
Integration of the North American Economy and New-paradigm Globalization*

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1. Introduction

Since the dawn of human civilization, the cost of moving goods, people, and ideas has forced the geographical bundling of economic activity. Before the days of easy shipping, communities were obliged to consume what they could make. The gradual reduction of shipping costs, with acceleration from roughly 1850 onward, meant that factories did not have to be near consumers, and competitive pressures pushed production toward the most efficient locations. This first “unbundling” brought about many wonders of the modern world. Nations (and regions within nations) started to specialize in the production of certain goods. Large cities arose and the concentration of talent and know how fostered further innovation and scale economies; the Industrial Revolution was born along with the rise of mass intranational and international trade. Up to the mid-1980s, unbundling operated at the level of factories or even whole industries since it was economical to keep all manufacturing stages in close proximity.

Since about the mid-1980s, rapidly falling communication and co-ordination costs have fostered a second unbundling – this time of the factories themselves. Cheaper, higher quality and more reliable communications reduced the need to perform most manufacturing stages near each other. As with the first unbundling, changing technology opened the door to spatial separation and competitive pressures pushed industry across the threshold. Even more recently, the second unbundling has spread from factories to offices with the result being the outsourcing and offshoring of service-sector jobs.

It is useful to view the first and second unbundling as being described by two paradigms. The old paradigm – essentially traditional trade theory – was useful for understanding the impact of the first unbundling. Understanding the second unbundling requires a new paradigm – what Gene Grossman and Esteban Rossi-Hansberg called “trade in tasks” in their famous Jackson Hole paper (Grossman and Rossi-Hansberg 2006a). Even though the old and new paradigms happily coexist (factories and consumers continue to be separated even as the factories themselves are unbundled), they have quite different implications for how governments should react to globalization.

As we shall see, the key difference is the level of analysis. In the old paradigm, greater openness tended to affect sectors as a whole and, importantly, the fortunes of sectors tended to be shared with the productive factors used most intensively in the sectors. The

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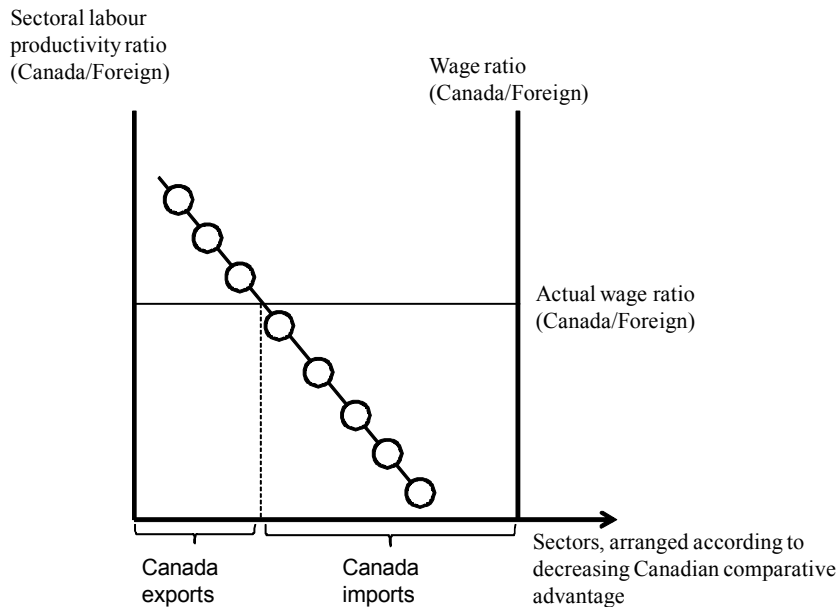
standard level of analysis was thus sectors and labour skill groups. Globalization occurs with a much finer resolution in the new paradigm, forcing a rethink of the policy prescriptions flowing from the old paradigm.

This paper presents the trade-in-tasks conceptual framework and extends it to allow for factors that are critical to the analysis of the development of North American industry (e.g., recognizing that Canada and the United States are both high-income nations while Mexico is not). It also considers the policy implications for the Government of Canada, identifying the policy levers and policy initiatives that should be examined to support the development of North American economic platforms. To accomplish these goals, it is necessary to start with the old paradigm, recasting it in a fashion that facilitates comparison with the new paradigm. This is the job of Section 2. The subsequent two sections respectively introduce the new paradigm (trade in tasks), and then extend it to allow for factors critical to the study of North American integration. The next section, Section 5, discusses the policy implications of the extended trade-in-tasks framework, including the impact of trade facilitation, labour and industrial policies, tariff policies, rules of origin, and product standards.

2. The Old Paradigm

Traditional thinking about globalization – namely standard trade theory – is based on a comparison of nations' competitiveness sector by sector. The goal is to work out a nation's comparative advantage. To think about this, it is useful to start with a fairly abstract view of the competitiveness of a nation's various sectors. Figure 1 facilitates the analysis.

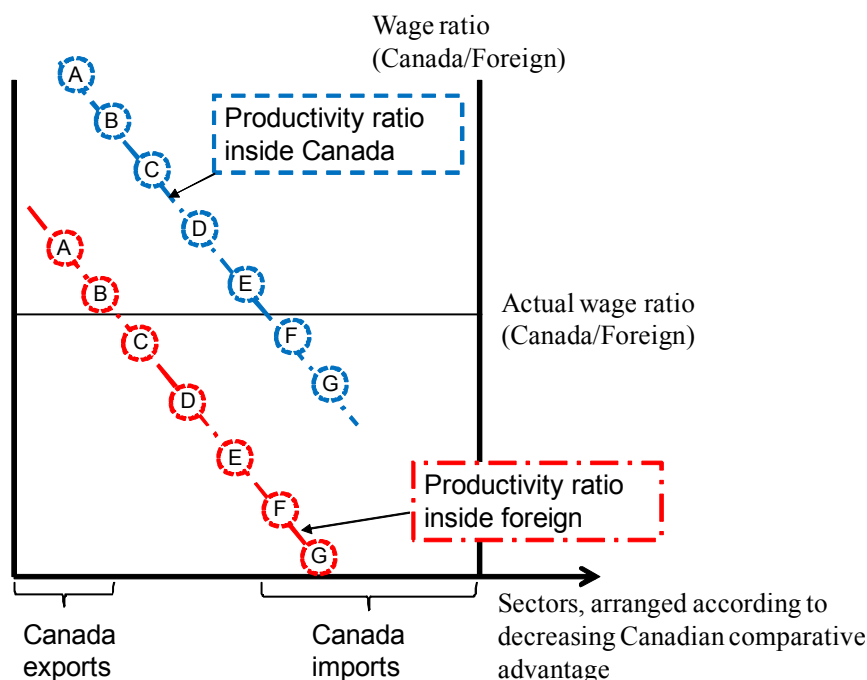
Figure 1: Old paradigm analysis of competitiveness



The diagram lists sectors along the horizontal axis according to their competitiveness. Canada's most competitive sectors are on the left. For instance, the ratio of Canadian to foreign labour productivity is highest for sector A. The least competitive sectors are on the right; e.g., sector H. This measure of competitiveness, however, is incomplete since it does not account for the wage differential. The actual wage gap – i.e., the ratio of Canadian wages to foreign wages – is marked with the flat line. As drawn, Canada's productivity gap more than outweighs the wage gap for sectors A, B, and C. That is, given the actual wage ratio (wage gap) and the productivity ratio (productivity gap), Canada can produce sector A, B, and C goods more cheaply and thus it exports these goods. The other goods are where the foreign market has a comparative advantage. Canada imports these goods.

The Figure 1 analysis ignores transportation and other trade costs. Since changes in such costs are a central character in globalization's drama, we have to modify the diagram to get them into the picture. This is simple, requiring nothing more than the realization that the competitiveness of a Canadian good is different in the Canadian market than it is in the foreign market and vice versa. Specifically, we have to adjust the productivity gap. The cost of Canadian products inside foreign markets will be higher due to trade costs, so Canada's productivity edge will be dampened by trade costs, and the opposite holds for the competitiveness of foreign products inside Canada. We show this in Figure 2 by having two lines representing the labour productivity ratio: one for the ratio inside Canada (where foreign firms face the disadvantage of having to pay transport costs) and one for the ratio inside the foreign market (where it is the Canadian firms that are disadvantaged by the transport costs).

