

# Production Fragmentation and Outsourcing: General Concerns

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Globalization is a phenomenon greatly in the news. It refers to many things – the great expansion in the volume of international trade, in the volume of foreign investment, and the high rate of growth of many developing countries, including the giants of China and India. Greater trade and investment seem strongly correlated to the success both of this pair of countries and of some other developing nations in achieving high growth rates, while a small degree of participation in production for world markets is often matched by low (or even negative) rates of growth. Much of Africa seems to fall into this latter category, while East Asia as well as China and India seem generally to be in the former category.

International trade has indeed grown, even relative to incomes. And international fragmentation of the production process supports the alteration in the *composition* of trade in recent years. In the 1990's world GDP expanded by 3.7% yearly, while world trade indeed expanded at the faster rate of 6.5%. However, international fragmentation of productive activity grew even more – trade in parts and components in the last decade of the twentieth century grew by an average of 9.1% a year, even faster than the rate of growth of intra-industry trade.<sup>1</sup> As Henryk Kierzkowski and I have argued (in our 1990 and subsequent papers), increases in world incomes and the great reductions in what we call *service link* costs have conspired to encourage greater degrees to which previously vertically integrated production processes have become fragmented into a series of

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<sup>1</sup> Thanks are due to Francis Ng for making these data available to Henryk Kierzkowski and me in preparing our 2005 paper with Lurong Chen.

*production blocks* that may be outsourced to various regions of a country or, indeed, abroad as part of an international production network. This typifies world production in such sectors as textiles, automobiles, sports footwear, furniture, and many others. Costs are incurred when such international outsourcing takes place, such as those of transportation and communication – activities we refer to as service links.

The basic ideas of our fragmentation scenario as well as the consequent feature that increasing returns to scale systematically emerge as production increases are most easily illustrated in our oft-used diagram shown in Figure 1.<sup>2</sup> It illustrates how total costs of production are positively related to scales of output. For example, ray *1* from the origin illustrates productive activity that takes place in a single location under constant returns to scale technology. By contrast, line *2*, flatter than ray *1*, shows how total costs might vary with output if the originally vertically integrated production process were split up into a pair of production blocks. This could serve to reduce marginal costs of production. The reason might be that workers in one area of the country tend to have different skills from those in another area, and the skills required in each production block differ so that a dispersion of activity according to comparative advantage could lower marginal production costs. This is a Ricardian type of story. Alternatively, it might be the case that the production blocks differ from each other in the proportions of different factors that are required. Labor-intensive production blocks would better be located in regions in which labor is relatively inexpensive compared with productivity. This would be a Heckscher-Ohlin type of difference. Such fragmentation, however, introduces new costs – the costs of connecting the two production blocks by service links such as

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<sup>2</sup> This kind of diagram was first discussed in our 1990 paper and in its present form was used in Jones and Kierzkowski (2005).

transportation, communication, and general costs of coordinating activities into a smooth sequence resulting in production of the final product. This would represent *outsourcing* within the country, and it could link production blocks within a single firm or, alternatively, involve one firm making arrangements at arms length with a different firm in a different location. Lines 3 and 4 in Figure 1 represent either splitting up the production process into more separate production blocks, allowing a finer degree of specialization according to comparative advantage, and/or of engaging in *international outsourcing*, with some production blocks, say, being located in a different country (such as Ikea does with Poland) in which the discrepancy between countries with different relative factor prices (compared with productivity) is even more pronounced than within countries. Again, such outsourcing may be kept within the (multinational) firm, or be let out to other firms via separate contracting (e.g. Nike in having production of athletic footwear located in East Asia). The terms outsourcing and fragmentation refer to moving parts to different locations, not necessarily to different firms.

In Figure 1 an extreme assumption is made, one meant to capture a difference between the technology of production blocks and those of connecting service links: The costs of service links are taken to be fixed with relation to output (e.g. the costs of communication involving a shipment of a hundred units is the same as those of a thousand units), while there are constant returns to scale within production blocks.<sup>3</sup> Of course this is a severe distortion for service link activities such as transportation (although even Alfred Marshall was intent on pointing out that the unit costs of transport significantly decline with output). As Figure 1 reveals, the relationship between total costs (including those of

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<sup>3</sup> In most of the literature of the “new economic geography” much of what we refer to as service links is taken up by transportation, albeit of the “iceberg” variety made popular by Samuelson (1954), which reflects constant returns to scale.

service link activities) and output, illustrated by the solid broken line, exhibits increasing returns to scale. As opposed to the discussion by Krugman and others in supporting increasing returns in a monopolistic competition framework, increasing returns here are to be found in the nature of service links instead of on the factory floor.

