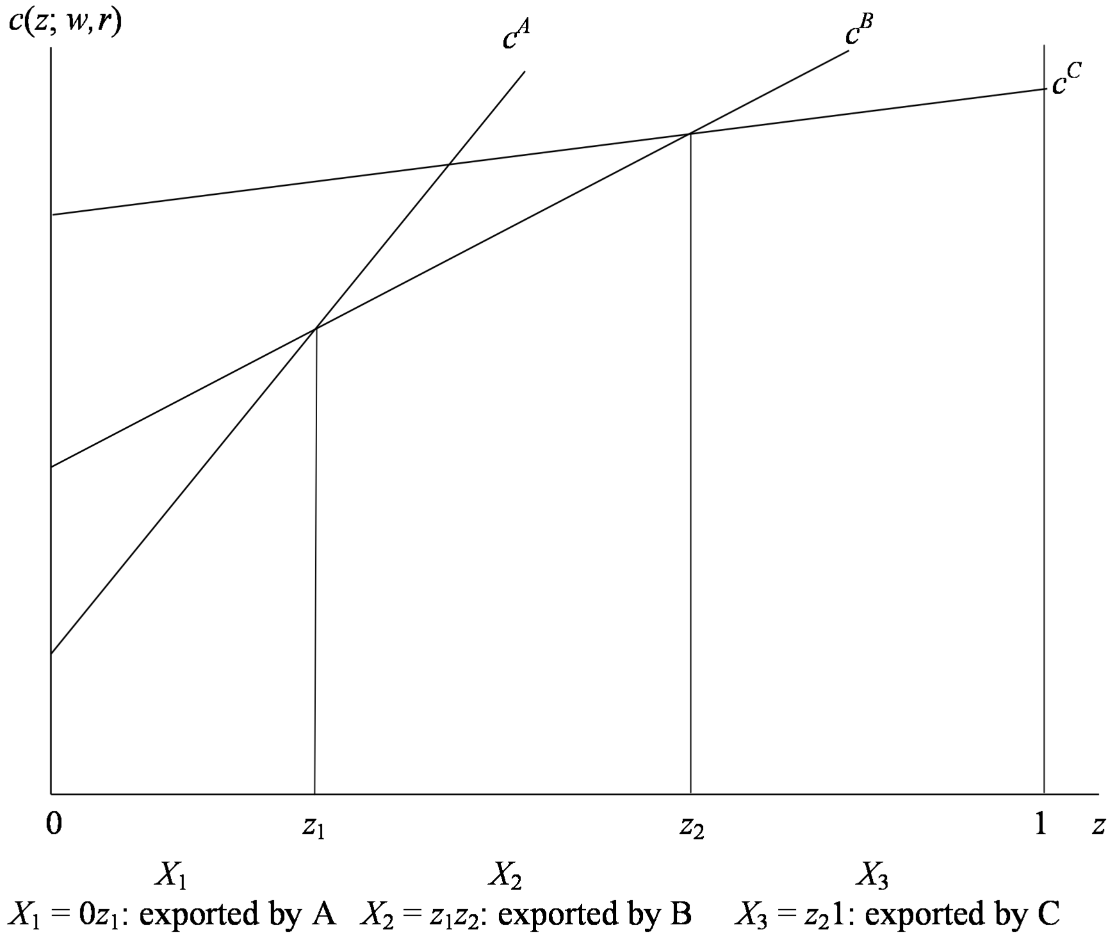
	Product by skill intensity	SITC code
High	Aircraft and spacecraft	95
	Pharmaceuticals	54
	Office, accounting and computing machinery	75, 87,88
	Radio, TV and communications equipment	76,77
	Medical, precision and optical instruments	87,88
Medium-High	Other electrical machinery and apparatus	81
	Motor vehicles, trailers and semi-trailers	71
	Chemicals excl. pharmaceuticals	51,52,53,55-59
	Railroad equipment and other transport equip.	78,79
	Other machinery and equipment	72,73,74
Medium & Low	Rubber and plastics products	62
	Basic metals	67, 68
	Fabricated metal products, excl. machinery	66, 69, 96, 97
	Other manufacturing and recycling	82, 89
	Pulp, paper and printed products	63, 64,
	Textiles, textile products, leather and footwear	61, 65, 83, 84, 85

Source: OECD 2007.

