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China, India and the Commodity Boom: Economic and Environmental Implications for Low-income Countries

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1. INTRODUCTION

THE emergence of China and India as major economic powers, forcing other countries to ‘dance with the giants’ (Winters and Yusuf, 2007) has already led to major changes in trade and investment patterns in Asia.¹ In many ways, this sea-change in international economic organisation has highlighted complementarities, rather than competition, among economies. When China first began to attract large-scale foreign investment and expand its export-oriented labour-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 China’s growth boom has generated a new dynamic, reflected in a pronounced acceleration in intra-Asian trade and regional economic integration (Tongzon, 2005; Haddad, 2007; Athukorala, 2009). India’s rapid growth and opening to trade indicates an impending second round. Indeed, in the context of the

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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, 2008).

1 current global recession, the resilience and growth of these two economies has
2 acquired even more prominence as a positive influence.

3 Most discussion of this phenomenon has focused on China's success as an
4 exporter of labour-intensive manufactures. From a developing world perspec-
5 tive, however, China is more properly seen as a major *importer*, of raw materi-
6 als and of manufactured components for final assembly in Chinese factories.
7 The majority of developing economies have been drawn into this international
8 production network, resulting in some cases in major changes in production
9 structure and the volume and direction of their international trade (Lall and
10 Albaladejo, 2004; Eichengreen and Tong, 2006; Coxhead, 2007).

11 The reorientation of many developing economies toward China has had mul-
12 tiple effects. Labour-intensive manufacturing has encountered intense competi-
13 tive pressures; resource exporters have enjoyed a sustained commodity price
14 boom (recent fluctuations notwithstanding), and opportunities for manufacturers
15 to expand through participation in 'fragmentation trade' with China have
16 expanded. Each of these has separately been the subject of analytical attention,
17 but there has been less attention paid to their joint effects, taking account of
18 interactions within the domestic economy. Addressing this lacuna is the first
19 goal of our paper. The second, given the importance of resource-based products
20 in the rapidly expanding trade between developing economies and China, is to
21 consider some environmental implications.

22 In the rest of this introduction we provide a brief survey of data and trends
23 in developing-country trade with China and (where relevant) India. In section 2
24 we use a stylised trade model to explore ways in which the emergence of a
25 large developing economy in global markets alters comparative advantage, and
26 the structure of production and factor rewards, for other developing countries.
27 The model enables us to consider simultaneously the effects of such a change
28 on skill-intensive and labour-intensive manufacturing and on primary (resource-
29 intensive) industries. In section 3 we explore some of the implications of the
30 model, and in Section 4 we illustrate these in a discussion of some Southeast
31 Asian case studies. The inclusion of a natural resource sector in the model
32 enables us to also draw some inferences about environmental outcomes – spe-
33 cifically, resource depletion trends— in these countries. Finally, section 5 offers
34 some brief conclusions.

35 36 37 *a. Background*

38 Since implementation of its open door policies, China has greatly increased
39 its domestic capacity for production of tradable goods and has attracted enor-
40 mous additional inflows of FDI, also directed primarily at tradable sectors.
41 Between 1990 and 2008 its total trade grew at an average 19 per cent per year
42 and its share in global merchandise trade rose from 1.7 per cent to 8 per cent.

1 India has experienced a more recent but no less rapid growth acceleration, and
2 although the retention of relatively high barriers to trade and foreign invest-
3 ment has dampened the trend, its trade has also expanded at an average rate of
4 15 per cent per year. India's share in global trade has risen from 0.6 per cent
5 in 1990 to 1.4 per cent in 2008.²

6 The rapid growth and opening of the Chinese economy has provided an
7 especially significant stimulus to trade with other developing countries. This is
8 in part due to the comparative advantage of the developing world in primary
9 commodities.³ China is now the world's largest consumer of most of the main
10 metals (accounting for a quarter or more of world imports), and a major con-
11 sumer of energy and many other minerals and primary commodities (Streifel,
12 2006). It is the largest consumer of a wide range of agricultural commodities:
13 wheat, rice, palm oil, cotton and rubber; and the second largest in soybeans,
14 soybean oil and tea. India – arriving later on the fast growth path and yet to
15 embark on Chinese-style industrialisation – is fifth in overall energy use (third
16 largest in coal), 7th or 8th in many of the main metals, and a large consumer of
17 agricultural goods (largest in sugar and tea, second largest in wheat, rice, palm
18 oil and cotton). Between 1990 and 2003, Chinese demand for major metals
19 grew at an average of 14.7 per cent per year. Since 1999, it has grown at over
20 17 per cent and absorbed around two thirds of incremental global output. Chi-
21 nese demand in particular has been the primary causal factor driving the com-
22 modity price boom underway since 2003; if India were to emulate the Chinese
23 growth path, it is not difficult to imagine the impact on global commodity
24 demand and prices.⁴

25 The growing demand for commodities from these fast-growing economies
26 has led to a global search for suppliers. China in particular, has reached out to
27 resource exporters worldwide. Brazil, for example, saw its exports to China
28 grow by 800 per cent in value terms during 2000–04, making China its third
29 most important export destination.⁵ As in many developing countries its exports
30 to China are dominated by a small number of primary commodities; in the
31 Brazilian case, iron ore, soybeans, crude oil, wood pulp and bovine leather
32

33
34 ² Average of exports and imports. China's exports include re-exports from Hong Kong. Source:
WTO Statistics Database at <http://www.wto.org>, accessed June 26, 2009.

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

38 ⁴ World commodity prices softened during the global financial crisis that began in 2008. By
39 mid-2009, however, they had fallen only to levels similar to those of about 2004, still substantially
40 above their 1990s levels (World Bank, 2009). Commodity prices can be significantly lower over the
41 medium term only in the event of a much greater slowdown of Chinese and Indian growth (see
UNCTAD, 2007, Ch 3 for a discussion).

42 ⁵ The value of Brazil's imports from China also rose, by a factor greater than three, making China
its fourth most important source of imports.

1 account for over 80 per cent of the value of shipments to China (Willenbockel,
2 2007). Chile signed a free trade agreement with China in 2005, and that coun-
3 try is now its second most important trading partner after the US. Chinese
4 imports from Chile are dominated by copper, wood pulp and fishmeal. Similar
5 developments are seen in Africa, with China along with some other Asian
6 economies emerging as major trading partners (Broadman, 2007).⁶ Though
7 small as a share of total Asian imports, African exports to Asia – dominated by
8 energy, metals and agricultural raw materials – have grown rapidly in recent
9 years, accelerating from an average annual growth rate of 15 per cent during
10 1990–95 to 20 per cent in 2000–05. By 2005, Asia’s share of African exports
11 (27 per cent) was nearly equal to that of the EU (32 per cent) or the US (29
12 per cent).