One of the striking changes that technology has brought about in the past several decades is the lowering of service link costs, especially the technological changes wrought by the information revolution. In Figure 1 these changes would be captured by a downward shift in the separately numbered cost lines, and result in greater degrees of fragmentation even for given levels of output. Of course man-made changes in the form of lower barriers to international trade and the easing of regulations internally in an economy that has imposed costs all aid in this process of encouraging international fragmentation. The numbers cited above for growth rates of GDP, international trade, and trade in parts and components all serve to illustrate the changes encouraged by international fragmentation.

Concerns about these aspects of the increased degree of globalization have been expressed both in highly developed countries and in countries at earlier stages of development. Before considering these note a common feature faced by both groups: Almost *any* change in world market conditions creates losers as well as winners, both among countries and within countries. Two years ago the pot got stirred when Paul Samuelson (2004) took on the strong supporters of globalization by emphasizing that changes in the terms of trade that accompany globalization may easily harm some countries as well as helping others. In my view part of the problem stems from the exceedingly strong result that is at the core of international trade theory: Any country

that moves towards free trade from an initial position of autarky gains from such trade. Furthermore, the gains are such that even if internally some will lose, the overall gains suffice to ensure that compensation schemes (although rarely put into practice) can theoretically allow winners to transfer income to losers so that everyone gains. This is indeed a strong result, but it does *not* state that once countries are part of a world trading network further changes that may be brought about by increases in globalization can benefit all parties. With countries already engaged in trade, changes in relative prices of traded commodities help some and hurt others.

A complaint heard in many advanced countries, perhaps especially in the United States, is that international outsourcing creates unemployment, especially among less skilled workers. However, just as almost any change in world markets creates losers as well as winners, it is also the case that any shock in world markets that calls for a reallocation of resources will, at least temporarily, serve to create some unemployment. If the argument stops there – pointing to the creation of unemployment – a pall will be cast over almost any change. Economic theorists tend to focus instead on a comparison of the new equilibrium with the old, assuming price (and wage) adjustments have been made in markets. The critics of international outsourcing in the United States, for example, have at the outset to handle two empirical facts, *viz.* that the overall rate of unemployment has been gradually falling, not rising, and that the extent of international *insourcing* is greater than that of outsourcing.<sup>4</sup> Furthermore, consider a kind of worse-case scenario for unskilled labor in an advanced country: International fragmentation leads to firms in an industry outsourcing an unskilled labor-intensive fragment to China or East Asia. Almost universal agreement could be reached that this would spell

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<sup>4</sup> See Walter Wriston (2004).

difficulties for unskilled labor, in facing a lower wage rate if not outright unemployment. Although plausible, does theory lead us necessarily to expect such an outcome?

The key to understanding the possibility that a capital or skilled-labor abundant country might experience an increase instead of a decrease in wage rates for unskilled labor if international fragmentation leads to outsourcing of an unskilled-labor intensive fragment to a less developed country lies in observing that such outsourcing takes place because it lowers costs of production.<sup>5</sup> Such cost reduction is akin to technological progress, and the question that then needs to be raised is whether technological progress in this sector of the economy represents progress in the unskilled-labor intensive sector or in the skilled-labor intensive sector. That is, what else does the economy produce? Is it more skilled (or capital) intensive than the sector in which outsourcing has taken place? If it is more skilled intensive, then international outsourcing is like the economy experiencing technical progress in its unskilled-labor intensive sector, resulting in an *increase* in the unskilled wage rate. Whatever the nature of the sector in which outsourcing has taken place, the *other* commodity produced (in this two-factor setting) is more apt to be more skilled (capital) intensive the greater is the relative endowment of human capital.

The object of this exercise is not to prove that unskilled labor in developed economies need not be concerned about international outsourcing, but rather to suggest that the opposite view, which probably has wide media support, does not necessarily follow. This

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<sup>5</sup> Further details, and a diagrammatic proof, are provided in Jones (2005)

is an example, like so many others, in which economics pays for itself by widening the range of possible outcomes compared with those seemingly dictated by common sense.<sup>6</sup>