Table 2: Non-fuel export shares and growth for three SE Asian economies

	Share (%) in non-fuel merchandise exports					Ann. gr. rate (%) of export value since 2000
	1980	1990	2000	2005	2007	
Indonesia						
Ag & NR (SITC 00-29)	80.2	30.5	17.3	22.5	25.1	14.92
Veg oils etc (SITC 4)	4.6	2.9	3.8	8.1	12.1	28.61
Chemicals (SITC 5 ex. 54)	1.1	4.2	6.6	7.0	7.3	10.63
Semi-mfctures (SITC 6)	10.0	39.3	26.8	23.3	22.2	6.17
Low-skill mfg nes (a)	1.9	20.0	21.3	16.3	14.3	3.02
Med-skill mfg ex. chem (b)	0.2	1.2	3.8	6.0	7.6	20.24
High-skill mfg (c)	1.8	1.9	20.4	16.8	11.3	0.13
TOTAL	100.0	100.0	100.0	100.0	100.0	7.47
Thailand*						
Ag & NR (SITC 00-29)	62.8	34.9	19.3	17.6	18.0	9.93
Veg oils etc (SITC 4)	0.2	0.0	0.1	0.2	0.2	18.41
Chemicals (SITC 5 ex. 54)	0.5	1.9	6.1	8.4	8.3	17.11
Semi-mfctures (SITC 6)	22.8	14.0	12.6	13.2	13.5	12.57
Low-skill mfg nes (a)	6.8	25.0	13.4	10.8	9.9	5.70
Med-skill mfg ex. chem (b)	0.9	3.9	10.0	16.7	16.9	21.35
High-skill mfg (c)	6.1	20.2	38.5	33.1	33.2	8.50
TOTAL	100.0	100.0	100.0	100.0	100.0	10.74
Malaysia						
Ag & NR (SITC 00-29)	48.0	23.1	5.4	5.9	6.3	10.3
Veg oils etc (SITC 4)	14.8	8.8	3.9	5.4	7.7	19.0
Chemicals (SITC 5 ex. 54)	0.7	1.8	4.1	6.2	6.9	16.0
Semi-mfctures (SITC 6)	17.5	9.9	7.7	8.6	10.3	12.3
Low-skill mfg nes (a)	2.9	10.6	6.9	7.4	7.9	9.8
Med-skill mfg ex. chem (b)	2.1	5.9	4.2	5.6	6.0	13.5
High-skill mfg (c)	14.0	39.9	67.8	61.0	54.9	4.6
TOTAL	100.0	100.0	100.0	100.0	100.0	7.26

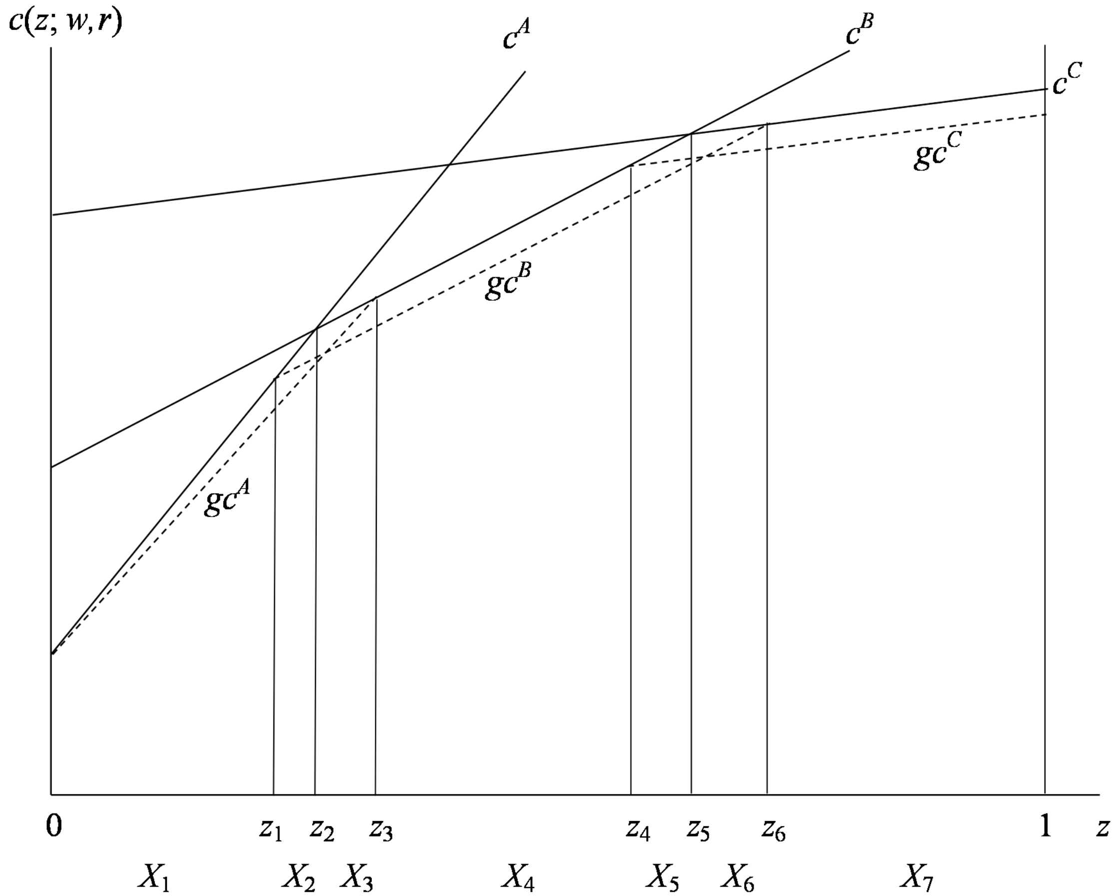
Source: UN Comtrade. * Last year is 2006



