Trade, resources and development: the implications of Asian integration

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Overview

The increasing integration of Asian economies has fueled a period of sustained economic growth for the region as a whole relative to the rest of the world, and for individual Asian economies. This growth has been supported by three phenomena: global demand growth; elastic supplies of labor and other inputs, and substantially lower costs of international trade and business. The latter trend has accelerated a very specific form of economic integration, the vertical unbundling (or "fragmentation") of production tasks (Jones 2000). Fragmentation has reduced total production costs by permitting the cost-minimizing allocation of tasks among regions, regardless of national boundaries and even of distance. At a global scale, fragmentation trade is associated with the "offshoring" of labor-intensive tasks from high-wage to low-wage countries (Grossman and Rossi-Hansberg 2006). Within developing Asia, it has led to the division of tasks among countries with similar factor endowments, based on the establishment of specialized niche industries with lower costs. This effect has been central to the integration of Asia's economies: "parts and components" is the largest and the fastest-growing form of intraregional trade.

While this "trade in tasks" has been extensively studied for manufacturing (Ando 2006; Athukorala and Yamashita 2006; Jongwanich 2010), it also affects natural resources (Coxhead 2007; Coxhead and Jayasuriya 2010). Transport and trade costs have fallen even for ores, timber, and other raw materials, and this has helped to undermine the traditional logic of locating processing plants and final goods production close to the raw material source. As with the better-known examples of electronics and electrical appliances, the value chain for resource-based products is rapidly fragmenting across nations—in some cases, with active policy support.

This trend has several implications for Asia's resource-abundant economies. First, they experience booms in resource demand. Second, this demand growth is faster for raw materials than for processed or semi-finished goods. Third, there are traditional Dutch Disease consequences of the export booms. For countries where institutions and policies are not sufficient to align private with social marginal costs, there is a threat of over-specialization in raw materials exports and the loss of tradable manufacturing industries and jobs— and thus fewer opportunities for future growth based on the externalities these industries generate. Finally, just as these economies progressively 'offshore' processing and manufacturing activities, they also 'onshore' a disproportionate share of the global and local environmental damages

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associated with global economic growth— becoming, in effect, havens for resource depletion and greenhouse gas release.

In this note I will explore these issues with a very simple model. Then, taking as a case study the conversion of Indonesian forests to logs and palm oil plantations, I will examine the role played by its increasingly close integration with China and other Asian regional economies. I will conclude with a brief discussion of some implications for policy, and for the design and conduct of regional research in environmental and resource economics.

Fragmentation trade and natural resource depletion: a simple model

The basic story of product fragmentation is shown in Figure 1 (from Jones 2000). This shows two alternative cost functions for a final good produced using a variety of intermediate inputs and assembly processes, which we assume to be undertaken by separate firms. The cost functions incorporate all these upstream processes, and have both fixed and variable cost components. The fixed cost consists of the transportation and communication links and financial and legal services that are required for production to take place across several firms (Jones 2000). These service costs are largely invariant to the scale of production. However, they are higher when production is fragmented, i.e. takes place in different locations, and especially if these locations are in different countries with their own languages, laws, and business practices. So the vertical intercept of the fragmented production plan, Y^F, is higher than that of the plan in which all upstream activities take place within the borders of one country, Y^N.

Although start-up (fixed) costs of fragmented production are higher, marginal costs are lower, as seen by the flatter slope of Y^F compared with Y^N. Marginal cost is higher in the 'national' production plan due to the need to produce all components and assemble them at home. By contrast, in Y^F each production and assembly operation takes place in the location where its cost is lowest. The fragmented plan captures economies of scale due to specialization across economies with differing factor endowments.