13 Asian (and especially Chinese) exports *to* Africa and Latin America have
14 also been growing rapidly, by an average 18 per cent per year during 2000–05.
15 This growth has been reinforced by increasingly strong investment flows; Chi-
16 nese and Indian FDI into Africa, particularly that targeting extractive industries,
17 has been growing steadily and the Chinese FDI stock in Africa is now esti-
18 mated to exceed US\$1.1 billion. Half of China’s global investment stocks are
19 now located in Latin America.

20 But despite the growth in trade and investment links with Africa and Latin
21 America, the relationships that the ‘giants’ have built with the rest of develop-
22 ing Asia are both more dominant and have expanded more quickly. This is due
23 in part to proximity and the historical strength of trade networks, and partly
24 because in Asia – specifically, in Southeast Asia – trade with the giants takes
25 place both in primary commodities, and in the other large and rapidly expand-
26 ing trade category, that of manufactured intermediate goods, or ‘parts and com-
27 ponents’. As trade barriers and transportation costs diminish, manufacturing
28 production has increasingly exhibited international fragmentation – the ‘cross-
29 border dispersion of component production/assembly within vertically-
30 integrated production processes, with each country specialising in a particular
31 stage of the production sequence’ (Athukorala and Yamashita, 2006: 233). The
32 growth of this form of trade has been notably rapid in East and Southeast Asia,
33 and now makes up about 60 per cent of all intraregional trade. If China is now
34 the world’s factory, then large parts of Southeast Asia have become China’s
35 fabricator of parts and components.

36 Like this burgeoning trade in intermediates, trade in commodities (raw or
37 partly processed) can be understood as a form of fragmentation trade – that is,
38

39 ⁶ Broadman (2007: 10) points to the complementarities driving this trade: ‘Africa has growing
40 demand for Asia’s manufactured goods and machinery, and demand in Asia’s developing econo-
41 mies is growing for Africa’s natural resources, and increasingly for labour-intensive goods. Factor
42 endowments and other economic resources will likely continue to yield these strong country-level
African-Asian complementarities....’

1 trade in different ‘slices’ of a product (Athukorala, 2006). Both are driven by
2 comparative advantage and are made possible by declines in transport costs
3 and in policy-related impediments to trade – although trade in commodities
4 obviously has a much longer history than that in manufactured intermediates.
5 Both types of trade have expanded very rapidly with the integration into global
6 markets of large, labour-abundant economies capable of specialising in final
7 assembly. Despite these similarities, however, there are some fundamental dif-
8 ferences. First, comparative advantage in commodities derives from immobile
9 resources such as mineral-laden or forest-covered land, and climate, whereas
10 that in manufacturing depends largely on past investments in infrastructure,
11 physical and human capital, and R&D. The latter, therefore, both evolves more
12 quickly and is more susceptible to influence from policies and international
13 markets. Second, comparative advantage in manufacturing sectors can be influ-
14 enced by domestic policies, and by policies adopted by other economies, when
15 the latter are large enough to move international markets. Third, there are econ-
16 omies of scale to be won by expanding modularised production of manufac-
17 tures, whereas no such gains can be claimed for resource extraction. Fourth,
18 whereas light manufacturing is relatively clean, the growth of primary indus-
19 tries raises big questions about resource depletion and other forms of environ-
20 mental damage: from over-fishing and the exhaustion of mineral reserves, to
21 the ‘haze’ of smoke that envelops Indonesia and its neighbours each dry season
22 when forests are burned to create new plantation lands. In light of these differ-
23 ences, it is important to consider the impact of growth in the ‘giants’ on the
24 manufacturing sectors of other developing countries distinctly from that on
25 primary industries.

26 The literature on international product fragmentation concerns itself almost
27 exclusively with manufacturing; the analytical models that support it largely
28 ignore natural resources and primary production. Its growth and welfare impli-
29 cations may have limited applicability outside secondary and perhaps tertiary
30 sectors. Even with this caveat, however, there are controversies over the wel-
31 fare consequences of the growth of fragmentation trade. In an important early
32 contribution, Jones and Kierzkowski (2001) predicted that vertical unbundling
33 with falling trade costs would lead to losses for countries that are ‘all-rounders’
34 in integrated production processes, since in a ranking of trading countries they
35 are intermediate in terms of relative factor endowments and thus lack clear
36 comparative advantage in either skill-intensive production or labour-intensive
37 assembly. Accumulated evidence now indicates, however, that while relative
38 factor endowments are central to outcomes of international integration, the pre-
39 diction that countries with intermediate endowment ratios will lose manufactur-
40 ing industries does not generalise to cases in which many goods are produced.
41 Manufacturing lends itself to finer divisions along the value chain through
42 product fragmentation. This is facilitated by trade and investment liberalisation,

1 and production networks – often established by multinational enterprises
2 (MNEs) – have been instrumental to intensified regional integration and
3 enhanced economic growth, even among ‘intermediate’ countries.⁷

4 In reality, of course, manufacturing and associated industries seldom account
5 for more than one fourth of GDP in low income developing economies; in
6 most, the share of agriculture, fisheries, natural resource extraction and the
7 basic processing of raw materials is much larger. This creates the possibility
8 that a commodity boom may have differential impacts on countries that differ
9 significantly in relative factor endowments and in the initial structure of pro-
10 duction and trade. Since the growth of China and India stimulates demand for
11 primary products as well as for manufactured parts and components, these dif-
12 ferences are important to our understanding of the economic and environmental
13 impacts of international integration on low-income countries.

14 Finally, most activity in resources industries has direct environmental impli-
15 cations, yet the full environmental consequences of growth of the ‘giant’ econ-
16 omies are only now beginning to be examined. Winters and Yusuf (2007)
17 address the environmental impacts of Chinese and Indian growth, but only in
18 terms of the likely impact of growth-related damages *within* those economies.
19 That is indisputably important, but does not account for environmental changes
20 (often with major cross-border spillovers) within the resource-rich developing
21 countries whose trade is now much more closely aligned with the fortunes of
22 the ‘giants’. These are typically countries in which market and government fail-
23 ures and weak institutions create a predisposition to excessive rates of environ-
24 mental degradation. The scale of resource extraction, moreover, is such that the
25 consequences for the global environment are huge. Land use change alone
26 accounts for 18 per cent of global greenhouse gas emissions, most from tropi-
27 cal deforestation. Indonesia is estimated to contribute 30 per cent of emissions
28 from this source, and Brazil another 20 per cent (Stern, 2007). Therefore, a
29 commodity boom that stimulates large-scale land use change in the tropics –
30 for instance, the growth of oil palm area discussed later in this paper – will
31 have global as well as local environmental impacts.