	X_1	X_2	X_3
A	●	○	○
B	○	●	○
C	○	○	●

● Exported ○ Imported

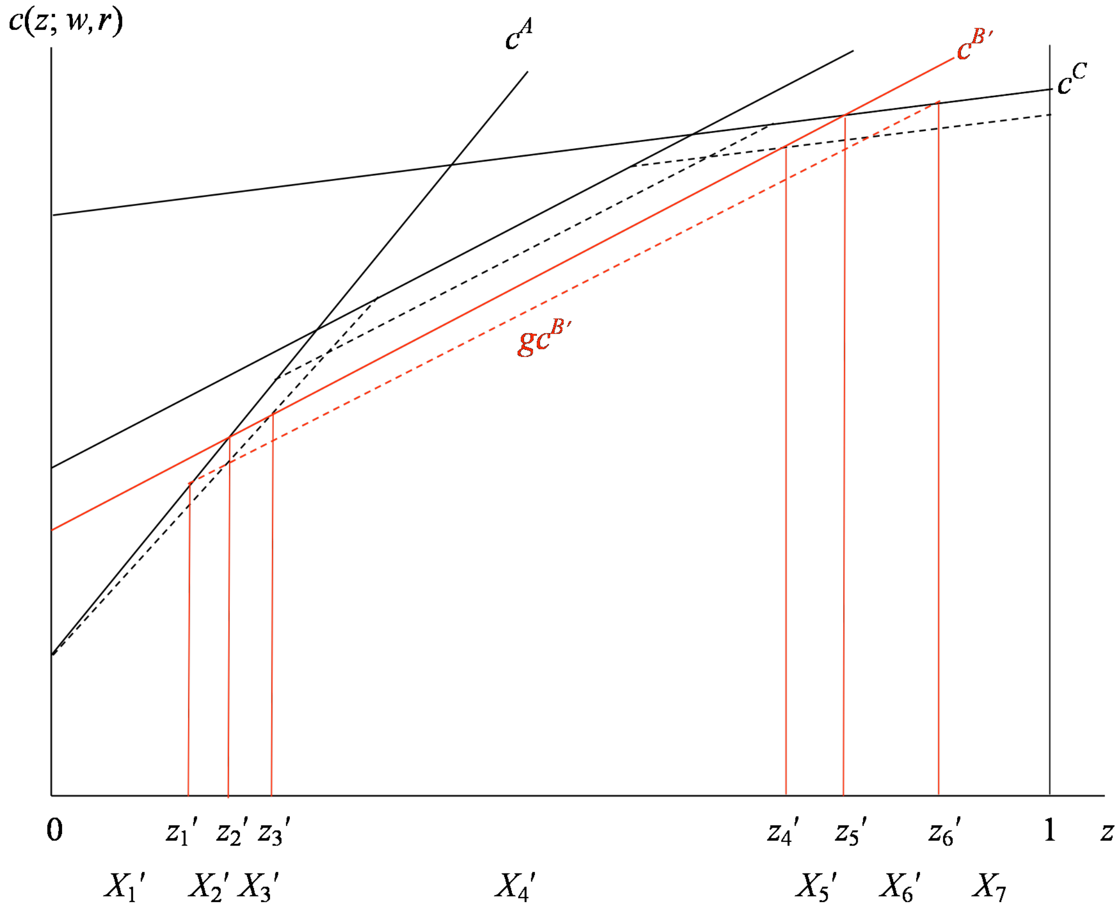
Figure 1: Patterns of specialization with no transport costs: three-country case
(Source: Deardorff 1987)