Figure 2: Old-paradigm analysis of competitiveness with trade costs



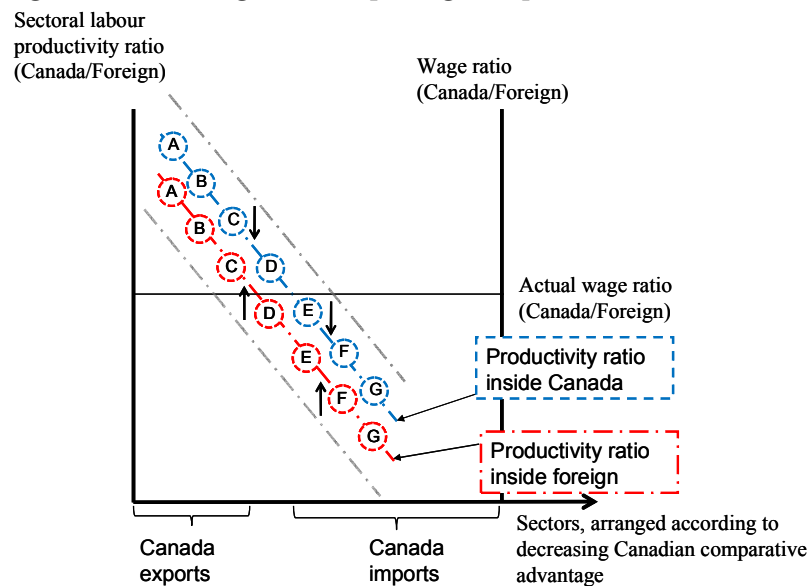
The implications of this are intuitively obvious: some goods will be made in both nations since local producers are more competitive in both markets given trade costs. In other words, there will be non-traded goods. In the diagram we see that product C is above the wage line for sales inside Canada; as usual, this indicates that Canadian firms will be the low-cost producers for the Canadian market. However, product C is below the line in the foreign market, so foreign firms will be the competitive ones in product C in their own market. The same holds for goods D and E, so C, D, and E will be non-traded. Using the bundling terminology, transport costs means that the production and consumption are still bundled nation by nation for these sectors; nations consume only what they make.

By contrast, products A and B are above in the foreign market, indicating that Canada would be the low-cost producer, so Canada exports these; F and G are below inside Canada, so these are the sectors where Canada would be the importer.

2.1 The impact of falling trade costs: The first unbundling

The last thing to do with this old-paradigm construction is the most crucial. We use a diagram to consider the impact of globalization; i.e., lowering trade costs. This is done in Figure 3. As trade costs fall, the two lines get closer since the trade cost is less of a factor in determining competitiveness. Naturally the result is an expansion of trade; consider the pattern of this expansion. Canada now becomes competitive in sector C (the trade cost-adjusted productivity ratio in foreign market is now above the line for C) and so it starts to export this sector. By the same token, the trade cost-adjusted productivity ratio is now below the line inside Canada, so the foreigner becomes competitive and Canada starts to import sector D.

Figure 3: Unbundling in the old paradigm: impact of lower trade costs



2.1.1 Key lessons for old-paradigm policy thinking

While few policy makers would have these diagrams in mind, something like them was very evident in shaping their thinking about globalization, the effects on the economy, and what they as policy makers should do about it.

The key point is that globalization made some of Canada's sectors more competitive and others less so. But which ones? The "winners" and "losers" were not randomly assigned. The new winners from globalization are sectors that are similar to the ones that were already exported. The losers, like sector E, are the sectors that are similar to the sectors where Canada was already uncompetitive.

2.2 The appropriate level of analysis: Sectors and skill groups

A critical implication of this line of reasoning – a line that most policy makers still work with today – is that globalization's impact is rather predictable. Policy makers could and did identify "sunrise" and "sunset" sectors in advance. They felt they had a rough idea of the identities of the winning and losing sectors. After all, the first unbundling essentially exaggerates the existing pattern of comparative advantage.

For example, as the world opened up, Canadian clothing manufacturers lost out to import competition, and as globalization proceeded, this trend deepened. The lower trade costs, however, meant the Canadian natural resource-based and high-tech products gained markets, with the range of such winning sectors expanding as globalization rolled on.

There are a couple of critical assumptions lurking behind this thinking. First, as drawn in Figure 3, it assumes that further globalization lowers trade costs more or less evenly for all sectors. That is, one would not expect a radically different change in the trade costs facing sector D and sector E. Second, the comparative advantage of the sector is roughly related to its factor intensity. For example, it was useful to think of Canada's sunset sectors as marked by unskilled labour intensity, while the sunrise sectors were marked by skill intensity.

2.3 Policy thinking based on the old paradigm

In the old-paradigm thinking, sectors, or at most firms, are the finest level at which globalization's impact was felt. More open trade spurred the fortunes of some firms while spiking the fortunes of others but the sector was the finest level of disaggregation worth looking at. Since most firms in a sector stood or fell together, the type of labour used most intensively in the sector typically shared the sector's fortunes. This led governments to organize their globalization policies around sectors and labour market skill groups. More specifically, the correlation between current competitiveness and the impact of deeper globalization demonstrated in Figure 3 led governments to believe they could predict globalization's future impact on the domestic economy. The sectors that "won" from globalization were the sectors that were already the most competitive ones. The "losing" sectors were the least competitive ones. Going further, one could roughly associate the most competitive sectors with high-tech, human capital-intensive sectors, and the least competitive sectors with unskilled, labour-intensive sectors. In turn, one could roughly associate the winners from globalization as Canada's high-skilled, high-education workers (and those working in natural resource-based sectors); the losers were, typically, low-skilled, low-education workers.

Guided by this old-paradigm worldview, the job of a good policy maker was crystal clear – at least in the abstract. The job is to help the country move resources from the sectors that are likely to lose as the first unbundling continued and shift them into sectors that are likely to win. In the Figure 3 example, the government should be helping to retrain workers who lost their jobs in sector E to become sector C workers. Again roughly speaking, this meant raising skill levels and shifting workers from sunset sectors to sunrise sectors. Skill upgrading, research and development, and support for high-tech industries were but some of the natural policy initiatives that flowed from this thinking.

As we shall see below, the new paradigm introduces a line of thinking that should make governments much more cautious about predictions concerning globalization's winners and losers, and thus more cautious about their optimal policy response.

2.3.1 Diagrammatic analysis of winners and losers

The difference between the old and new paradigms can be made clearer by introducing a simple diagram that helps connects the fortunes of sectors and skill groups. Figure 4 is the diagram.

We start with the left panel of the diagram. Here the wage of unskilled workers, w , is on the vertical axis and that of skilled workers, v , is on the horizontal. For simplicity's sake, there are only two sectors, the Y sector, whose pricing is especially sensitive to the price of skilled labour (since it is skill-intensive), and the X sector, whose price is especially sensitive to unskilled wages. This sensitivity is easy to see. The Y-sector pricing equation shows the combinations of w and v that allow Y-sector firms to match the market price. Plainly, any increase in either w or v must be matched by a reduction in the other if price competitiveness is to be maintained. But note that a small increase in the skilled wage, v , requires a larger decrease in w – that's because Y is skill-intensive. Similarly, X is unskilled labour intensive, so a 1 percent increase in w would require a more than 1 percent drop in v to allow X-sector firms to remain competitive with foreign producers.

The combination of skilled and unskilled wages where both sectors are competitive is marked by the point E; the equilibrium wages are marked as w^0 and v^0 .

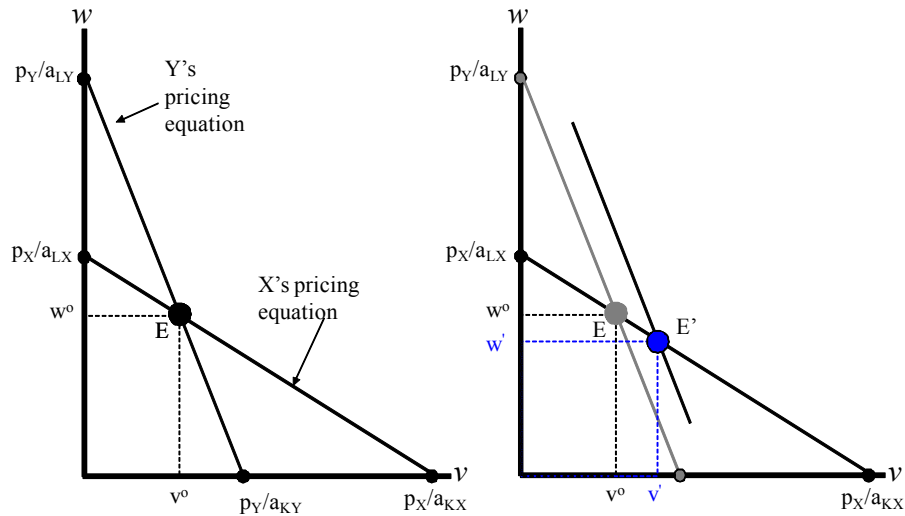
The purpose of the diagram is to allow us to connect the fate of skill groups to the sectors in which they are intensively employed. The left panel does this. In this case, we assume that Y is the export sector, so lower trade barriers, natural and artificial, favour Y. Specifically, as Y-sector firms get better access to foreign markets, the sector adjusts along two dimensions: first, the sector produces and sells more, and second, it sees a higher price net of trade costs.

In the diagram, this favourable export-sector development shows up as a shift out in the Y-sector price line. That is, the sector can now maintain competitiveness even after paying some combination of higher v and/or w . The situation in the import competing sector, the numeraire X sector, doesn't change. This tells us that the w and v must move in opposite directions if both sectors are to remain competitive after the further market opening.

The new intersection, point E', shows the new combination of w and v that allows both sectors to be competitive. The result – a result we foretold with verbal reasoning above – is that the factor used intensively in the export sector gains from globalization while the factor used intensively in the import sector loses.

This, in diagrams, is the correlation between sectoral fates and skill group fates – a correlation that is at the heart of most nations' thinking on the effects of globalization.