32 In assessing the economic and environmental consequences of growth in the
33 giants, then, it is important to distinguish among types of economy by endow-
34 ments, economic structure, and associated patterns of trade and potential envi-
35 ronmental degradation. Within Southeast Asia – the region with which our
36 analysis is most closely concerned – Malaysia, Indonesia and, to a lesser
37

38 ⁷ For detailed descriptions and analysis of the nature of product fragmentation and trade patterns in
39 Asia, see, for example, Kimura and Ando (2005), Ando (2006), Athukorala and Yamashita (2006).
40 Relative to China, India has not experienced the same pattern of manufacturing growth based on
41 production fragmentation; this is to be attributed not only to its late entry into a rapid growth path
42 but also to the regulatory and institutional barriers and infrastructure bottlenecks that have made it a
less attractive destination for export-oriented MNC operations.

1 extent, Thailand are often loosely described as resource-rich, but they obviously
 2 differ very significantly in relative endowments of skills, infrastructure and
 3 other forms of capital. This is partly due to previous investments and policy
 4 regimes. These factors influence how such countries now respond to ‘threats
 5 and opportunities’ emerging from Chinese and Indian growth. Among resource-
 6 rich developing countries in general, net changes in welfare emanating from
 7 global trade links depend on both the growth of manufacturing and on changes
 8 within the commodity and natural resource sectors – and on the intersectoral
 9 links between them. The recent literature on fragmentation and economic
 10 growth, by focusing on manufacturing in isolation from other sectors, has
 11 neglected these interactions. Once they are included, it can more readily be
 12 seen that while middle-income resource-rich countries are likely to be able to
 13 benefit greatly from both the commodity and the manufacturing boom, low-
 14 income resource-rich economies may be confronted with major threats to their
 15 longer-term development prospects.

16 17 18 2. THEORY

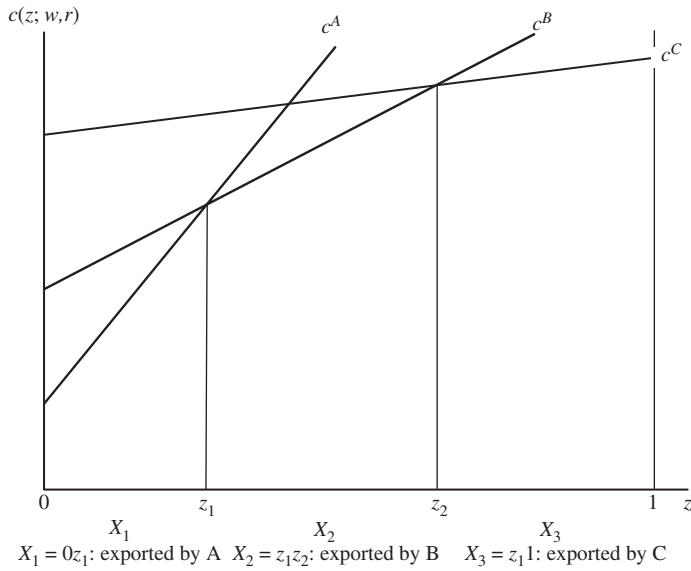
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20 The foregoing discussion has linked changes in trade to changes in the scale
 21 and structure of production in developing economies with related environmen-
 22 tal implications. How do these links operate, and how does the structure of pro-
 23 duction alter in response, in the short and long run? To explore this, it is
 24 important first to establish the determinants of changing patterns of trade in a
 25 multi-country context and then to explore the likely environmental conse-
 26 quences. We start by first exploring the pressures for structural changes and
 27 sectoral adjustments. We draw for this purpose on Deardorff (1987)’s two-
 28 factor, n -good, m -country model in which the pattern of trade is determined by
 29 comparative costs and transport costs or equivalent trade barriers.⁸ In our
 30 re-interpretation of his model, manufactured goods (z) range over a Dornbusch-
 31 Fisher-Samuelson continuum (0,1) and are ranked by the skill-intensity of their
 32 production processes. In each country, define the relative factor price $v = w/r$,
 33 the ratio of wages for unskilled labour to returns on human capital, or skills.
 34 Then cost-minimising unit input requirements are determined by $a_i(z) = a_i(z; v)$
 35 for $i = K, L$, where K stands for skilled labour and L for unskilled, and,

$$36 \quad k(z; v) = a_K(z; v)/a_L(z; v)$$

37
38 is strictly increasing in z . Equilibrium factor prices in each country are deter-
 39 mined as part of the global trading equilibrium, and need not be equal across
 40

41 ⁸ The model abstracts from scale economies, imperfect competition, and existing distortionary
 42 policies.

FIGURE 1
Patterns of Specialisation with No Transport Costs: Three-country Case



	X_1	X_2	X_3
A	●	○	○
B	○	●	○
C	○	○	●

● Exported ○ Imported

Source: Deardorff (1987).

economies due to specialisation 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.⁹ This is shown for the example of three developing countries, labelled A to C, in Figure 1 (adapted from Deardorff, 1987), where

⁹ This requires that $n > m$, a condition easily satisfied by the continuum of goods structure.

1 by assumption, $v^A < v^B < v^C$, which yields the unit cost curves c^A , c^B , and c^C .
 2 Then A produces the set of the most labour-intensive goods, X_1 , B the next
 3 most labour-intensive set X_2 , and C the most skill-intensive set, X_3 . The table
 4 beneath the figure shows the pattern of trade that results; the width of each col-
 5 umn in the table corresponds to the segment of z along $(0,1)$ occupied by each
 6 set.

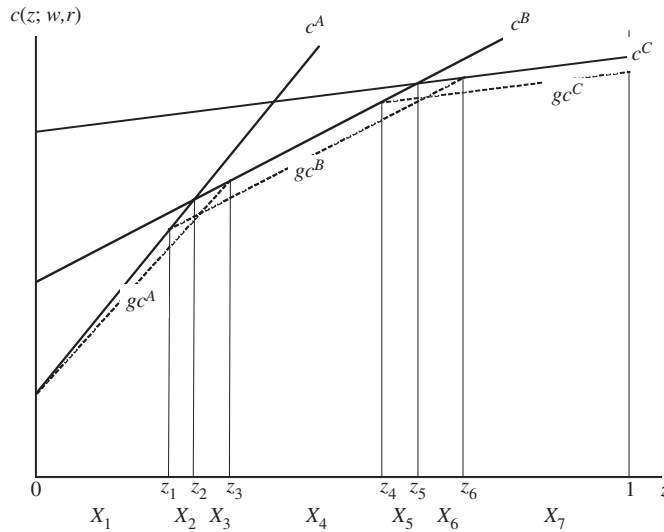
7 The factor endowment ranking $k(z; v)$ corresponds to a per capita income
 8 ranking, so we can think of A as a low-income country, B as lower-middle
 9 income, and C as upper middle-income. In the neutral case, the poorest country
 10 exports the most labour-intensive goods, and richest exports the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