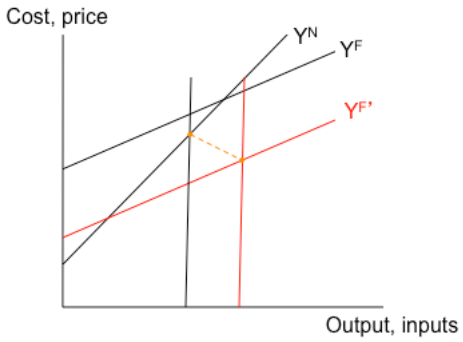

Figure 1: Fragmentation

If all production of a final good initially takes place within a national economy, the model shows two ways in which fragmentation occur. The first is by an expansion of the production run: as

output expands, the share of fixed cost in total cost diminishes and Y^F becomes the least-cost technology. This is the conventional story of vertically integrated multinational corporations, which outsource component supply to international subsidiaries. The second change is when international service costs diminish, as shown by the downward shift from Y^F to $Y^{F'}$. Then for a given scale, it becomes profitable to switch production to international niche markets rather than stay with entirely domestic suppliers of parts and components. This is the dominant story of Asian economic integration, a process marked not only by formal reductions in tariffs and other trade barriers, but also by greatly diminished costs in telecommunications, international banking and finance, and other necessary facets of an internationally integrated production system.

Figure 1 also helps us think through what happens to unit prices of natural resources as service costs diminish. So long as the final good faces a relatively elastic export demand curve (as is most likely the case for the consumer goods we have in mind) then as lower production costs move the supply (marginal cost) curve down, revenues rise. In the case of China's exports to the rest of the world (assembled from raw materials, parts, and components produced both within China and elsewhere in Asia) fragmentation causes trade diversion: suppliers elsewhere in the world lose market share to China. Also, to the extent that the final good price does indeed fall, there is an expansion in the overall size of the market. The move to fragmented production is self-reinforcing.

Because the move to fragmented production raises output, demands for inputs to production of the final good inevitably rise. Now trade theory also tells us how the additional gains will be distributed in a competitive market. Suppose (as seems reasonable) that the inputs, parts and components to a final product are used in more or less fixed proportions, so that an X% increase in output increases all variable input demands by X%. What then happens to input prices will depend on the elasticity of their supply. If the supply of inputs used intensively in assembly operations is elastic (as with labor-abundant China) and there are many potential competitors to fulfill this task (e.g., Bangladesh or Vietnam), then a relatively large share of increased revenues from final sales growth accrues instead to factors that are less elastically supplied—that is, they become higher rents paid to resource extraction. World prices of commodities rise much faster than labor costs. In short, fragmentation, leading to increased production scale of final goods, results in higher unit returns, or even a price "boom", for the suppliers of natural resource inputs to those goods. The rents to be earned from mining and timber harvesting increase.

There is another consequence of the boom. When service costs were high, it made economic sense to process resource-based products close to their source. Lower service and shipping costs for raw materials de-link resource-based production from the resource itself. Just because your country has many trees no longer implies that it will also produce and export furniture. This point is explored in a general model by Coxhead and Jayasuriya (2010). Figure 2 illustrates it with timber products data from China.

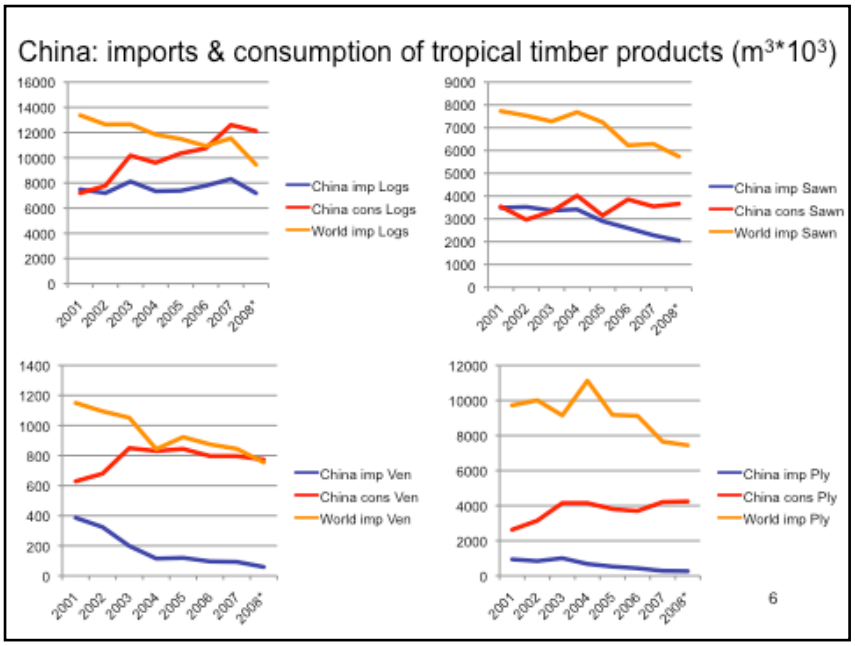

Figure 2: China's imports and consumption of tropical timber products
Source: ITTO Annual Review, various years.
http://www.itto.int/en/annual_review/, accessed 20.2.2010