Figure 4: Sectors and the fate of skill groups: first unbundling



3. The New Paradigm: Second Unbundling and Trade in Tasks

As manufactures account for 70 percent of global trade, the nature of trade and the nature of manufacturing are inexorably linked. Both the first and second unbundlings fostered and were fostered by radical changes in how things are made.

3.1 Nature of manufacturing, nature of trade, and the first unbundling

Before the Industrial Revolution, manufactured goods were basically handicrafts. One of the most sophisticated 18th century machines – rifles – were constructed one at a time by highly skilled craftsmen using hand tools. The workshops making them were geographically dispersed across nations, roughly in line with the location of consumers; trade flows were modest. In 1801, Eli Whitney came up with the notion of standardizing parts to the extent that they were interchangeable. Rifles could be made faster, cheaper, and with less skilled workers. The resulting gains in competitiveness gave rise to large manufacturing corporations that put many smaller arms makers out of business. The resulting geographical concentration of rifle making separated factories and consumers, spurring long-distance trade (both intra- and international) of the first-unbundling type.

A century later, the Ford Motor Company greatly refined assembly-line mass production. The Ford method was much faster and used less manpower than 19th century manufacturing techniques, but worked best at massive scales of production. This further stimulated first-unbundling trade as the competitiveness of Ford's products forced smaller automotive factories around the world to close – thus increasing the distance between automakers and most auto buyers. The Ford method faced important organizational challenges. To keep things moving smoothly and reliably, producing a car every three minutes, Henry Ford spatially concentrated the production of almost everything. What he couldn't concentrate, he bought so as to better control. He owned rubber plantations, coal mines, and forests as well as the ships and railroad cars that transported them to his plant.

The famous River Rouge plant in Michigan employed about 100,000 workers in the early 20th century.

This hyper concentration came at a cost. It meant that almost every stage of producing a Model T had to be done with labour and capital located in Michigan. There would have been a financial gain from unbundling production stages and locating where factor costs were better suited to each stage's demands, but this was impossible. Co-ordinating complex activities over long distances was impossible at the time. Transportation was slower and less reliable; telecommunications were only for emergencies. To ensure that parts and components were ready when needed, North American labour, capital, and technology were spatially bundled in one place.

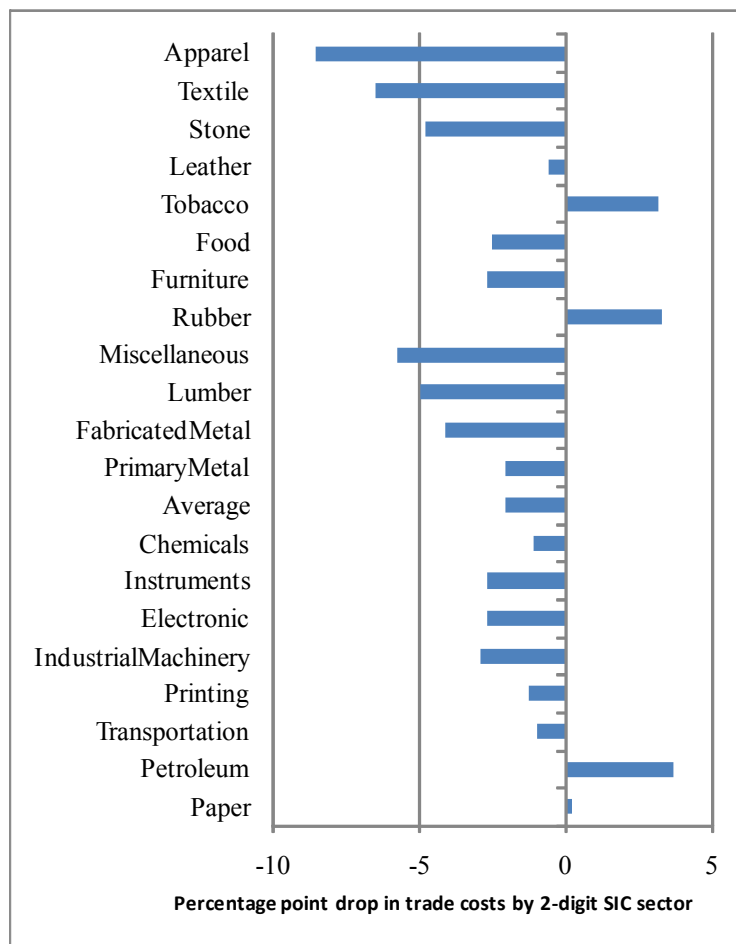
3.2 Unbundling and the co-ordination revolution

Geographically separating various production stages became more attractive as it became less costly to co-ordinate complex tasks across distance. Falling trade costs – the combination of lower tariffs and lower freight costs – played some role, but not a dominate one (Hummels 2007). As Figure 5 shows, trade costs (the combination of freight rates and tariffs) did fall in this period, but for most sectors the reduction was less than 5 percent from 1982 to 1992. Regular surface shipping did not get much cheaper but the growing density of shipping lines made surface shipping easier and more reliable. The price of air cargo fell, but again not spectacularly (WTO 2008).

More important are advances in information and communications technology (ICT) in explaining the dramatic drop in the cost of organizing complex activities over distances. This showed up in many ways. The price of an old-fashioned telephone call plummeted, along with regulation, computing costs, and the cost of fibre optic transmission rates. New forms of communication appeared and rapidly transformed the workplace. Faxes became standard equipment. Cellular phone usage exploded. The telecommunications network also became denser and more reliable as it became cheaper. Above all, the Internet – first e-mail and then web-based technology – revolutionized the sharing of information over distance. In 1984, there were 1,024 Internet hosts in the world; by 1995, the number was 6.6 million, rising to 106.8 million in 2000.

Interacting with cheaper communications costs was the spectacular fall in the price of computing power. Things that required a Cray super computer in 1984 could soon be performed on a high-powered PC. This encouraged the development and widespread use of information-management software (ranging from spreadsheets to sophisticated database programs). Cheap and reliable telecommunications, combined with information management software and desktop computers to run them, completely transformed the difficulty of organizing group-work across space. Stages of production that had to be performed in close proximity – within walking distance to facilitate face-to-face co-ordination of innumerable small glitches – could now be dispersed without an enormous drop in efficiency or timeliness. Working methods and product designs were also shifted in reaction to the spatial separation, typically in ways that made production more modular.

Figure 5: Drop in trade costs 1982-1992 by SIC sector



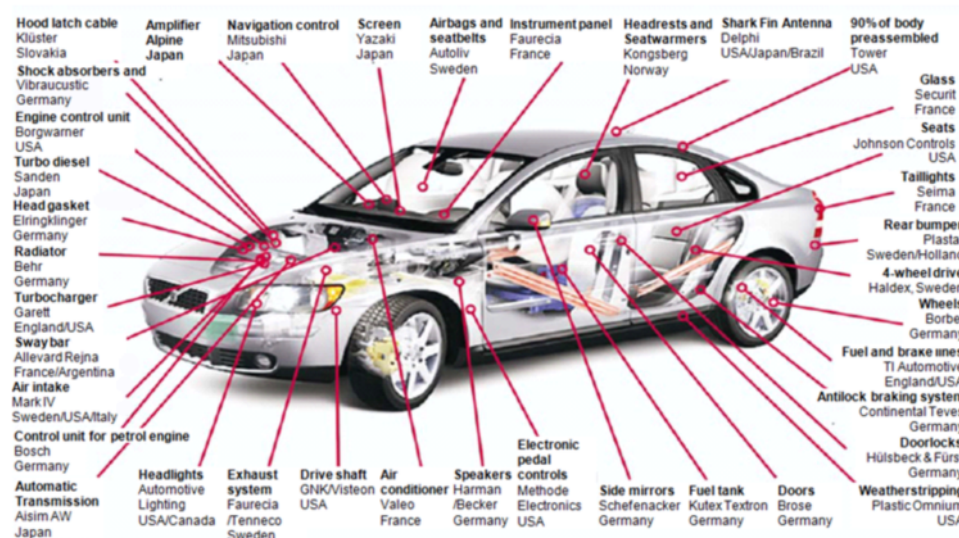
Source: Bernard, Jensen, and Schott (2003), Table 1

The second unbundling is a result of this lower communication costs. Things that had to be done in various bays in the same factory in order to reduce delays due to miscommunications could now be done in separate factories located far from each other. In essence, the production bays became their own factories and were dispersed to locations that had factor prices and other characteristics better suited to the particular needs of the production stage.

An example of the second unbundling can be seen in Figure 6. This shows where the parts of the “Swedish” Volvo S40 are made. The navigation control and screen is made in Japan, the side mirror and fuel tank in Germany, the air conditioner in France, the headlights in the United States and Canada, the fuel and brake lines in England, the hood latch cable in Germany. Some parts are even made in Sweden (airbag and seat belts). These “parts” are themselves made up of many parts and components, whose production location is likely to be equally dispersed. For example, the air conditioner will have to have

a compressor, motor, and a control centre, each of which may be made by a different company in a different nation.

Figure 6: Where are the components of the Volvo S40 made?



Source: Baldwin and Thornton (2008), taken from a presentation by Ericsson, Chairman Michael Treschow.

Note: Thanks to Shon Ferguson for translation from Swedish.