13 In the real world, of course, similar but differentiated goods can be sourced
 14 from many countries, and two-way trade is widespread. The model generates
 15 somewhat more realistic outcomes once transport costs or equivalent trade
 16 restrictions are included. Suppose that transport costs take an iceberg form, so
 17 that only a fraction g ($0 < g < 1$) of each good exported arrives at its destination.
 18 (For simplicity, assume also that transport costs are the same for all goods and
 19 countries.) Then a country will import a specific product only if the landed
 20 price is less than the domestic cost of production; or (for importer i and exporter
 21 j) if $gc^i(z; v^i) > c^j(z; v^j)$. Comparative cost is now no longer the sole deter-
 22 minant of propensity to produce and export, and as a result, some countries
 23 produce some goods solely for home market consumption. This is illustrated in
 24 Figure 2, where dashed lines labelled gc^A , gc^B and gc^C show the transport-
 25 inclusive import unit costs faced by countries A , B , and C . The pattern of pro-
 26 duction and trade is again shown in a table below the figure. In this example
 27 some goods (those in the ranges covered by X_2 , X_2 , X_5 and X_6) are produced in
 28 two countries. One country is the sole exporter of each good, while the other
 29 produces only for its own domestic market. Production for the home market
 30 only occurs for goods at either end of a country's capital-intensity range. Thus,
 31 for example, country B imports goods in the sets X_1 and X_7 , and exports those
 32 in $X_3 - X_5$. It also produces X_2 and X_6 , even though its production costs are
 33 higher than in countries A and C , respectively, because once transport costs are
 34 included, B can source these goods more cheaply from its own producers.¹⁰

35 The transport cost model is analytically useful for two reasons. First, we can
 36 mimic the effects of global market liberalisation or reductions in other trade
 37 barriers by reducing or removing transport costs. It is a simple matter to show
 38 how trade patterns will alter in response to such changes. Second, we can simu-
 39 late the effects of *ceteris paribus* productivity growth (resulting – as in the case
 40

41 ¹⁰ The results of the transport cost model depend on the assumption of identical homothetic prefer-
 42 ences in all countries, as Deardorff has pointed out (1987: 8–10).

FIGURE 2
Patterns of Specialisation with Transport Costs, Three-country Case



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

● Exported ○ Imported ■ Produced but not traded

Source: Deardorff (1987).

of China and India – from policy and institutional reforms and/or investments in R&D and infrastructure 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

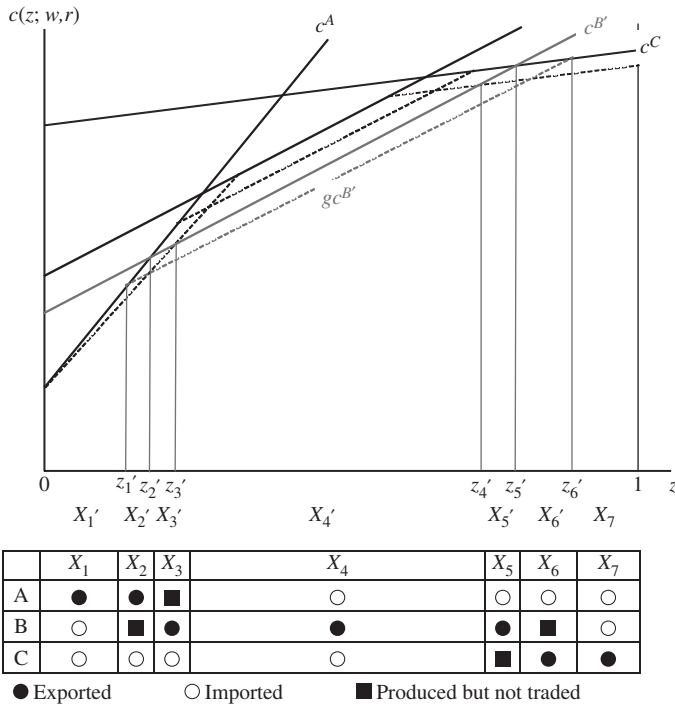
1 efficiency in such an economy. In the example of growth in China relative to
 2 its trading partners, this model suggests that such growth would cause China to
 3 begin producing and exporting new products at *both* the labour-intensive *and*
 4 the skill-intensive ends of the range of goods that it produced in the initial
 5 equilibrium.¹¹ Moreover, China's import demand for adjacent 'marginal' goods
 6 produced in other countries would also diminish as unit costs fell in its own
 7 domestic industries. Meanwhile, any country that is slightly more labour-
 8 (skill-) abundant than China will lose global market share at the skill- (labour-)
 9 intensive end of its range of exports, as China both expands the range of its
 10 own exports and also reduces its own import demand in those sets of goods.

11 This experiment is illustrated in Figure 3, which shows the effects of a *cete-*
 12 *ris paribus* uniform lowering of production costs in country *B*. Country *B*'s
 13 new unit cost curve is c^B ?; its trading partners face unit costs of imports from
 14 *B* as shown by the line labelled gc^B ?. The pattern of production and trade spe-
 15 cialisation is again shown in the table beneath the figure; the reader is invited
 16 to compare the width of columns in this table with those beneath figure 2.
 17 There it can be seen that the range of z covered by X_1 ? is both smaller and less
 18 skill-intensive than X_1 in figure 2; the range X_3 - X_5 exported by *B* expands to
 19 X_3 ?- X_5 ?, and so on. If China is equivalent to country *B*, then its growth rela-
 20 tive to that in other economies results in a loss to low-income economy *A* of
 21 its most skill-intensive exports, and a loss to *C* of its most labour-intensive
 22 exports. However, China's *imports* of goods outside of the range of its compar-
 23 ative advantage would increase (we assume that trade must be balanced both
 24 before and after any exogenous change). Increased exports from other countries
 25 to China could include intermediate products – that is, the parts and compo-
 26 nents trade discussed earlier – as well as final goods. Thus, a country that is
 27 slightly more skill-abundant than China – country *C*, for example – will lose
 28 export market share in its most labour-intensive goods, and at the same time
 29 see increased export demand for those more skill-intensive goods where it has
 30 retained comparative advantage.

31 This model generates helpful insights for trends in international trade. For
 32 the purpose of analysing developing country outcomes, however, its applicabil-
 33 ity is limited in that its input side is restricted to two factors of production,
 34 while the issues with which we are concerned involve endowments of land or
 35 other natural resources in addition to labour and capital. We can augment the
 36 basic continuum of goods model, in which manufacturing industries produce a
 37

38 ¹¹ This is in contrast to the more conventional growth case in which an economy moves to the right
 39 along z , acquiring comparative advantage at the skill-intensive end of its endowment range but los-
 40 ing it at the labour-intensive end (e.g. Krueger, 1977). In our discussion below, while recognising
 41 this effect, we focus on the implications of the enormous productivity/efficiency changes brought
 42 about by policy and institutional reforms that have raised growth rates in China and India to histori-
 cally unprecedented levels.