As China's economy has grown and become more internationally integrated, its domestic timber processing capacity has also expanded. Figure 2 shows that consumption of all processed timber products (sawnwood, plywood, and veneer) has grown much faster than imports.[2] In fact, China's imports of processed timber products have actually declined—in line with total world imports—even as its consumption has grown. Indonesia's timber exporters increasingly face demand only for raw materials, not for value-added products, from their largest and fastest-growing export market.[3]

Fragmentation captures economies of scale (as seen in Fig. 1), and so may also have dynamic effects, not only on growth but on comparative advantage. Cost-minimizing firms engaged in similar activities concentrate in a single location, regardless of the industry with which they are associated (e.g., computer chips produced in a single plant or cluster of plants, having a wide variety of product applications; all kinds of products are shipped to the Pearl River Delta for assembly and packaging). Thus "the possibility of the application of some fragment or service link over a broad variety of industries serves as an important spur to the development of new technologies; research and development efforts are bound to be greater if the potential market in which profits can be earned is spread more widely" (Jones 2000:120). But the gains from this technological dynamism in manufacturing and assembly will initially be captured in the economy where they occur, not in the economies that specialized in resource exports.

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[2] Due to smuggling from Myanmar and other neighboring countries, China's log import data are almost certainly underreported; see Sun et al. 2004.

[3] I use China's import data in this analysis rather than country export data, because where timber products are concerned, the latter are notoriously unreliable.

To summarize, we can see that the fragmentation of intra-Asian trade is resulting in a familiar boom in natural resource demand, but that this does not necessarily mean a corresponding rise in demand for exports of downstream products based on natural resources. The resource export boom creates higher rents, leading to faster growth of GDP (conventionally measured), but also to faster resource exploitation, where that is possible. And simultaneously, opportunities to create "good" jobs in more technologically dynamic downstream activities (processing, manufacturing and final assembly) are being lost, or at best added at a slower rate. The rate of loss of such jobs may be even faster still than predicted by the mechanism just described, because the resource export boom also supports a real appreciation – the central mechanism of the phenomenon most commonly known as Dutch Disease.[4] Resource export specialization is asserted to have corrosive effects on institutions, policies, and incentives to acquire skills, and raise overall macroeconomic volatility. All these effects raise the marginal social cost of generating a dollar of additional GDP in resource exporting economies, even as the same cost *falls* in economies that have specialized in processing and assembly operations.

Evidence

Within SE Asia, concerns about the negative consequences of specialization and resource exploitation are especially relevant in Indonesia. This is a resource-abundant economy whose manufacturing industries are vulnerable to exactly the kind of challenges posed by the international unbundling of production processes. The diversification of Indonesia's trade pattern, from a starting point of near-total dependence on natural resource exports in 1980, has been impressive, but is not necessarily stable. Table 1 shows recent export shares by sector and their growth rates in 2000-07, and compares the latter with two other regional economies, Thailand and Malaysia. These data are suggestive of countries on divergent development paths. Indonesia's export growth has been fastest in natural resources and palm oil. Its exports of manufactures are growing a lot slower than those if its neighbors (with the partial exception of the smallest category, medium-skill manufactures). And surprisingly, even the resource-based semi-manufactures categories, which include chemicals, ores, sawnwood, pulp and paper and other intermediates, have grown less quickly in Indonesia than in the other countries.

The export trends in Table 1 don't conclusively prove anything, but they do raise researchable questions. In the Indonesian context the rapid growth of natural resource exports immediately raises questions of natural resource depletion. Indonesia's forest stocks are being drawn down at a rapid rate, driven by demands for timber and for land, the latter to be converted in increasingly large quantities to estate crops, mainly oil palm (Figure 3). This process of land conversion has projected the country into the leading ranks of global greenhouse gas (GGG) emitters. Land use change in Indonesia is estimated to contribute about 6% of the total GGG emissions (Stern 2007)—far above the country's share of global GDP or population. By converting its forests to lumber and plantations, Indonesia has become a global *resource depletion haven*.