The diagram makes clear that Henry Ford's spatial concentration of production is finished. Manufacturing stages that used to be done by the same company in the same factory are now dispersed around the world. Sometimes these are owned or controlled by the original manufacturer, but often they are owned by independent suppliers.

It is important to note that many of these international supply chains are regional, not global. The cost and unpredictable delays involved in intercontinental shipping still matters. Moreover, co-ordination in the same time zone is easier and more reliable. An additional factor that has fostered regionalization over globalization is the fact that the cost of moving key managers and technicians has not fallen radically. Even if airfares have come down, the opportunity cost of the managers' time has actually risen. If a Canadian firm puts a factory in Mexico, the manager may have to spend a whole day to hold a one-hour face-to-face meeting. If the factory is in China, the time cost will be more like one whole workweek.

The first large-scale production unbundling started in the mid-1980s and took place over very short distances. The maquiladora program created "twin plants," one on the US side of the border and one on the Mexican side. Although the program existed since 1965, it only boomed in the 1980s, with employment growing at 20 percent annually from 1982 to 1989 (Federal Reserve Bank of Dallas 2002, Feenstra and Hanson 1996). Another second unbundling started in East Asia at about the same time (and for the same reasons). In this region, distances are short compared with the vast wage differences (Tokyo and Beijing are about 90 minutes apart by plane, yet in the 1980s the average Japanese income was 40 times the Chinese average). In Europe, the second unbundling was stimulated first

by the European Union (EU) accession of Spain and Portugal in 1986, and then by the emergence of Central and Eastern European nations.

3.3 The trade-in-tasks conceptual framework

To organize our thinking about the second unbundling, it is useful to explain the basic determinants of whether a particular task is performed at home or abroad. This is not difficult as it boils down to cost savings. Consider a task that requires some skilled and some unskilled labour. If the firm organizes production such that the task is performed domestically, then the cost of the task will be:

$$\begin{pmatrix} \text{Domestic} \\ \text{task} \\ \text{cost} \end{pmatrix} = \begin{pmatrix} \text{Domestic} \\ \text{unskilled} \\ \text{wage} \end{pmatrix} \begin{pmatrix} \text{Domestic} \\ \text{unskilled} \\ \text{requirement} \end{pmatrix} + \begin{pmatrix} \text{Domestic} \\ \text{skilled} \\ \text{wage} \end{pmatrix} \begin{pmatrix} \text{Domestic} \\ \text{skilled} \\ \text{requirement} \end{pmatrix}$$

The cost of the task if the firm buys it from abroad would be quite similar but note that now foreign wages and foreign input requirements would be used. There are also additional costs that would arise from co-ordinating the production with one of the tasks taking place far away:

$$\begin{pmatrix} \text{Foreign} \\ \text{task} \\ \text{cost} \end{pmatrix} = \begin{pmatrix} \text{Foreign} \\ \text{unskilled} \\ \text{wage} \end{pmatrix} \begin{pmatrix} \text{Foreign} \\ \text{unskilled} \\ \text{requirement} \end{pmatrix} + \begin{pmatrix} \text{Foreign} \\ \text{skilled} \\ \text{wage} \end{pmatrix} \begin{pmatrix} \text{Foreign} \\ \text{skilled} \\ \text{requirement} \end{pmatrix} + \begin{pmatrix} \text{Offshoring} \\ \text{costs} \end{pmatrix}$$

The last terms encompass all manner of co-ordination and trade costs.

In the trade-in-tasks framework introduced by Gene Grossman and Esteban Rossi-Hansberg at the Jackson Hole conference in 2006, the key determinant of unbundling is the cost of performing each task at home or abroad. In one version of their theory, they allow firms to use home-country technology when employing foreign workers abroad. In this case the “Foreign task cost” involves foreign wages, but “Home” labour requirements – a factor that has interesting implications for research and development (R&D) policy (Section 5).

3.3.1 Determinants of offshoring costs: Unpredictability

It is not a random outcome that the production of goods and services is undertaken in factories and offices throughout the world. Spatially clustering production stages – i.e., packaging tasks in offices and factories – is done to make it easier and cheaper to produce what the firm sells. The problem is that economists really do not understand the “glue” that binds production stages and tasks together. The standard approach, production functions, is a black box; one assumes that certain amounts of productive factors are combined to produce a certain amount of output. Given this lack of modelling – to say nothing of a lack of empirical work in the area – economists cannot really pretend to understand how expensive it would be to offshore various bits of a production process. Worse yet, the problem cannot really be considered task by task since the offshoring of some tasks will typically change the cost of offshoring other tasks.

For example, consider a “team” of tasks that is spatially clustered in a single office. To be concrete, say there are n tasks – each performed by one worker – that must be performed to produce the intermediate input (say a marketing report), which is itself fed into a larger production process. Co-ordinating the n tasks requires each worker to talk, say, once a day with every other worker. Turning to offshoring possibilities, assume that offshoring entails a fixed cost per task offshored, and that each of the tasks could be performed more cheaply in India.

But what about co-ordination costs? Talking face-to-face is more efficient in terms of time than e-communicating. Keeping all the tasks in the same office reduces co-ordination costs, but this is true whether the office is in Canada or India. In particular, co-ordination costs are maximized when half the tasks are done in India and half in Canada. Now what this means is that wage savings plus extra co-ordination cost may not make offshoring one task worthwhile. However, if the co-ordination cost among a group of tasks falls, the offshoring decision can face a tipping point. Offshoring of tasks happens in a lumpy fashion. In this simple example, no tasks are offshored for all co-ordination costs up to a certain level, but beyond that point, all tasks are offshored.

Another key source of unpredictability could come from cluster economies. In both services and manufacturing, tasks are subject to backward and forward linkages. That is, there is a tendency to cluster certain tasks together spatially to improve efficiency and gain better access to customers. In this sort of world, the international allocation of tasks can be subject to multiple equilibria with the possibility that small changes can shift the economy between these equilibria. For example, it could be that few tasks are offshored since the local production of these tasks creates agglomeration economies that make local production competitive. However, if enough tasks get offshored to erode the agglomeration economies, all the rest of the tasks may also then be offshored.

The range of possibilities is quite large, as policy analyses in the new economic geography show (see Baldwin et al. 2003). When agglomeration economies are important, marginal changes can lead to very large shifts.

3.3.2 Is trade in tasks good or bad?

In 2004, Greg Mankiw, who was then Chairman of the US Council of Economic Advisers, announced to the US business media that offshoring was just like trade in goods: “More things are tradable than were tradable in the past, and that’s a good thing” (as cited in Blinder 2006, p. 113). Mankiw was in good company since trade theorists have long modelled the second unbundling, fragmentation, as if it were just like trade in new goods.¹

A central insight in the Mankiw offshoring literature is that one can think of offshoring as technical progress in final goods. The intuition is dead easy. Unbundling production processes – allowing trade in intermediate goods and services – opens new opportunities for arranging final-good production more efficiently. The extra opportunities must mean that the same quantity of primary resources can produce a higher value of final goods. That, of course, is just the definition of technological progress in final goods, and this is why offshoring tends to act like technological progress in final goods.

¹ For example, Dixit and Grossman (1982), Ron Jones and co-authors (Jones and Findlay 2000, 2001; Jones and Kierzkowski 1990, 2000, 2001; Jones and Marjit 1992); Deardorff (2001a, 2001b), Venables (1999), and Markusen (2005). These papers present a bouquet of special cases in which many expected and unexpected things can happen. For an even older tradition, see Batra and Casas (1973).

While the productivity improvement is guaranteed at the global level, national gains are subject to the usual provisos concerning terms of trade, factor intensive reversals, etc. This ancient insight is very helpful in placing offshoring models in the broader context of trade theory.² It is also a useful way to explain the potential gains from offshoring to non-specialists.

A second central insight in the Mankiw offshoring literature concerns the impact of offshoring on wages. In general, the literature concludes that there is nothing that can be said in general. The impact depends upon the factor intensity of the offshored task and the factor intensity of the sector doing the offshoring. The point of these results was to dispel the common perception that offshoring the production of labour-intensive goods to low-wage nations definitely harms low-skilled workers in the offshoring nation.

The fundamental economic logics of these two key insights are considered in turn.

3.3.3 Offshoring as technical progress

The core economic logic of the offshoring-as-technical-progress insight can be most directly illustrated in a very simple framework where there are no gains from trade in final goods. That is, there are two nations, but only one final good and only one factor of production: labour. The production of the final good involves two stages or “tasks.”

To study the welfare effects of Mankiw offshoring, it is useful to introduce the standard Ricardian diagram where there are two types of tasks (task 1 and task 2), one final good, and two nations, as shown in Figure 7. As usual, the total amount of the tasks that can be produced by each nation is shown with the production possibility frontier (PPF) for Home and Foreign. The tasks, however, cannot be directly consumed; they are combined into the single final good. Graphically, this is shown as an “isoquant”; i.e., the combination of task 1 and 2 that can make a given amount of the final good.