	X_1	X_2	X_3	X_4	X_5	X_6	X_7
A	●	●	■	○	○	○	○
B	○	■	●	●	●	■	○
C	○	○	○	○	■	●	●

● Exported ○ Imported ■ Produced but not traded

Figure 2: Patterns of specialization with transport costs, three-country case
(Source: Deardorff 1987)



	X_1	X_2	X_3	X_4	X_5	X_6	X_7
A	●	●	■	○	○	○	○
B	○	■	●	●	●	■	○
C	○	○	○	○	■	●	●

● Exported ○ Imported ■ Produced but not traded

Figure 3: Effects of growth in country B on specialization and trade

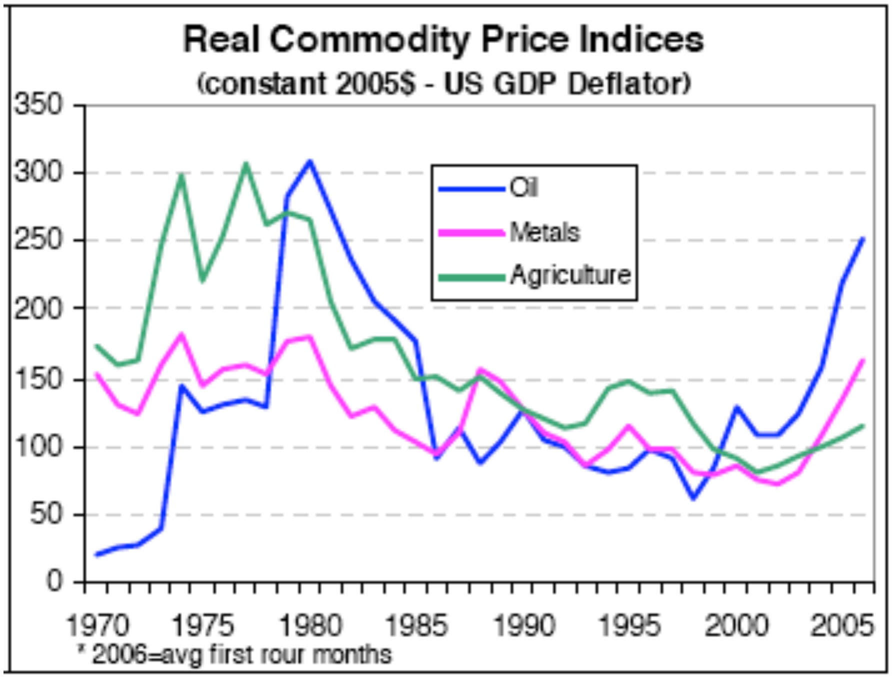


Figure 4: Real commodity price trends in world markets (Source: Streifel 2006)