FIGURE 3
Effects of Growth in Country B on Specialisation and Trade



range of goods of differing skill-intensity, by the addition of a resource sector(y) (Krueger, 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 labour 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 labour 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 labour relative to skills in manufacturing and will determine the subset of z that is produced.

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

14 An important observation from this model is that for given international
15 prices, the structure of manufacturing production in each country depends not
16 only on comparative costs in z , but also on conditions in the natural resource
17 sector, since these influence ν through intersectoral competition in the labour
18 market. A rise in the price of the resource sector's output¹² will raise the value
19 of labour's marginal product in that sector, and labour mobility will cause ν to
20 rise and L_z/K_z ($= [L - L_y]/K_z$) in manufacturing to fall. In response to a shock
21 of this kind, a country previously producing manufactures at the lowest end of
22 the skill-intensity continuum might initiate production of a slightly more skill-
23 intensive good, and could even cease production of its most labour-intensive
24 good. Further increases in resource prices may spur continued movement up
25 the scale of skill-intensity in manufacturing – with corresponding changes in
26 the pattern of trade. Thus a resource-rich, wealthy (i.e. skill-abundant) econ-
27 omy, with high ν , will export a mix of resource products and skill-intensive
28 manufactures and import labour-intensive manufactures (Norway and the
29 United States are examples). As in the earlier exposition, the range of manu-
30 factures produced will depend in part on transport costs, which inhibit interna-
31 tional specialisation.

32 In a world of many countries, *ceteris paribus* changes in a single econ-
33 omy that lower its production costs across the board will expand its z -sector
34 production at both the labour-intensive and the skill-intensive ends of its
35 factor endowment range, as already described. The range of manufactures
36 that it exports will increase, and with positive transport costs, the range that
37 it produces for home consumption will also change. This expansion will
38 be fuelled by increased imports of manufactures in which other countries
39 have comparative advantage. In the case of growth in a labour-abundant
40 country like China, the additional manufactured imports will tend to be

42 ¹² Or some equivalent shock, such as an increase in the stock of resource sector-specific capital.

1 more skill-intensive than that country's own endowments. The expansion
2 will *also* increase the country's demand for imports of resource goods y
3 from resource-rich countries. This will occur both because of the higher
4 overall activity level in the expanding country, and also because growth in
5 its production of z will reduce the amount of labour available to produce y
6 domestically. The spread of fragmentation trade has allowed China to attract
7 and benefit enormously from a surge of FDI by expanding the range of its
8 labour-intensive operations from relatively low technology manufactures such
9 as clothing, garments and footwear to the labour-intensive final assembly
10 segment of much more sophisticated final goods. Thus China has emerged
11 as 'the world's factory', producing and exporting a variety of manufactures
12 that ranges from highly labour-intensive to moderately skill-intensive. As is
13 well known, this has been accompanied by huge increases in its imports of
14 capital goods and skill-intensive parts and components from richer countries,
15 and of energy, metals, timber, paper, rubber, vegetable oils, and other natu-
16 ral resources from resource-abundant countries.

17 What of the effects of this growth on other low or middle income econo-
18 mies? If the expanding economy is large enough to influence world prices then
19 its growth will have effects on resource allocation everywhere. Its 'boom'
20 affects production structure and trade in other countries through two distinct
21 channels: the market for z , and that for y . Moreover, these two effects must
22 also interact.

23 Consider first a middle-income economy with a higher skill to labour
24 endowment ratio relative to the 'giant' economy. Growth in the latter econo-
25 my results in the loss to the more skill-abundant economy of its most
26 labour-intensive exports, and also generates an increase in demand for its
27 exports of the resource good, y . Within an economy so affected, some
28 labour is reallocated to y production. Increased intersectoral competition
29 for labour reduces L_z/K_z , the factor endowment ratio faced by the manufac-
30 turing sector. As a result, the skill-intensity of z production increases. At
31 the same time, this economy faces increased demand from the 'giant' for its
32 more skill-intensive products. The two effects are complementary: the
33 structure of production and trade should shift toward higher GDP and
34 export shares of resource goods and skill-intensive manufactures alike. Pro-
35 duction and export of this country's most labour-intensive manufactures will
36 decline.

37 What remains unknown in this case is whether the relative factor price $v =$
38 w/r will rise or fall. The resource sector's expansion will raise the wage, while
39 increased demand for skill-intensive manufactured exports will raise the return
40 on skills. There are two potentially interesting stories. First, in economies
41 where the y sector is relatively small, the latter effect will dominate. Since v is
42 correlated with a measure of the skill premium in the domestic labour market,

1 then this premium will rise and along with it, the returns on acquisition of
2 education and skills will also increase. A second possibility is that the economy
3 will respond by opening its factor markets. If the resource boom increases
4 intersectoral competition for labour and the resulting rise in v would threaten to
5 limit expansion in manufacturing, then it may be rational to open the borders
6 to inflows of unskilled workers.¹³

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

23 Even supposing policies to be the same across all economies, the develop-
24 ment implications of different initial endowments are stark. In upper middle-
25 income economies, growth in the 'giant' creates *complementarities* in
26 skills-based production and trade. In low-income economies, the same growth
27 intensifies *competition* for the output of their most skill-intensive industries.
28 Moreover, whereas the giant's expanded import demand for y is complemen-
29 tary in the wealthier economies with their shift toward more skill-intensive
30 manufacturing, in poorer economies the same change induces intersectoral
31 competition for labour in their most labour-intensive manufacturing industries.
32 Labour costs rise, but there is no offsetting mechanism to raise returns on
33 skilled labour used in manufacturing. Faced with higher labour costs and
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40 ¹³ In the middle-income countries considered here, we can assume that labour markets are gener-
41 ally tight. In some low-income countries there may be sufficient slack in the labour market that in-
42 tersectoral competition is not an important feature of adjustment to altered global market
conditions. Others may exhibit forms of labour market segmentation that inhibit adjustment.

1 lower returns to skills, the manufacturing sectors of poorer economies face a
2 growth trap.¹⁴
3
4

5 3. CONSEQUENCES FOR ENVIRONMENT AND ECONOMIC GROWTH 6

7 We now turn to a discussion of the environmental implications of these
8 developments by examining the impact of China/India growth on resource-
9 based sectors. Our focus will be on the impact of these developments for natu-
10 ral resource sectors and the likely environmental consequences. Hence we do
11 not plan to survey the large existing literature on trade-environment linkages in
12 detail, but draw on existing analytical models and insights to inform our discus-
13 sion.¹⁵ Our model posits that a productivity-driven ‘boom’ in a large develop-
14 ing economy will undercut labour-intensive exports and promote growth in the
15 production and export of resource-based goods in a low-income, resource-rich
16 trading partner. The model does not predict a net welfare gain to the latter
17 economy. There are, moreover, reasons to believe that even if gains from the
18 resource boom dominate losses in manufacturing sectors in the short run, there
19 may still be adverse long-term development consequences. These could arise
20 due to specific types of market failures, rigidities and externalities that are
21 likely to be important in a developing country context. The literature on Dutch
22 Disease and the ‘curse’ of natural resources considers a great number of these
23 (e.g. Humphreys et al., 2007). In this section we address three that seem to be
24 of particular importance both in the Southeast Asia context, and more broadly
25 among resource-abundant developing economies.