Given that international fragmentation and outsourcing has raised concerns like these in highly developed countries, what is the likely attitude towards this aspect of globalization among countries at earlier stages of the development process? As a prelude, consider the attitude of many less developed countries at the time of the Uruguay Round, when major efforts were made to lower trade barriers for a number of services. Fears were expressed that some less developed countries did not have a comparative advantage in services, and therefore would be hurt by opening up trade in these areas. But just the opposite could happen – lowering the costs of services by shifting some production to more developed countries that had a comparative advantage in services could aid other less developed countries by lowering their costs in getting the commodities in which they possessed a comparative advantage into world markets. That is, some services are of the type described earlier, those like transportation and insurance, that provides the service links that make possible more international outsourcing of labor-intensive production blocks. The appropriate question perhaps is not “do we possess a comparative advantage in service production?”, but rather “can we make good use of lower-cost services in promoting our production of fragments that can fit into a world production network?”. Of course not every country is guaranteed a place in such networks. Trade theory does indeed show that every country can engage in trade and

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<sup>6</sup> Another example is connected to the remarks made by Samuelson (2004). In his discussion suppose the United States and China produce a commodity in common and that China experiences a productivity improvement in that commodity, but not so much as to wipe out the American sector. The United States loses in this case. But suppose instead that initially the United States has a pronounced technological advantage in producing this commodity and that this technology gets transferred (without compensation) to China and as a consequence the American industry does get wiped out. The result: real incomes to American workers (the only factor in this Ricardian setting) *might* actually increase! The results for the two-commodity case are set out in Ruffin and Jones (2006).

gain from such trade by concentrating resources on activities in which that country has a comparative advantage, but it does not guarantee that these activities will be in the form of production fragments that form part of an integrated world “supply chain”.

Many service link costs tend to be country-specific. Some countries have poor highway networks, harbor facilities and airports, and may compound these problems by an array of self-imposed regulations that raise the costs of doing business with the outside world. That is, although advanced countries may have a comparative advantage in many service activities, others are dictated by country-specific infrastructure. For example, Clark et al. (2001) cites median clearance time at ports (number of days to clear customs) and a port efficiency index (with the most efficient being 7 and the least, 1). Of the countries cited, none of them in Africa, Singapore was a leader in both categories (median clearance time of 2 days and a port efficiency index of 6.76), while Brazil, Ecuador and Venezuela all had clearance time of more than 10 days and port efficiency indices of around 3. China was in the middle range (a median clearance time of one week and efficiency index close to 3.5).<sup>7</sup>

Much has been written about the characteristics of China and India, and especially of their differences. Of course India stands out because of the widespread use of the English language, which supports relatively high local wage rates for those working in call centers and other service activities. Compared with China, however, there is much less activity in Indian manufacturing for international markets. Furthermore, China has invested much more in improving its harbors and highway systems. With reference to the earlier distinction made in discussing international fragmentation, does this difference

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<sup>7</sup> More theoretical and empirical work on service-link costs among countries is being undertaken in early drafts of S. Golub, R. Jones and H. Kierzkowski (2006).

suggest that service link costs are lower in China, thus supporting more international outsourcing of production blocks? In some ways, yes, but hidden behind these aggregate terms is the notion that the service link activities required for India's participation in international production networks are quite different from those required for China. Some "service" activities are integral parts of "production blocks". When an Indian doctor is called upon to provide advice for ongoing medical activities in the United States, e.g. by analyzing X-rays or assisting (long distance) in operations, or accountants and computer specialists are plugged into business activities half-way around the world, these service activities are parts of production blocks, and the necessary supporting "service links" are not highway systems and efficient harbours. Instead, they are high-quality, inexpensive information systems operating in a common language.

Both the Chinese and Indian economies have something in common, not shared by many other less developed countries. They each have large *hinterlands*, vast supplies of labor used in other activities and capable of being brought into whatever production activities make a good fit for international demand without necessitating relative large disturbances in factor prices.<sup>8</sup> Smaller countries do not have this advantage, and thus may be left out of the selection process if fragmentation takes place in sectors (e.g. automobiles) in which production blocks may require substantial labor inputs.

For many less developed economies more active participation in world markets not only provides more opportunities, especially to supply labor-intensive fragments in an internationally diversified production chain, but also exposes these economies to greater levels of competition. An early example of how such competition can alter previous patterns of international outsourcing is provided by Morawetz (1981). Several decades

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<sup>8</sup> The importance of hinterlands in the process of globalization is developed in Jones (2000), ch. 3.

ago the task of assembling fabrics cut in the United States was outsourced to South America (Colombia), with countries in the Far East disadvantaged by greater distance from the final market. However, Colombia lost out when reductions in costs of communication and transportation made closer proximity to markets less important. Of course highly developed countries as well are concerned with the greater values for supply elasticities induced by international fragmentation; it is a universal fear of national economies (and private firms) that increasing mobility and flexibility in international production networks will create unemployment and necessary resource reallocation.