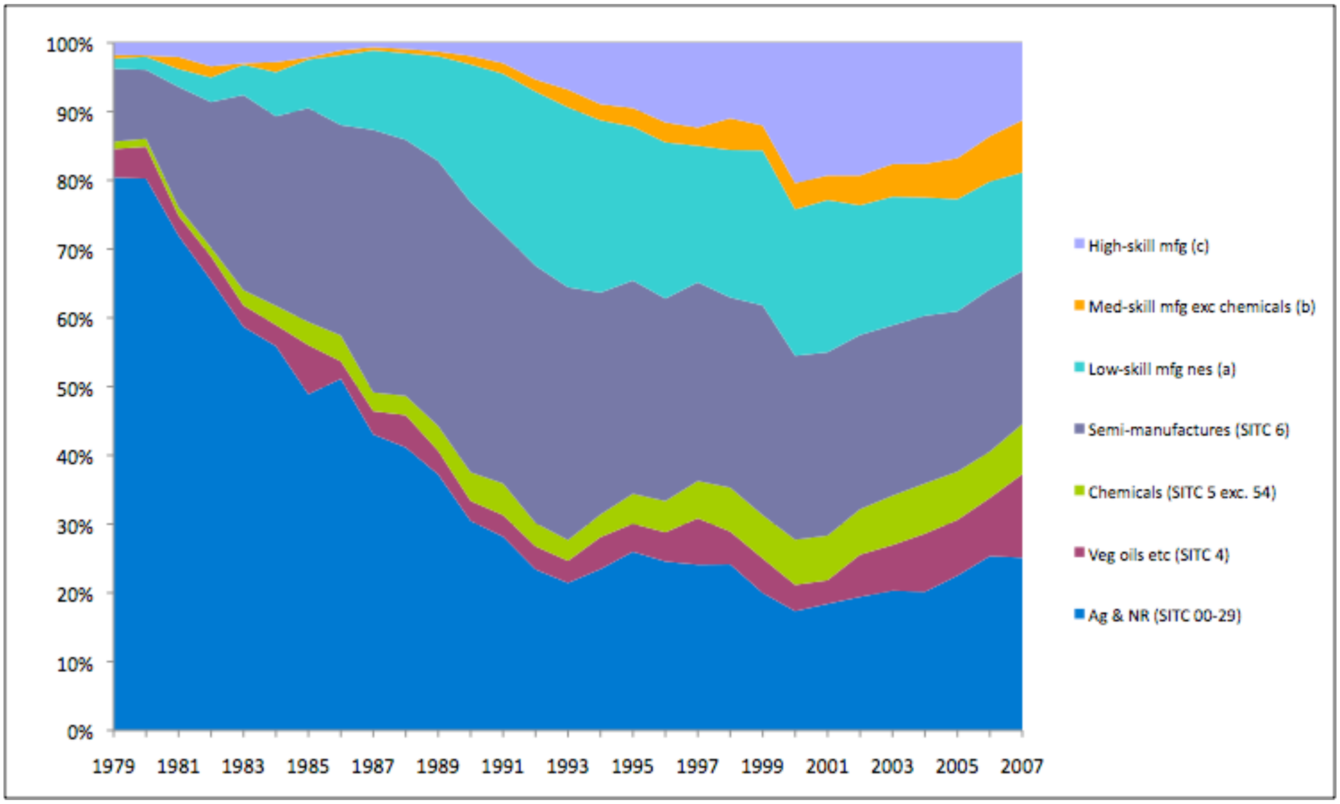


Figure 5: Thailand: composition of non-fuel merchandise exports (source: UN Comtrade)