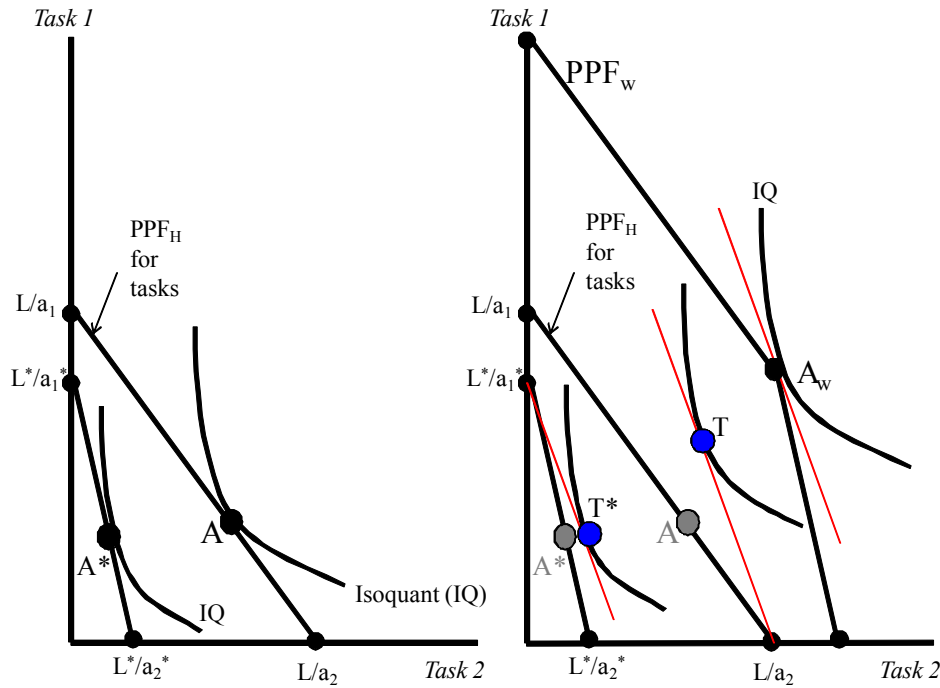
To see how much Home makes without trade in tasks, we search for the highest isoquant that respects Home task-production constraint, namely the PPF. The answer is at point A in the left panel. Note that:

- A similar exercise reveals that Foreign would be at point A* without trade in tasks.
- The implicit prices of task 1 and 2 in Home and Foreign are set in their local markets and equal to the slopes of their respective PPFs.
- There would be no trade between these nations since wages would adjust to make each nation equally competitive in producing the final good.

When trade in tasks becomes possible, nations can trade the two intermediate tasks 1 and 2 as well as final good X. This situation is described by the right panel where the world PPF, marked PPF_w, becomes the relevant constraint on the production of final good X. (For simplicity, we assume away trade costs for tasks and goods in the diagram, so this is a switch from prohibitive task-trade costs to zero task-trade costs.)

² Jones and Kierzkowski (1990) point out that it can be gleaned from Adam Smith’s work; they also quote the 1928 American Economic Association presidential address by Allyn Young: “... over a large part of the field of industry an increasingly intricate nexus of specialized undertakings has inserted itself between the producer of raw materials and the consumer of the final product” (p. 34). The insight is quite explicit in Jones and Kierzkowski (2000) and implicit in the diagrammatic analysis in Jones and Kierzkowski (1998).

Figure 7: Trade in tasks as technological progress



At the world level, the optimal combination of task 1 and 2 is shown by the point A_w and the relative prices of tasks 1 and 2 are now established on the world market by the slope of the isoquant at A_w . The world relative price lies between the two no-trade prices (as it must if all labour is to be employed). This change in prices makes Home task 1 production uncompetitive, so all Home task 1 production is offshored and all Home labour shifts to task 2 production. The change in relative prices makes Foreign task 2 production uncompetitive, so all foreign task 2 production is offshored.

The right panel shows how trade in tasks shifts the final-good production point from points A and A^* to T and T^* (production of the final good is like consumption in the classic 2-good Ricardian model). Note that the isoquant tangents to T and T^* are higher than the isoquants tangent to A and A^* .

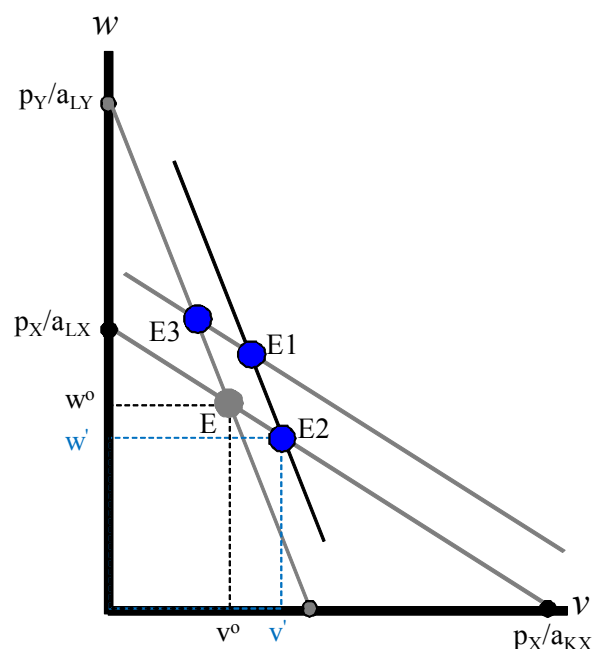
The result is just like technological progress in both nations. Trade in tasks allows Home and Foreign to produce more of the final good with the same amount of primary factors. Both nations' labour forces become more productive when the productivity is measured as final-good output per hour.

3.3.4 Wage effects of offshoring

Once we realize that offshoring is like technological progress, we can explore the general equilibrium wage effects of offshoring using a diagram like Figure 4. The result is shown in Figure 8. Since offshoring can occur in sectors and in tasks that are both skilled and unskilled labour-intensive, the new price lines will, in general, be shifted out. The new

intersection, however, implies that offshoring can raise skilled wages while lowering unskilled wages (as at point E2), raise both (point E1), or raise unskilled wages while lowering skilled wages (point E3).

Figure 8: Ambiguous wage effects of offshoring



This is one of the fundamental differences between the new and the old paradigms. As offshoring can affect both sectors, it is not clear which groups will gain or lose from further globalization.³ More precisely, each sector is initially a bundle of tasks and the sector's factor intensity is the average intensity of all its constituent tasks. As unbundling proceeds, tasks are reallocated internationally roughly in line with comparative advantage. However, the process proceeds in both sectors, so the relative change in factor productivity – and thus the wage effects – is not clear cut.

3.4 What's really new? Globalization with higher resolution

As far as policy making is concerned, there are three really new things going on with globalization.

1. Unpredictability

³ The papers that rekindled academic interest in North America over offshoring, or “trade in tasks,” by Grossman and Rossi-Hansberg (2006 a,b), argued that offshoring unskilled intensive tasks would ambiguously raise the wage of unskilled workers, but this turned out to be a special case that arose from the authors’ many special assumptions (Baldwin and Robert-Nicoud 2007).

The winners and losers from globalization are much harder to predict. By their very nature, lower trade costs for goods tend to affect all traded goods in roughly similar ways and this is why one could tell which sectors would win from further reductions in trade costs. Governments felt they could predict which sectors would win and lose from future globalization. This changes when the main barrier is the cost of co-ordinating complex processes across distance (trading ideas). Now it is difficult to identify winning and losing tasks, so we do not really understand the “glue” that binds such tasks together in the first place. Knowing the direct cost of telecommunications is not enough since it interacts in complex and poorly understood ways with the nature of the task and the task’s interconnectedness with other tasks.

2. Suddenness

A job that three years ago was considered absolutely safe – say a German computer programmer designing custom software for a Landesbank – may today be offshored to India, or outsourced to a German software firm that offshores the job to India. The deep reason for this suddenness lies in the nature of complex interactions within factories and offices. Telecommunication costs have fallen rapidly but the impact has been quite different for different tasks. This may be due to the organization of tasks within offices and factories. This organization has changed more slowly. At some point – what might be called the tipping point – cheap communication costs line up with new management technology and a new task can be offshored to a lower cost location.

3. Individuals, not firms, sectors, or skill groups

In the first unbundling, one could view firms as “black-box” bundles of tasks since firm-against-firm competition was globalization’s finest level of resolution. The Princeton paradigm suggests that the forces of globalization will achieve a far finer resolution at the level of tasks. This means that under globalization, particular workers in particular firms in a given sector could suffer while others in the same firm with the same educational attainment could prosper. New paradigm competition is on a much more individual basis and this has some implications for policy. Policies designed to help sectors may miss globalization’s losers entirely.

In addition to these new features that are important from a policy perspective, it would seem that there are two additional features that change the classic economic analysis of globalization. These are:

4. Big versus little firm effects

At present, offshoring of services has been much more aggressively pursued by large firms, probably due to economies of scale or scope involved in offshoring. To the extent that it lowers the costs of big firms, offshoring alters the balance of big-versus-small firm competition in domestic and export markets. This has many implications. For example, suppose one was trying to work out how many jobs had been lost to offshoring. Given the shift on big-small firm competition, it is not enough to simply count the number of, say, data entry jobs offshored by large companies. The competitive edge gained by large companies will force small firms in the same nation and same industry to downsize or go out of business. This suggests the estimates would be too low. On the other hand, the large firm’s gain in competitiveness would typically boost its sales and this would favour job creation in other tasks. Offshoring data entry jobs may lead a large truck manufacturer to hire more production workers. This suggests the direct estimates of job loss from

offshoring are overestimated. One would need a new-paradigm model to account for such intrasectoral effects properly. Of course, one could simply assume that offshoring lowered the marginal cost of big firms in a standard heterogeneous firms model, but this would start the story halfway through. It would not provide an analysis of the connection between the fundamental change (easier trade in tasks) and its effects.