26 First, the growth of manufacturing in general, and of specific sectors within
27 manufacturing, is argued to generate dynamic productivity gains through a vari-
28 ety of mechanisms: learning-by-doing, inter-industry spillovers of skills and
29 knowledge, and scale-related phenomena leading to endogenous increases in
30 the marginal product of factors employed in manufacturing. The expansion of a
31

32
33 ¹⁴ To further clarify the role played in this process by the resource sector, it is helpful also to con-
34 sider the case in which the poor economy has little or no tradable y production. In this case, growth
35 of the ‘giant’ economy again results in attenuation of the more skill-intensive industries. If, how-
36 ever, there is no corresponding increase in labour demand from the resources sector, then v must fall
37 and the resource-poor, labour-abundant economy will specialise in the least skill-intensive goods
38 along the manufacturing spectrum. Given our focus on the interplay between resource wealth and
39 other sectors, we will not consider this case in more detail. However, Bangladesh and Cambodia are
40 representative of countries that fit this variant of the model. Each country earns approximately 80
41 per cent of its export revenues from garments and closely related labour-intensive production activi-
42 ties, and these industries employ the largest fraction of the non-farm labour force.

¹⁵ For an excellent survey of the literature and analytical models, see Copeland and Taylor (2003).
Coxhead and Jayasuriya (2003) provide a discussion of trade and natural resource issues with an
Asian developing country focus.

1 resource-intensive sector such as oil or forestry, to the extent that it raises pro-
2 duction costs or investment incentives in manufacturing, reduces the potential
3 for these dynamic productivity gains. Thus long-run economic growth may be
4 negatively affected, but more specifically, the economy's future structure will
5 also reflect lower returns to capital (outside of resource sectors) and reduce
6 investments in human capital. In van Wijnbergen (1984), for example, the level
7 of activity in manufacturing raises factor productivity in the future through
8 learning-by-doing effects.¹⁶ A resource boom reduces manufacturing sector out-
9 put through the familiar Dutch Disease mechanisms, and this in turn lowers the
10 potential for endogenous manufacturing sector productivity growth in the
11 future. The economy's capacity to diversify away from dependence on natural
12 resources is reduced. This effect may be larger if resource sector profitability is
13 boosted above its socially optimal level, for example if the adverse environ-
14 mental and ecological impacts of deforestation and mineral extraction are not
15 fully reflected in private costs. The resulting over-specialisation can be impor-
16 tant from a welfare point of view when natural resources are subject to increas-
17 ing extraction costs or outright exhaustion, since in that case the economy's
18 level of specialisation in natural resource sectors cannot be sustained in the
19 long run.¹⁷

20 A second unintended consequence of the economy's response to higher
21 resource prices and diminished manufacturing export opportunities is that it
22 becomes more vulnerable to trade-based shocks. Primary commodities usually
23 have low price elasticities of supply, so their world prices exhibit much higher
24 variance than do manufacturing prices. This increases terms-of-trade volatility
25 for price-taking exporters. Price volatility in these economies is further exacer-
26 bated by the effects of the resource boom on the domestic economy. The boom
27 reduces the size of non-resource tradable sectors and increases that of non-
28 tradable sectors; since changes in demand for the latter are resolved in large
29 part by price adjustments rather than through the intersectoral movement of
30 factors, the volatility of domestic prices is also increased. If investors are risk-
31 averse, higher inherent real exchange rate instability may lead to inefficient
32 specialisation; investment in non-resource tradables sectors will be reduced by
33 the higher capital costs needed to cover additional risk (Chen and Rogoff,
34 2002; Hausmann and Rigobon, 2002).

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

38 ¹⁷ This analysis is a precursor to endogenous growth models in which expansion of high-skill
39 industries has positive productivity spillovers, which raise returns to skilled labour and induce addi-
40 tional investments in human capital. But human capital investments are financed by profits earned
41 from production in lower-skill industries. So faster growth in lower-skill industries accelerates
42 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.

1 Finally, a higher share of income from resource rents is associated in
2 developing countries with higher inequality (except in cases where owner-
3 ship of the resource stock is widely distributed; see Deininger and Squire,
4 1996), and with weak or corrupt institutions (Mauro, 1995; Auty, 2001).
5 Greater inequality need not be the source of inefficiency or reduced growth
6 opportunities. However, the concentration of incomes may be indicative of a
7 deeper problem, in which the allocation of resources to rent-seeking rather
8 than to productive activities widens the gap in returns between the two, and
9 so creates an undesirable equilibrium characterised by high returns to rent-
10 seeking and low returns to productive activities and innovation (Murphy et
11 al., 1993; Copeland and Taylor, 2009). In this equilibrium, entrepreneurial
12 activity is limited to rent-seeking activities, highlighting an interaction effect
13 between resource rents and sectoral allocations of investment and effort that
14 arises when institutions are not robust enough to tax resource rents or to
15 prevent corrupt behaviour.

16 In each of these cases, Dutch disease or related mechanisms reduce
17 returns on investments in the tradable manufacturing sector below socially
18 optimal levels, when long-run welfare growth is the criterion. They are
19 longer-term consequences of a resource boom in a typical developing econ-
20 omy. In general, in the longer run the distribution of investment across sec-
21 tors will shift to match the changing pattern of comparative advantage,
22 falling in z as a whole and rising in y . Capital will seek to move into y ,
23 increasing the rate of depletion of the underlying natural resource stock.
24 Whether increased activity in y raises or lowers welfare in the long run
25 depends on the rate of exploitation, potential for exhaustion, and the uses to
26 which the revenue stream is put. At the same time, the resource boom con-
27 tributes in more than one way to reduced investment growth in non-resource
28 sectors, and thus constitutes an additional source of foregone growth
29 opportunities.

30 31 32 4. SOME COUNTRY CASE STUDIES

33
34 It is instructive to look at how the NIEs and other developing Asian econo-
35 mies have evolved during the recent surge of Chinese and Indian growth, and
36 especially since the start of the commodity price boom. Data for this purpose
37 are obtained from the UN Comtrade database; we use two-digit product divi-
38 sions. The Standard International Trade Classification (SITC) taxonomy of
39 products used in Comtrade, however, was established in an earlier, pre-
40 fragmentation era when product characteristics, rather than factor content, were
41 the primary determinants of trade flows. Thus the products grouped under SITC
42 7 (machinery and transport equipment) and SITC 8 (miscellaneous manufac-

TABLE 1
Product Divisions Used in Calculating Skill-intensity of Exports

<i>Product by skill intensity</i>	<i>SITC code</i>	
High	Aircraft and spacecraft	95
	Pharmaceuticals	54
	Office, accounting and computing machinery	75, 87, 88
	Radio, TV and communications equipment	76, 77
Medium-High	Medical, precision and optical instruments	87, 88
	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
Medium & Low	Other machinery and equipment	72, 73, 74
	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).

tures) display great diversity of capital–labour and skill–labour factor content ratios.¹⁸ 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 summarised 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 described earlier in this paper, at least as far as the composition of exports is concerned.