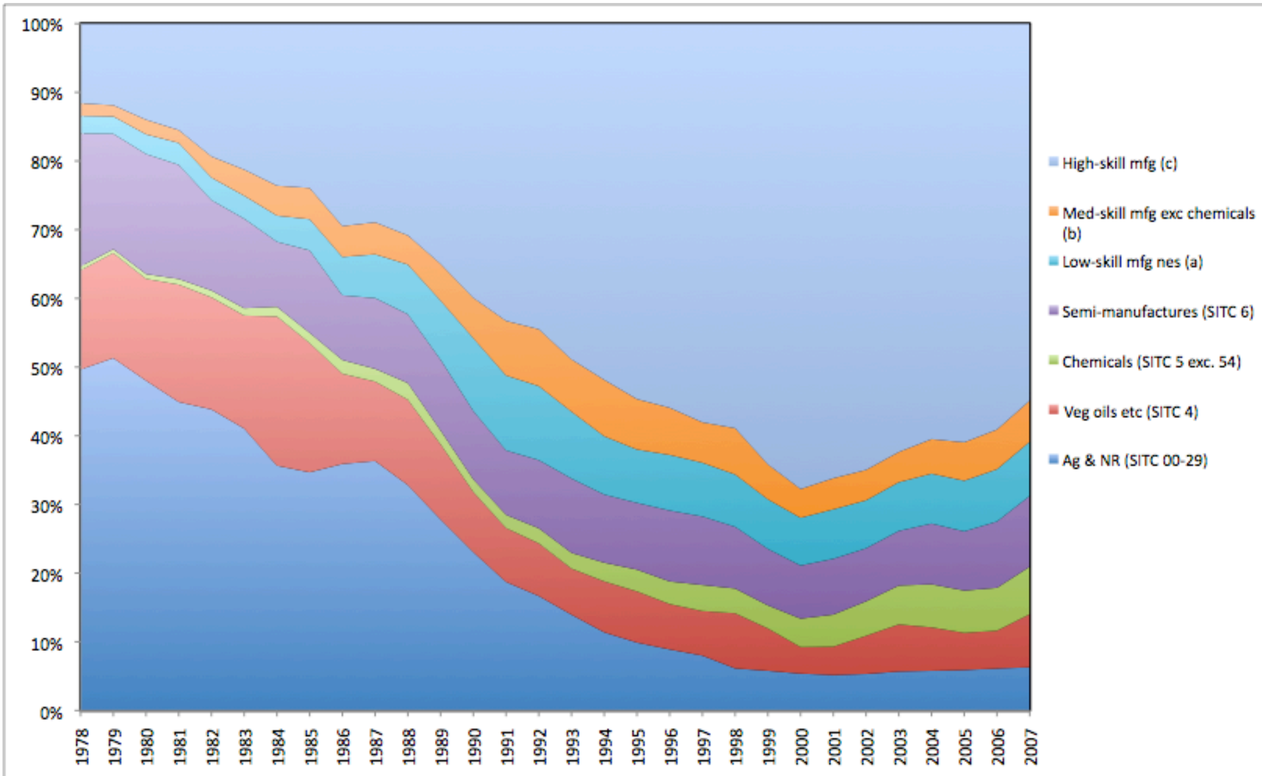


Figure 6: Malaysia: composition of non-fuel merchandise exports (source: UN Comtrade)

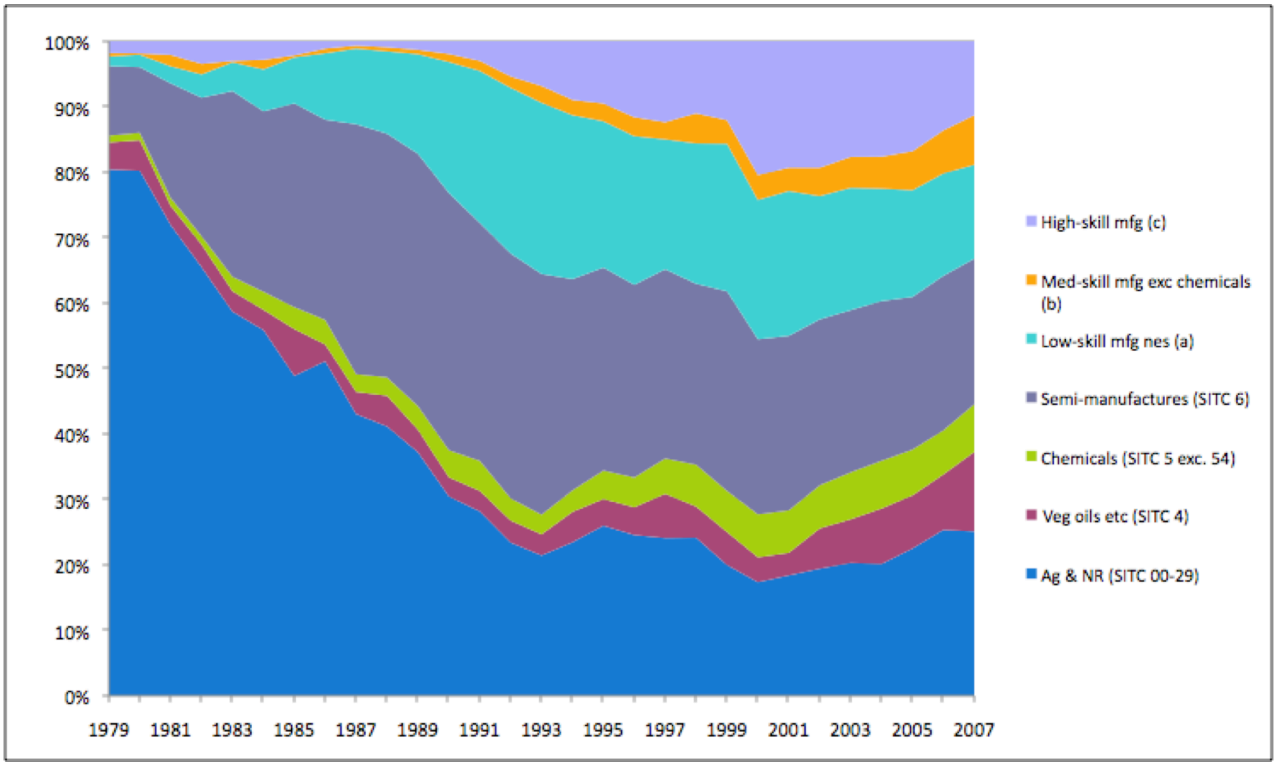


Figure 7: Indonesia: composition of non-fuel merchandise exports (source: UN Comtrade)