5. “Us versus them” effects

Another set of issues concerns international intrasectoral competition. For example, suppose the home nation forbids outsourcing of data entry jobs in an attempt to save jobs. If other nations allow their firms to offshore, the home nation firms will find themselves at a competitive disadvantage. The expected result of this would be a reduction in home firms’ production, so in the end the policy could end up indirectly destroying even more data entry jobs than offshoring would destroy directly.

Moreover, as parts and components are quite model-specific, and because transportation is relatively difficult and expensive, the unbundling of tasks at the factory level has not taken place over vast distances. Widespread adoption of lean production techniques and increasing product variety tends to foster spatial clustering of parts production and final assembly.

4. Relevance of the New Paradigm to North American Economic Integration

The trade-in-tasks theory was developed by Grossman and Rossi-Hansberg (2006b) primarily to examine the offshoring driven by low wages, which was the “issue du jour” in the United States at the time. The focus on large wage differences is misplaced in the US-Canada context, although it is still relevant in the broader North American Free Trade Agreement (NAFTA) context. The United States and Canada are both rich nations with sophisticated industrial firms in a range of sectors. Although wages are not equalized – and generally speaking Canada’s productivity-adjusted wages are lower – wages are not massively different. A far more important problem with Grossman and Rossi-Hansberg’s “new paradigm” is that fact that it ignores market size issues. A dominant element affecting the location of industry in North America is the huge market size advantage possessed by the United States. Since this factor is completely assumed away in existing trade-in-tasks theory, the theory must be extended to allow us to study the interactions among trade costs, agglomeration economies, and economic integration.

4.1 The trade-in-tasks framework when market size matters

The mainstream framework for studying the impact of market size on industrial location is the so-called new economic geography (NEG) literature launched by Paul Krugman in the 1990s (e.g., Krugman 1991). We briefly review the logic of this framework before discussing how to integrate it with the trade-in-tasks framework.

4.1.1 A new economic geography primer

The focus of NEG is on firms’ location decisions. These decisions rest on the balance of two sets of forces: dispersion forces and agglomeration forces.

Dispersion forces, as their name suggests, favour the geographic dispersion of economic activity. These forces are generally driven by some sort of congestion broadly

defined. Most of these congestion factors (land rent, commuting time, etc.) are rather local and thus not directly of concern in this paper. Three dispersion forces are important.

First, is labour market congestion. Industrialization tends to push up wages and this tends to discourage further agglomeration. This is an important issue in the United States, Germany, Japan, and increasingly China.

Second is local market competition. This reflects the fact that having many industrial firms located in a particular region tends to increase the degree of competition for customers in the local market; this tends to encourage firms to spread out. Importantly, local market competition depends upon trade barriers. For example, in the extreme case where a nation's markets were perfectly open to international competition, we would see global, not local, competition, but short of this, trade barriers of all kinds tend to make local competition a more important consideration. This fact creates a direct link between industry location and all manner of trade barriers, ranging from tariffs to standards to border security checks. This linkage will play a key role in the policy discussion in Section 5. Agglomeration forces counteract dispersion forces.

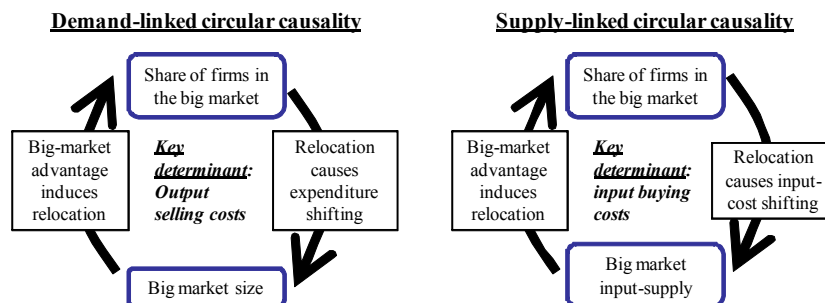
Third is standard comparative advantage. Nations are not all equally good at producing all things, or to phrase it in standard old-paradigm terms, nations have different comparative advantages. The sources of these differences can range from resource endowments to technological differences to natural geography. These constitute dispersion forces, since other things being equal, they imply that some types of economic activity should be done in all nations. At a sector level, however, the sources of comparative advantage tend to encourage clustering by sector. In the traditional trade framework, countries become more specialized as trade costs fall. For example, as trade barriers come down, an ever larger share of clothing production shifts to China. From the global perspective, however, this might look like the clustering of apparel production, but it is not driven by agglomeration economics.

An agglomeration force is said to exist when the spatial concentration of economic activity creates forces that encourage further spatial concentration. There are many agglomeration forces, but some of them operate on only a very local scale (like the knowledge spillovers that explain why university departments and government departments are typically clustered in a given building). This level of spatial clustering, however, is not relevant to this paper. The two agglomeration forces we consider are supply-side and demand-side circular causality; they operate at a continent-wide scale and are directly affected by trade costs (and thus affected by policy choices including tariffs and border infrastructure).

Demand-linked circular causality rests on market size issues. Firms want to locate where they have good access to a large number of customers, like the United States, in order to reduce selling costs (where selling costs include everything from shipping charges, border delays, and import duties to back-and-forth communication with customers). Firms buy inputs from other firms, so firm relocation affects market size and thus the causality becomes circular. If no dispersion forces are in operation to counteract this agglomeration force, all economic activity ends up in the big market. If all factors of product are mobile across borders, this force would tend to completely empty out small regions via factor migration; however, in the international setting we usually ignore massive cross-border movements of labour. (This demand-linked circular causality is a key factor in the rapid rural-urban migration observed globally. As internal transport costs fall, firms create jobs near big cities since they want to be near their customers; people move to the cities since

that is where the good jobs are, and the cycle begins again.) This is illustrated in the left panel of Figure 9.

Figure 9: Circular causality and agglomeration forces



The second major type of agglomeration force is the input cost-linked circular causality, or “supply linkages.” This is the agglomeration force most relevant to production unbundling in the North American setting since it deals directly with supply chains. Manufacturing firms in modern industrial economies buy many inputs from other firms, such as machinery, parts and components, and specialized services such as marketing, accounting, and IT. Since it is cheaper to find and buy such input from firms that are nearby, the presence of many firms in a location tends to reduce manufacturing cost of doing business in that location, other things being equal.

Again, this leads to circular causality (see the right panel of Figure 9). If many firms are already in the big market, then doing business in the big market – all else being equal – will be cheaper and this will attract firms that in turn make the site more attractive from the input cost perspective. If there were no dispersion forces, this circular causality would empty out the small market entirely. (Inside nations, this goes a long way to explaining the spatial clustering of sectors; e.g. the chemicals sector and the automobile sector.)

4.2 The locational effects of liberalization

The focus here is on trade and industrial policy and one of the most direct effects of such policies is on trade costs. We therefore turn to studying the connections between trade costs and the location of industry in the NEG framework.

The first thing to observe is that lower trade costs reduce the strength of demand- and supply-linked agglomeration forces. As selling costs – including freight, border costs, and two-way communication with customers – fall, the incentive to locate in the big region diminishes. Likewise, supply-linked agglomeration is motivated by a desire to reduce the cost of buying intermediate inputs. As distance-related buying costs fall, the importance of being geographically close to suppliers shrinks.

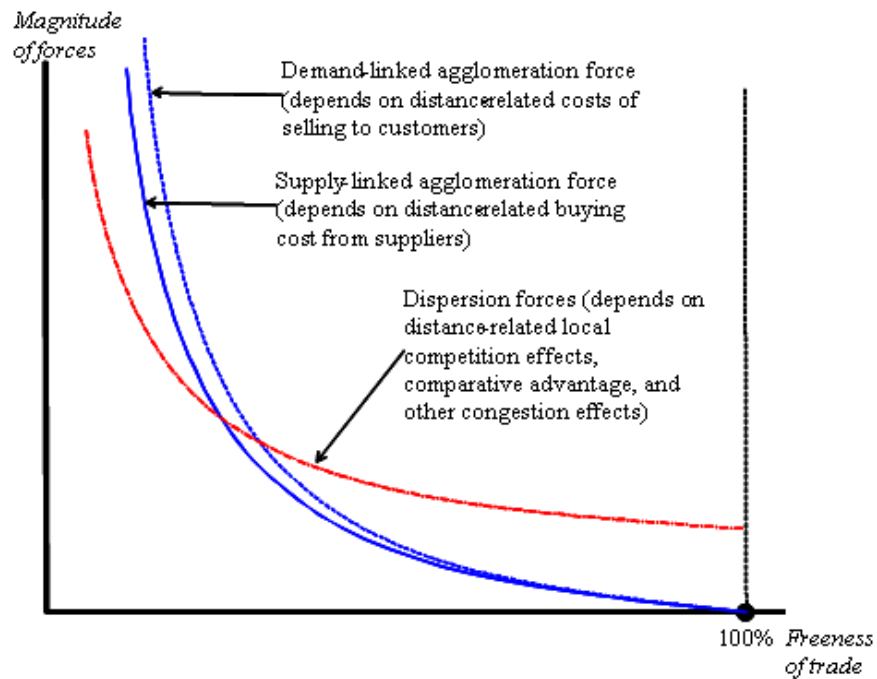
The distance-related dispersion forces also get weaker as trade costs fall. The key distance-related dispersion force is the local competition effect. Here again, reduced trade costs reduce the advantage of being located far from your competitors. Indeed if trade were to become costless, the local competition effect would disappear as the degree of competition would be the same regardless of where firms were located.