¹⁸ Such heterogeneity increasingly applies to other SITC divisions as well (for a discussion, see Athukorala and Yamashita, 2006).

TABLE 2
Non-fuel Export Shares and Growth for Three SE Asian Economies

	<i>Share (%) in non-fuel merchandise exports</i>					<i>Annual growth rate (%) of export value, 2000-2007</i>
	<i>1980</i>	<i>1990</i>	<i>2000</i>	<i>2005</i>	<i>2007</i>	
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-manufactures (SITC 6)	10.0	39.3	26.8	23.3	22.2	6.17
Low-skill manufactures	1.9	20.0	21.3	16.3	14.3	3.02
Med-skill manufactures except chemicals	0.2	1.2	3.8	6.0	7.6	20.24
High-skill manufactures	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-manufactures (SITC 6)	22.8	14.0	12.6	13.2	13.5	12.57
Low-skill manufactures	6.8	25.0	13.4	10.8	9.9	5.70
Med-skill manufactures except chemicals	0.9	3.9	10.0	16.7	16.9	21.35
High-skill manufactures	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-manufactures (SITC 6)	17.5	9.9	7.7	8.6	10.3	12.3
Low-skill manufactures	2.9	10.6	6.9	7.4	7.9	9.8
Med-skill manufactures except chemicals	2.1	5.9	4.2	5.6	6.0	13.5
High-skill manufactures	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

Note:

Annual data series 1980–2007 are available from the authors on request.

Source:

UN Comtrade. *Last year for Thailand is 2006.

Table 2 summarises the changing composition of exports from selected Southeast Asian countries. Within the region, Thailand and Malaysia exhibit recent trends in industrial structure and trade that correspond 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 labour-intensive manufactures that drove their growth in previous decades. This relative expansion of skill-intensive industries reflects responses both

1 to pressures on their more labour-intensive manufacturing sectors due to the
2 rapid expansion of China's labour-intensive exports, and increased Chinese
3 demand for skill-intensive intermediates as inputs to its labour-intensive assem-
4 bly operations. The positive effects of Chinese growth are not confined to man-
5 ufactures, however. Both Thailand and Malaysia have also increased their
6 exports of resource products, including energy, rubber, processed foods, and
7 edible oils, to meet increased demand for these products both as intermediates
8 in labour-intensive manufacturing and as final goods experiencing rapid con-
9 sumer demand growth. Both countries, in addition, now play host to large
10 stocks of unskilled workers from neighbouring countries: Burmese in Thailand,
11 2 and Indonesians in Malaysia (Manning and Bhatnagar, 2004). These 'labour
12 imports' have clearly helped dampen cost growth in the most labour-intensive
13 industries, including food crops, plantation agriculture and fisheries, thus slow-
14 ing the rate of their decline (Kulkolkarn et al., 2007).

15 Trends in Thai export data appear strongly consistent with our model's pre-
16 dictions for a country of type 'C'. Thailand has considerable resource wealth in
17 the form of agricultural land, but relatively small commercially exploitable
18 stocks of forests, minerals, or hydrocarbons. As early as 1990, manufactures
19 accounted for half of the value of merchandise exports (Table 2), with labour-
20 intensive and medium-high/skill intensive sectors each worth about one-fourth.
21 Over the subsequent 16 years, skill-intensive exports rose to 50 per cent of the
22 total, while labour-intensive exports fell to about 10 per cent. Exports of chem-
23 icals (SITC 5), which are also capital-intensive, also rose from less than 2 per
24 cent of exports to about 8 per cent. The most labour-intensive resource-based
25 sectors – agriculture and fisheries – experienced sharply declining export
26 shares, but less labour-intensive resource sectors (SITC 4) increased. These
27 trends coincide with the rise of China in world trade and as a trading partner
28 for Thailand (Coxhead, 2007), though of course this is not the only factor
29 responsible for observed export share changes. In 2000–06 Thailand experi-
30 enced a continued slight decline in labour-intensive export share, matched by a
31 modest increase in medium-skill export share, while other shares remained
32 steady.

33 In a similar case, Malaysian export share trends since about 1990 have been
34 dominated by the decline of primary export shares and the rise of skill-inten-
35 sive exports. Malaysia's labour-intensive manufacturing exports peaked as a
36 share of total exports in the early 1990s, and have since grown no faster or
37 slower on average than total exports, maintaining a share of just less than 8 per
38 cent. As in Thailand, Malaysia's high-tech sectors have been prominent benefi-
39 ciaries of China's growth (Eichengreen and Tong, 2006; Coxhead, 2007). In
40 Malaysia, however, the shares of medium- and high-skill manufactures in total
41 merchandise exports have diminished somewhat – although the growth rates of
42 total export values remain robust (Table 2, last column). These share trends

1 reflect Malaysia's substantially greater natural resource wealth, on a per capita
2 basis, compared with Thailand; in particular, the global boom in palm oil
3 demand has had a very large effect on the composition of Malaysia's exports
4 overall.

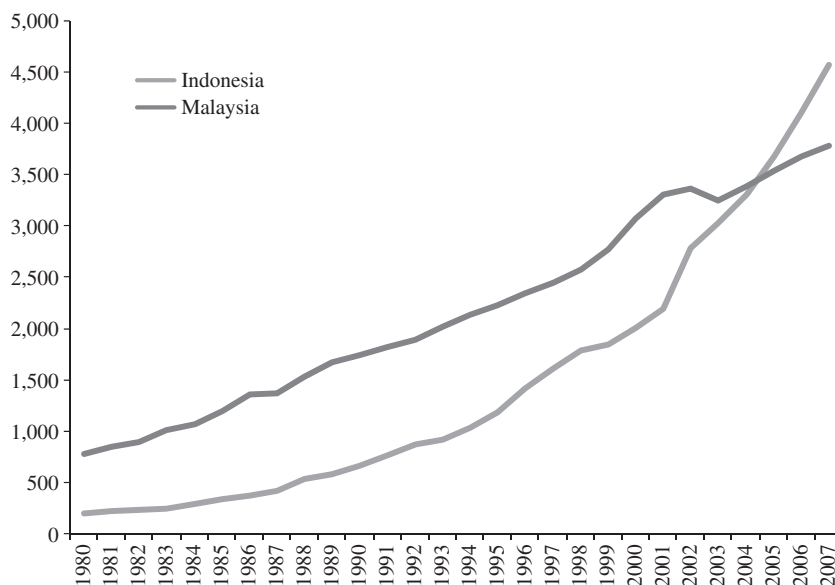
5 In contrast to its neighbours, Indonesia appears to fit better the prediction
6 for an economy with a lower relative skill endowment than the 'giant'.
7 With large resource sectors and a relatively poorly developed skill-intensive
8 manufacturing industry, Indonesian manufacturing as a whole is squeezed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