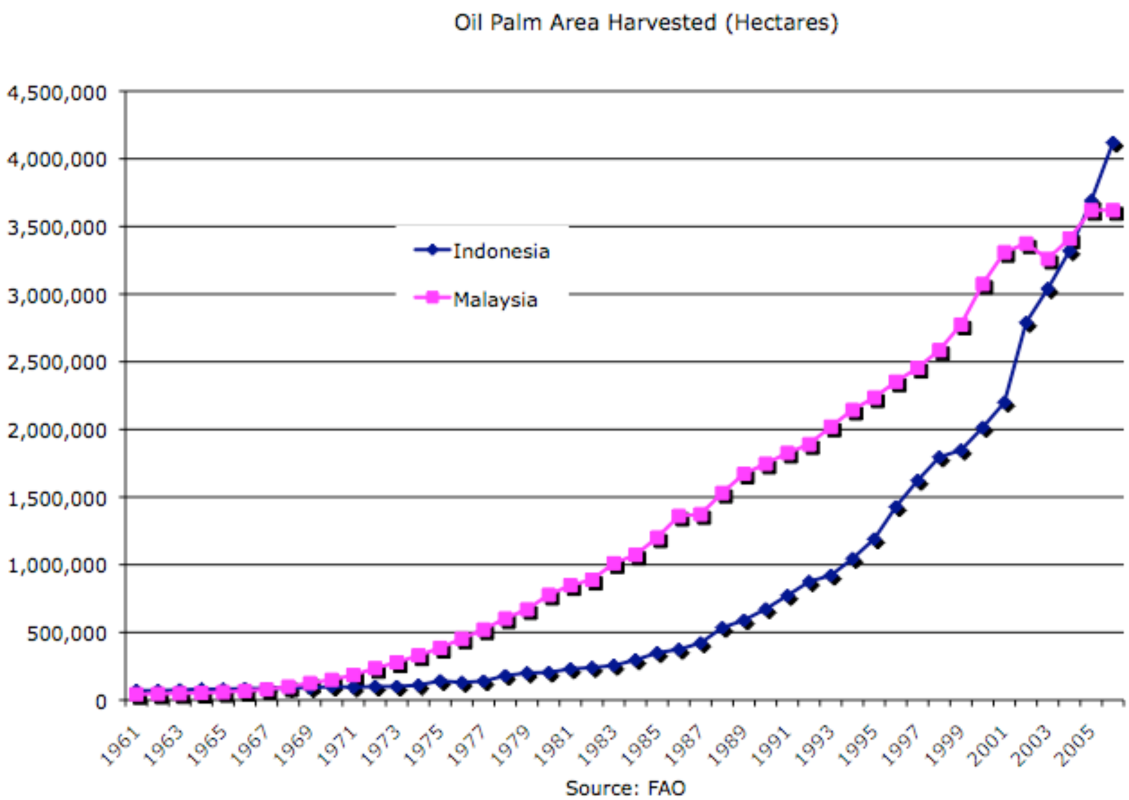


Figure 8: Oil palm area harvested (thousand ha), Southeast Asia, 1961-2006 (Source: FAO).

Notes

[1] " ...the growth of these giant economies will affect not only goods markets but also the flows of savings, investment, and even people around the world, and will place heavy demands on the global commons, such as the oceans and the atmosphere" (Winters and Yusuf 2007:1). The size of these economies and the implications of their growth remain large even after incorporating recent downward revisions of their estimated size (World Bank 2007).

[2] See, for example, Roland-Holst and Weiss (2005).

[3] Chinese demand for primary commodities has been a far more dominant factor than Indian demand in global commodity markets both because of its larger scale and because of the nature of Chinese growth, with its much stronger emphasis on manufacturing industry.

[4] Debate about the sustainability of the current commodity boom is beyond the scope of this paper; however, while global economic conditions (business cycles) will undoubtedly exert significant influence, commodity prices can be significantly lower over the medium term only in the event of a major slowdown of Chinese and Indian growth (see UNCTAD 2007, Ch 3 for a discussion).