Importantly, many dispersion forces do not diminish with distance. For example, the labour market congestion effect – the tendency of industrial wages to rise in nations with

relatively high industry GDP shares – is not directly related to distance or trade costs. Other dispersion forces actually get stronger as trade gets freer. Comparative advantage is one: the trend for labour-intensive industry to move to labour-abundant nations, for example, gets stronger as trade costs come down.

To illustrate these relationships, Figure 10 plots the forces against the freeness of trade. It shows that both agglomeration and dispersion forces erode with trade freeness but that at totally free trade – i.e., costless trade – the dispersion forces would prevail. Quite simply, a world with costless trade would resemble classic trade theory where each nation's resources were fully employed and “each nation makes what it does best and trades for the rest.” If this happened, industry would be far more evenly spread across the globe than it is now, where a handful of nations produce most of the world's manufactured goods.

Figure 10: Trade costs and strength of agglomeration and dispersion forces

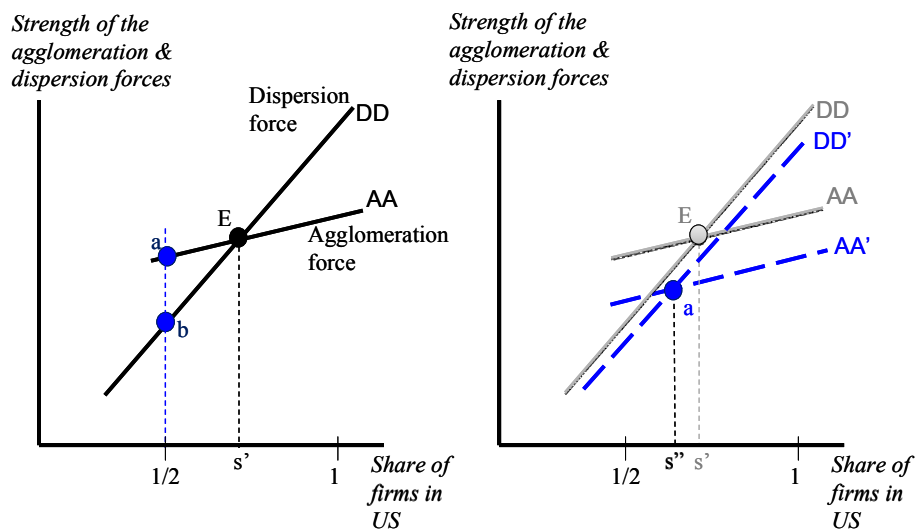


4.2.1 Determining the spatial equilibrium

Discussion of these forces and the impact of free trade prepares the ground for the main goal of this section: the study of the spatial equilibrium. As we shall see, the share of industry in the big region adjusts to balance agglomeration and dispersion forces much like a price adjusts to balance supply and demand.

To see this, it helps to have a diagram to crystallize our thinking (Figure 11). Both panels of the diagram plot the strength of agglomeration and dispersion forces on the vertical axis. However, in contrast to Figure 10 the horizontal axis plots the share of industry in the big region (the United States).

Figure 11: The locational equilibrium diagram



The left panel shows two lines, AA and DD, which illustrate how agglomeration and dispersion forces change with the concentration of industry in the United States. The agglomeration force line, AA, is rising due to circular causality (spatial concentration raises the incentive to spatially concentrate). The dispersion force line, DD, is rising since the benefit of staying in the small region rises as more firms move to the big market due to wage congestion and local competition effects.

The locational equilibrium is at point E. This identifies the share of firms in the big market (the United States) where incentives to agglomerate are just balanced by incentives to disperse. Given the United States's intrinsic size advantage, it is clear that a share of half is not an equilibrium (i.e., the strength of the agglomeration force at $s = 1/2$ is "a"; the strength of the dispersion force at $s = 1/2$ is "b"; if the share started at $1/2$, agglomeration forces would drive relocation until the big region's share of industry rose to s^*).

4.2.2 Is free trade pro- or anti-agglomeration?

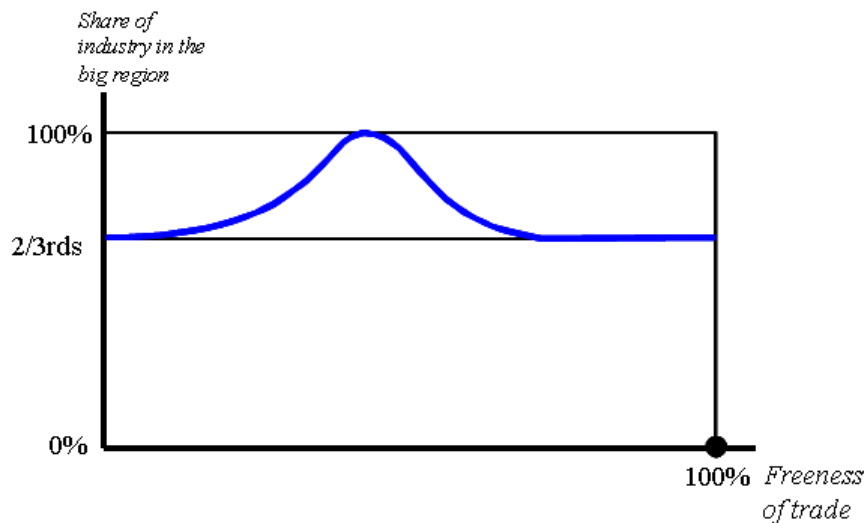
The left panel in Figure 11 was drawn for a given level of trade freeness. A critical issue for this paper is the impact that reducing trade costs have on the location of industry. This is studied in the right panel. As discussed above, lower trade costs generally make distance less of an issue and thus weaken both agglomeration and dispersion forces. The impact on the share of industry in the small region can go either way. If the agglomeration forces weaken more than the dispersion forces, the small region's equilibrium share rises (i.e., the US share falls). This is the case illustrated in the right panel, but plainly it could go the other way if DD fell more than AA.

As a rough rule, broad trade liberalization in recent decades seems to have fostered a dispersal of industry, which is why the left panel depicts liberalization as anti-agglomeration. We can see this at the global level (Organisation for Economic Co-operation and Development nations are de-industrializing while the emerging economies are industrializing; see Debande 2006), within Europe (see the auto industry example above), and between the United States and Canada. However, during the first wave of

globalization (roughly 1870 to 1914), lower trade costs were associated with a very strong agglomeration of industry in the North (especially in United Kingdom, the United States, and some West European nations) and a de-industrialization of the South (especially India and China; see Baldwin and Martin 1999).

The NEG literature explains both outcomes with the so-called hump-shaped nature agglomeration rents, which notes that the balance of agglomeration and dispersion forces is most strongly tilted toward agglomeration at *intermediate* trade costs. Consider the polar examples. When trade is highly restricted, it is very unprofitable for firms in the core (big) region to sell to peripheral markets. This dampens their enthusiasm for location in the core. Indeed, each region has to make everything it consumes, so the dispersion of industry matches the dispersion of consumers. At the other extreme of perfectly costless trade, location in the core or any other region is immaterial, so the gains from being in the core are nil. It is in between these two extremes – in other words, at intermediate trade costs – that location in the core matters most. For intermediate trade costs, clustering is both possible (since firms in the core can still sell to customers in the periphery) and profitable (since locating in the core economizes on trade costs).

Figure 12: The hump-shaped relationship between agglomeration and trade costs



This widely known feature of the NEG logic leads to the seemingly contradictory conclusion that lowering trade costs when they are high tends to produce a concentration of firms in the big region. However, beyond some level of trade costs, further trade facilitation leads to dispersion away from the core.

This is shown in Figure 12. For the case of a big country that is naturally big, say it has two thirds of the world population and the small country has one third, a neutral or non-agglomerated location equilibrium would involve a two-thirds/one-third distribution of industry. When the freeness of trade is zero (autarky) and 100 percent (costless trade), the neutral distribution prevails. In between, agglomeration forces tend to encourage spatial concentration in the big region. Note, however, that once trade gets free enough, the dispersion forces that are unrelated or positively related to trade costs take over and push the equilibrium to the non-agglomerated state. While there is no clear empirical

dividing line, many economists believe that the advanced industrialized economies are beyond the turning point. Further globalization seems to be associated with a dispersal of manufacturing away from the big markets and toward nations with lower labour costs, especially those that are located in a way that naturally provides them excellent access to big markets. Baldwin and Krugman (2004) have used this feature to explain the changing nature of tax competition since the 1980s.