33 The data strongly suggest that if Malaysia and Thailand are analogous to
34 country 'C' in our model, Indonesia is analogous to country 'A'. Indonesia
35 appears to be an example of a country 'on the cusp' in the sense of having
36 resource wealth as well as considerable tradable manufacturing capacity. Thus
37 the Indonesian case is an inherently interesting one, and raises large questions
38 about optimal (or at least desirable) development strategy.¹⁹

39 Some of the issues confronting countries like Indonesia can be illustrated
40 by considering the case of palm oil. World palm oil prices have recently
41

42 ¹⁹ Coxhead and Li (2008) present a more detailed quantitative exploration of these country data.

FIGURE 4
Harvested Area of Oil Palm, Malaysia and Indonesia (thousand hectares)



Source: <http://faostat.fao.org>, accessed January 21, 2008.

reached record highs, due to rapid growth of demand both from traditional sources such as food processors (including the switch away from trans fats in food preparation and the rapid growth of consumer demand for processed foods) and from burgeoning markets for non-fossil fuel energy sources (palm oil is an ingredient in biodiesel production). This boom has emanated in particular from demand growth in China and India.²⁰ Indonesia and Malaysia supply 86 per cent of the world's palm oil exports. Since the early 1980s oil palm area in these countries has grown tremendously (Figure 4). In Malaysia, oil palm plantations cover one-eighth of the nation's land area, and its expansion was claimed to be the cause for 87 per cent of deforestation in that country from 1985–2000 (Wakker, 2005). The area of oil palm planted in Indonesia has expanding much more rapidly, from 295,000 hectares in 1980 to 4,120,000 ha in 2005, and now exceeds that in Malaysia (Figure 4, and see Zen, Barlow and Gondowarsito, 2005). The spread of oil palm plantations is a leading cause of deforestation worldwide, and concern

²⁰ China is the world's largest importer of palm oil, and India is the third largest importer just behind the 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.

1 about the national and global environmental effects of area expansion is
2 now widespread.²¹

3 An on-going boom in global palm oil demand is likely to place even greater
4 strain on the capacity of countries like Indonesia to balance environmental con-
5 sequences against private pressures for further plantation growth. How well
6 they achieve this will depend critically on the quality of institutions and safe-
7 guards for natural resource management. The recent UNCTAD *World Invest-*
8 *ment Report* conclusion on extractive industries can be readily extended more
9 broadly to resource sectors in general:

10
11 The quality of government policies and institutions is a determining factor for ensuring sus-
12 tainable development gains from resource extraction, with or without TNC involvement. The
13 management of a mineral-based economy is complex, and requires a well-developed gover-
14 nance system and well-considered national development objectives. In some mineral-rich
15 developing countries, however, government policymaking may be aimed at short-term gains
16 rather than long-term development objectives. Furthermore, the distribution and use of a host
17 country's share of mineral revenues may be determined with little attention to development
18 (UNCTAD, 2007: xxv).

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

24 Middle-income Southeast Asian economies like Malaysia and Thailand have
25 flourished from the growth of fragmentation trade, in which ever-finer 'slices'
26 of products can be produced in different locations. Some of their neighbours,
27 however, have not – and Indonesia is the leading example. Like other resource
28 exporters, Indonesia, has done well in trade terms from the commodity boom.
29 But its manufactured exports – or more specifically, its more skill-intensive
30 exports – have suffered, its natural resource stocks are threatened, and it is
31 experiencing a range of indirect damages both to its environment and to the
32 economic health of its manufacturing and other secondary industries. Once
33 resource wealth is included in the analysis, it seems probable that the real
34 losers from growth of vertically-unbundled trade are less likely to be the 'all-

36 ²¹ See Curran et al. (2004). Environmental research groups assert that deforestation and land
37 conversion for oil palm expansion is a significant contributor to global greenhouse gas emissions
38 (Fargione et al., 2008). Peat swamp draining and burning for plantation establishment in Indonesia
39 are held responsible for 660 million tonnes and 1.5 billion tonnes, respectively, of carbon release,
40 equivalent to 8 per cent of the global carbon emissions due to burning of fossil fuels (*New York*
41 *Times*, 2007; 2008). Nor are concerns limited to the environmental implications of oil palm expan-
42 sion; 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>).

1 rounders' identified by Jones and Kierzkowski (2001) than countries of the
2 Indonesian type: resource-abundant, but not rich in human capital or other
3 inputs to skill-intensive production – especially if their resource stocks are vul-
4 nerable to overexploitation and exhaustion.

5 6 7 5. CONCLUSIONS

9 The rapid growth of China and India is having major effects on every facet
10 of the global economy, including the environment, and this influence is pro-
11 jected to continue to expand. The growth of these two 'giants' in the develop-
12 ing world has produced a massive surge in Asian regional trade. In
13 manufactures, competitive pressures have sharpened in labour-intensive export
14 sectors, even as new growth opportunities have emerged for complementary
15 expansion in skill-intensive industries engaged in fragmentation trade. The
16 other dramatic trade impact has been the commodity price boom, a product of
17 huge increase in demand for energy, minerals and other commodities. This too
18 has had particularly strong effects on resource-rich Asian economies.

19 In this paper we sketched a model that highlights key economic forces oper-
20 ating on the resource-rich economies. We showed analytically how the growth
21 of the 'giants' generates adjustment pressures on either side of their own factor
22 endowment range along the skill-intensity spectrum. We discussed how differ-
23 ences in relative factor endowments may produce different outcomes in the
24 face of new challenges to pre-existing patterns of comparative advantage. We
25 then used insights from the model to explore the effects on environment and
26 prospects for future growth.

27 When fragmentation trade dominates total trade growth, an economy's endow-
28 ments of skills and other factors used in advanced manufacturing are of great
29 importance in establishing comparative advantage. However, commodity extrac-
30 tion and production has strong economic and environmental impacts, particularly
31 when regulatory institutions are weak, and a commodity boom may also under-
32 mine incentives to invest in skills and other factors needed to establish and main-
33 tain comparative advantage in the more dynamic areas of manufacturing industry.
34 In resource-exporting countries with weak institutions and poor governance, the
35 interactions between low initial capital/skill endowments and a commodity boom
36 could have serious consequences for growth, equity and the environment.

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