[5] Broadman (2007:10) points to the complementarities driving this trade: "Africa has growing demand for Asia's manufactured goods and machinery, and demand in Asia's developing economies is growing for Africa's natural resources, and increasingly for labor-intensive goods. Factor endowments and other economic resources will likely continue to yield these strong country-level African-Asian complementarities…."

[6] For detailed descriptions and analysis of the nature of product fragmentation and trade patterns in Asia, see, for example, Ando (2006), Athukorala and Yamashita (2006), Kimura and Ando (2005). Relative to China, India has not experienced the same pattern of manufacturing growth based on production fragmentation; this is to be attributed not only to its late entry into a rapid growth path but also to the regulatory and institutional barriers and infrastructure bottlenecks that have made it a less attractive destination for export oriented MNC operations.

[7] The model abstracts from scale economies, imperfect competition, and existing distortionary policies.

[8] This requires that $n > m$, a condition easily satisfied by the continuum of goods structure.

[9] The results of the transport cost model depend on the assumption of identical homothetic preferences in all countries, as Deardorff has pointed out (1987: 8-10).

[10] This is in contrast to the more conventional growth case in which an economy moves to the right along *z*, acquiring comparative advantage at the skill-intensive end of its endowment range but losing it at the labor-intensive end (e.g. Krueger 1977). In our discussion below, while recognising this effect, we focus on the implications of the enormous productivity/efficiency changes brought about by policy and institutional reforms that have raised growth rates in China and India to historically unprecedented levels.

[11] Or some equivalent shock, such as an increase in the stock of resource sector-specific capital.

[12] In the middle-income countries considered here, we can assume that labour markets are generally tight. In some low-income countries there may be sufficient slack in the labor market that intersectoral competition is not an important feature of adjustment to altered global market conditions. Others may exhibit forms of labor market segmentation that inhibit adjustment.

[13] To further clarify the role played in this process by the resource sector, it is helpful also to consider the case in which the poor economy has little or no tradable *y* production. In this case, growth of the 'giant' economy again results in attenuation of the more skill-intensive industries. If, however, there is no corresponding increase in labor demand from the resources sector, then *v* must fall and the resource-poor, labor-abundant economy will specialize in the least skill-intensive goods along the manufacturing spectrum. Given our focus on the interplay between resource wealth and other sectors, we will not consider this case in more detail. However, Bangladesh and Cambodia are representative of countries that fit this variant of the model. Each country earns approximately 80% of its export revenues from garments and closely related labor-intensive production activities, and these industries employ the largest fraction of the non-farm labor force.

[14] Such heterogeneity increasingly applies to other SITC divisions as well (for a discussion, see Athukorala and Yamashita 2006).

[15] Coxhead and Li (2008) present a more detailed quantitative exploration of the Indonesian case.

[16] In addition, Grossman and Rossi-Hansberg (2006) present evidence suggesting that the potential for productivity growth in fragmented intermediates production is higher than that in final goods.

[17] This analysis is a precursor to endogenous growth models in which expansion of high-skill industries has positive productivity spillovers, which raise returns to skilled labor and induce additional investments in human capital. But human capital investments are financed by profits earned from production in lower-skill industries. So faster growth in lower-skill industries accelerates growth along with structural change (expansion of higher-skill output); conversely, lower world prices for lower-skill manufactures reduce profits, and thus reduce the rate of growth and structural change.

[18] China is the world's largest importer of palm oil, and India is the third largest importer just behind EU. Chinese and Indian imports have increased sharply from 1,291,000 MT and 209,000 Mt in 1990 to 4,500,000 MT and 3,800,000 MT respectively by 2005.

[19] See Curran et al (2004). Environmental research groups assert that deforestation and land conversion for oil palm expansion is a significant contributor to greenhouse gas emissions. Peat swamp draining and burning for plantation establishment in Indonesia are held responsible for 660 million tones and 1.5 billion tons, respectively, of carbon release, equivalent to 8% of the global carbon emissions due to burning of fossil fuels (NYT 2007; 2008). Nor are concerns limited to the environmental implications of oil palm expansion; the effects on the poor of rising food and vegetable oil prices have also attracted substantial attention, with a leading UN official describing the diversion of land to oil palm as a "crime against humanity"(http://news.bbc.co.uk/2/hi/americas/7065061.stm).