[4] A recent econometric study shows Indonesia's manufactured exports to be considerably more sensitive to the real exchange rate than are those if its regional neighbors (Jongwanich 2010).

Indonesia and its neighbors: structure of export growth

	Share in Indon. non-fuel exports (%)		Ann. growth rate (%) of export value 2000-07		
	2000	2007	Indonesia	Thailand	Malaysia
Ag & NR (SITC 00-29)	17.3	25.1	14.92	9.93	10.3
Veg oils etc (SITC 4)	3.8	12.1	28.61	18.41	19.0
Chemical (SITC 5 ex 54)	6.6	7.3	10.63	17.11	16.0
Semi-mfctrs (SITC 6)	26.8	22.2	6.17	12.57	12.3
Low-skill mfg	21.3	14.3	3.02	5.70	9.8
Med-skill mfg excl. chem	3.8	7.6	20.24	21.35	13.5
High-skill mfg	20.4	11.3	0.13	8.50	4.6
ALL	100.0	100.0	7.47	10.74	7.26

Source: UN Comtrade

7

Table 1: Export shares and growth rates, Indonesia and its neighbors
(Source: Coxhead and Jayasuriya 2010)

There are other potential development implications of this trend. Following the Asian Crisis of 1997-99, Indonesia's oil palm area growth accelerated, and in 2004 total area overtook that of Malaysia, formerly the largest producer (Figure 4). The growth rate of oil palm area in Indonesia remains high – about 10% per year – while that in Malaysia has fallen to under 5% per year. Meanwhile, Malaysia has added capacity in capital-intensive, skill-intensive downstream industries producing oleochemicals, while Indonesia remains specialized in the export of crude palm oil (CPO) – including exports that supply Malaysian refineries. This is another example of international fragmentation. Between the two economies, Indonesia increasingly specializes in oil palm plantations and CPO (production of which must take place immediately after harvest), while Malaysia increasing specializes in products with higher technology content and non-natural resource value-added. If there are dynamic gains associated with expansion of the palm oil processing industry, they will be won mainly by downstream industries, and if these are located mainly in Malaysia, then it is that country's labor force whose productivity will be raised as a result. Meanwhile, Malaysian companies have made large investments in Indonesian plantation development (Figure 5), thus helping widen the factor endowments gap that is driving cross-border specialization.

Implications

The argument developed in this note is based on a highly stylized model and only fragmentary and suggestive evidence. No substantive conclusions can be drawn. But there are clear indicators for further research, some of which might result in testable hypotheses and defensible policy implications.

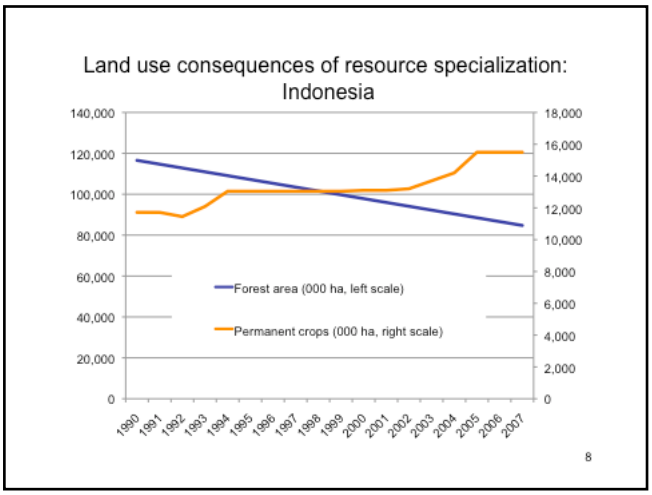

Figure 3: Forest and plantation crop area, Indonesia (source: FAO)