The kinds of technological improvements in communication and transportation that have encouraged greater degrees of international fragmentation not only conspire to introduce a greater level of competition among less developed countries in potentially supplying labor-intensive fragments, they have also tended to increase the intra-country competition between generations. It is possible to argue that these technological improvements have altered the relative values of physical and human capital, in favor of the latter, and that the older generation in many countries is relatively richly endowed in physical capital and the younger generation in human capital. Such an inter-generational asymmetry is encouraged as well by the greater international mobility of students in less developed areas to universities in Europe and the United States. The hypothesis that was made in Jones and Marjit (2001) suggested that many of the regulations and customs in less developed countries are in place largely to prevent threats to the material wealth of the older generation, with such threats coming from two possible sources: foreigners, and the younger generation. Thus international trade, as well as foreign investment, is heavily regulated. As well, apprenticeship schemes and difficulties of obtaining local

credit serve to curtail those productive activities of the younger generation that are independent of supervision and control by the older generation. Greater access to foreign education and sources for credit, and to information about other cultures obtainable from the internet, have tended to widen the range of opportunities to the younger generation. And a foreign investor anxious to take advantage of relatively inexpensive labor in arranging a production fragment to be produced locally might prefer to make a partnership with a young graduate from the Wharton School instead of an established local firm that has a vertically integrated production facility that may even require tariff or quota support because of inefficient capital-intensive fragments.

International fragmentation of production processes will tend to continue, and with it bring gains to the world economy. However, past history suggests that progress does not come smoothly. Outsourcing and fragmentation are processes that reflect greater competition and greater competition induces protective moves from those interests threatened by change. Such concerns do not merely arise in highly developed countries anxious about losses of productive activities heavily reliant on relatively unskilled labor. Symmetry suggests that less developed economies would be concerned about losses of physical and human capital-intensive activities to the more developed areas of the world. More relevant is the possibility that some less developed areas may miss out on this process. Much depends upon their ability both to raise productivity (relative to wages) in production blocks that could find a place in international production chains and to lower the costs of the required locally-provided service links. At the present time East Asian countries seem to be doing well in these respects, especially relative to countries in Africa and perhaps some in Latin America, but history provides many examples in which

today's successes stumble in the future. We are living in a "brave new world" in which national economies are getting more interdependent, but in ways in which the roles played by any particular economy may become less stable and protection more difficult.

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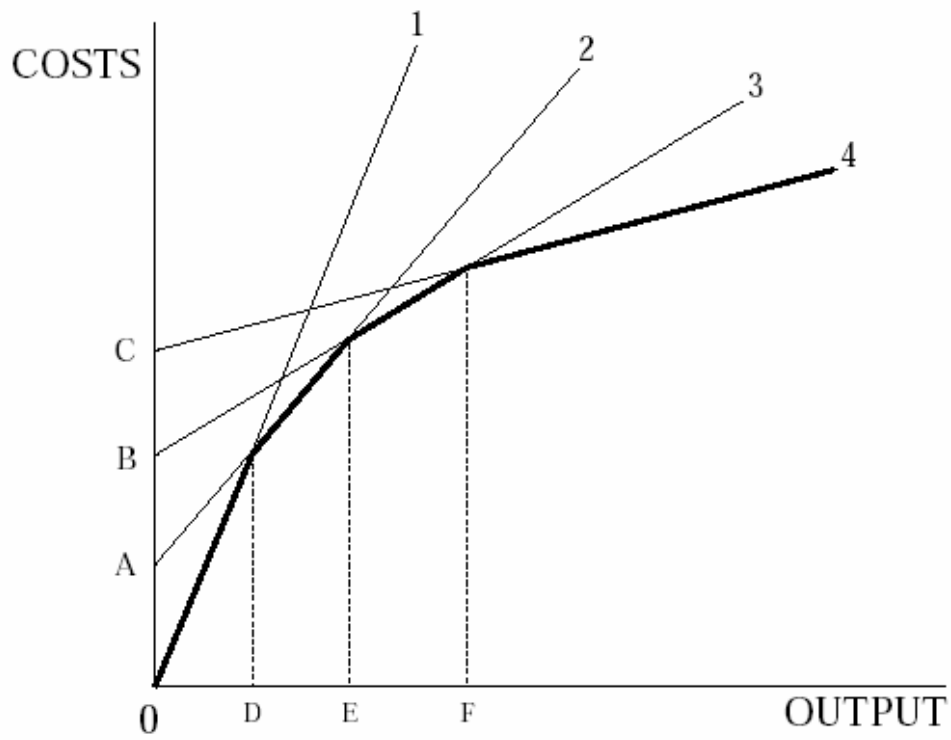


FIGURE 1