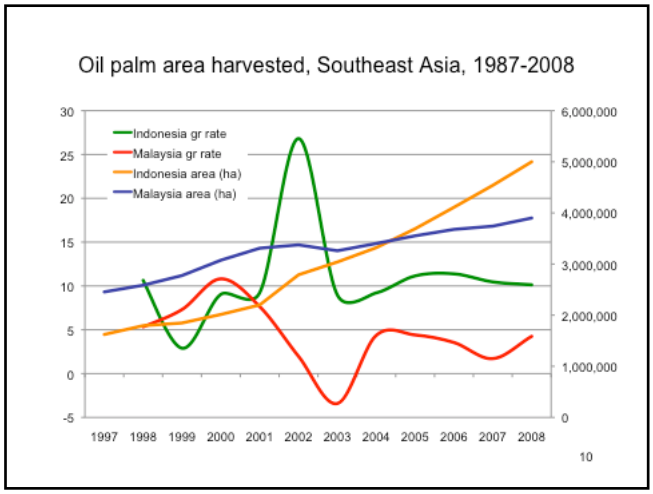

Figure 4: Oil palm area harvested & area growth, Indonesia & Malaysia (source: FAO)

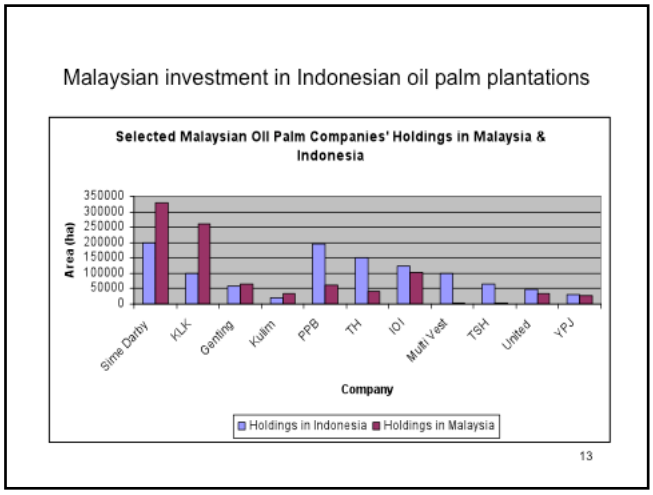

Figure 5: Malaysian oil palm holdings in Malaysia and Indonesia

For researchers concerned with environment and development, the implications of Asian integration vary according to the research topic. But one methodological point is clear: there are no longer any seriously autarkic economies. Trade and international factor flows are pervasive; they influence and are in turn influenced by environmental and natural resource decisions and policies. The integration of Asia's economies with each other and with the global marketplace is arguably the biggest single factor influencing their development in current times, since it links their fortunes to those of the world's second-largest and most dynamic economy, China. The

scale of the associated environmental issues is also huge, as seen by Indonesia's disproportionate contribution to GGG emissions. Not every environmental problem in the region is so immediately linked to trade as the issue of forest depletion and land use change, but in general the design of research that ignores international influences risks coming to conclusions that are irrelevant, or in the worst case, incorrect.

For environmental researchers, then, the data reveal a need to take global price and trade trends into account in resource valuation studies. Trade in general means that natural resource values ("stumpage values") are de-linked from conditions of their scarcity in the domestic economy. In contrast with predictions from closed-economy models, a small open economy can entirely deplete its stock of some resource, yet the price, set in global markets, will remain unchanged.

Fragmentation trade in particular means that comparative advantage is neither exogenous nor stable—in fact, the whole concept of comparative advantage becomes ill-defined in a world of trade in tasks. This means that both resource exploitation incentives, and expectations of growth in resource-based processing and manufacturing are more complex to evaluate. Tracing this through the economy, predictions of growth in skills, incomes, and other factors that economists sometimes bundle together as the "technique effect" in an environmental Kuznets curve are all subjects for careful study.

On policy, the intertwining of markets, factor flows and economic growth outcomes across Asia introduces international environmental spillovers, not only directly as in the effects of "haze" from forest fires, but indirectly in the displacement of resource depletion across national borders. This means that the national economy is no longer the optimal scale at which to address such issues. Resolving environmental problems due to overexploitation of natural resources becomes a matter for international policy coordination.

Finally, at the national level there are likely to be strong complementarities between good environmental policy and good development policy. Countries must manage their resources as best they can, of course. But to capture economies of scale and technological dynamism associated with trade in tasks requires investments in human capital and complementary factors (Coxhead and Li 2008). With fragmentation trade there are many possibilities: the diminution of trade and transport costs within Asia means that production processes can be subdivided into ever-smaller niches. But only by investing and capturing some of these niches will resource-abundant economies maintain a diversified export base and avoid environmentally, and ultimately developmentally, destructive specialization.

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