4.3 Threshold effects, trade cost/policy interactions, and hysteresis

Cluster economics presents policy makers with a set of issues that do not arise in more standard, smoother, more neoclassical models. Three of these are worth discussing in the present context (see Baldwin et al. 2003, Chapter 9 for a more extensive discussion, and Chapters 12 – 18 for applications to trade policy, tax policy, and subsidies policies).

When starting from a situation where industry is concentrated spatially, agglomeration forces can render small policy interventions useless, even though a large policy intervention could be effective. Firms located in a region with a large concentration of industry enjoy agglomeration economies, as explained above. (In many cases, governments and labour unions in the core region attempt to “tax” these agglomeration economies by charging higher taxes and demanding higher wages, higher benefits, stricter firing conditions, etc.).

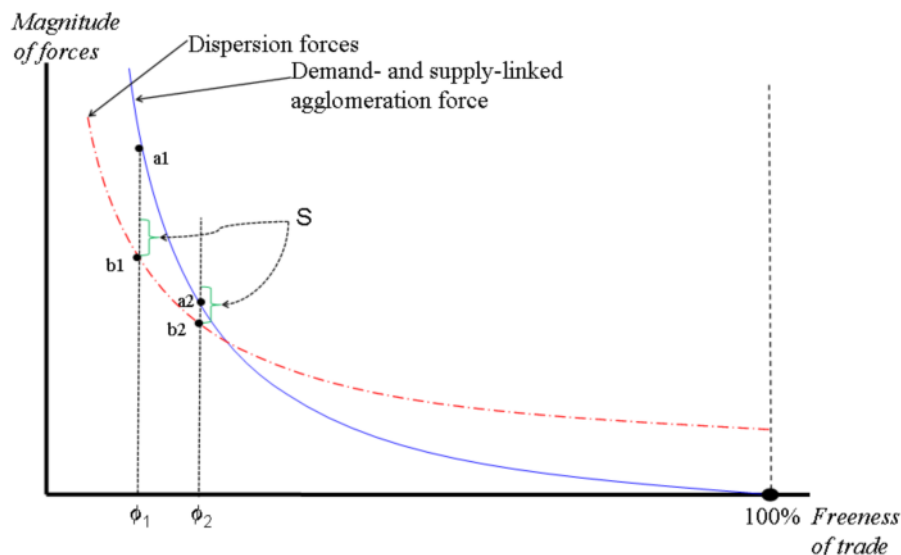
Threshold effects arise since it takes a sufficiently large policy push, say a production subsidy or tax holiday, to attract firms away from the agglomeration rents available in the core. Unlike the standard neoclassical framework, one does not observe a little relocation from a little subsidy. One observes no relocation until the subsidy passes a particular threshold and then the effect can be larger than expected. The reason is that as firms start to locate away from the core, circular causality runs in reverse. Relocation of some firms reduces the attractiveness of the core and boosts that of the small region.

Importantly, the level of trade costs can interact in unexpected ways with the relocation policies. Figure 13 shows an example. Consider a level of trade freeness equal to ϕ_1 , where the agglomeration forces (whose level is shown by a_1) are stronger than the dispersion forces (shown by b_1). At this point, a subsidy to firms that relocate to the small region will not be effective unless it is at least equal to the difference between a_1 and b_1 . Suppose that a subsidy equal to S is offered nonetheless, but no firms relocate to take advantage of it since the subsidy doesn't offset the relative attractiveness of the big market. Things change when trade gets free.

If trade gets freer, thus narrowing the advantages of being in the big region, the same subsidy may well have an effect. In the example, a rise in trade freeness to ϕ_2 would narrow the gap between agglomeration and dispersion forces to a_2 minus b_2 . Since the subsidy S exceeds this gap, some firms would relocate in response. This means that trade facilitation programs will tend to amplify the impactfulness of Canada's pro-industry policies ranging from R&D policies to health care.

Hysteresis is the next concern. The world of real economic geography is marked by “path dependencies.” The reason is that there are many possible places for industry to agglomerate, but once an agglomeration gets started – or for that matter starts to unwind – it can be very difficult to reverse the trend.

Figure 13: Trade cost and relocation policy interactions



For example, a temporary policy that punishes firms in a particular location may lead them to depart, or may deter them from coming to the location in the first place; if trade is quite free, the policy can even be a rather small one. To be concrete, suppose the policy change is a rise in the corporate tax in a particular region that induces firms to choose another region. When the policy mistake is reversed, and taxes are restored to their initial point, no relocation occurs. The reason is that the firms are now enjoying agglomeration economies in some other region, and simply restoring the initial policy situation will not be sufficient. This property of irreversibility is called “hysteresis” in physics. Krugman (1991), who presents several historical cases where random events lie behind the establishment of large industrial agglomerations today, calls this the “history matters” property. Baldwin (1988) looks at the case of hysteresis due to large exchange rate fluctuations.

With these preliminaries out of the way, we turn to the main task of this section: extension of the trade-in-tasks framework to allow for agglomeration effects.

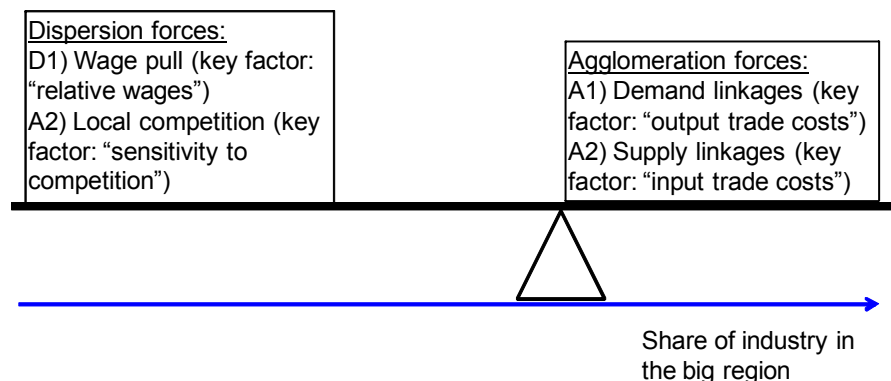
4.4 Adding trade in tasks: Unbundling when supply and demand linkages are important

How does production unbundling fit into the NEG? The standard NEG approach views firms as a production bundle; the range of production stages performed inside the firm is taken as immutable. Production unbundling changes this. To be specific, consider a car whose components’ production must initially be spatially bundled with final assembly (due to communication costs, delays, and uncertainty). When ICT advances make production unbundling possible, the components can be produced by separate factories on either side of the border. Almost surely, this will alter the spatial distribution of industry because the balance of agglomeration and dispersion forces will be different for each component.

In fact there is likely to be a very clear pattern in the relocation produced by unbundling. To see this, it is useful to conceptualize the location equilibrium (i.e., the

share of industry in the big market) as balancing the weight of agglomeration forces on the one hand and dispersion forces on the other (Figure 14). In this approach, the spatial division of industry is the fulcrum that balances agglomeration forces (on the right end of the lever) against the dispersion forces (on the left side of the lever). The location of the fulcrum when the lever is in balance describes the share of industry in the core region. Anything that strengthens the agglomeration force (i.e., increases the weight of the agglomerate forces in our lever analogy) requires the fulcrum to shift rightward to rebalance the forces (implying an increase in the share of industry in the big region). Factors that strengthen dispersion forces will shift the fulcrum to the left (more dispersion). Of course, what really matters is the relative weight on the two arms.

Figure 14: Location equilibrium: Fulcrum, load and effort arms, and the weight of forces



Using the lever analogy, it is easy to see that unbundling will almost surely alter the location of industry. The text in Figure 14 (which summarizes the discussion in the previous section) indicates that we can focus on five key factors determining the spatial division of industry: (1) relative wages, (2) sensitivity to local competition, (3) output-selling trade costs, (4) input-buying trade costs, and (5) cost share of intermediate goods.

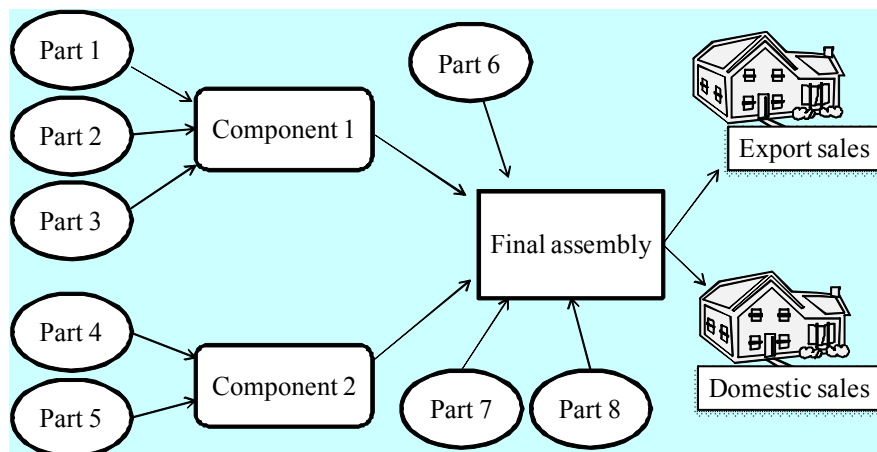
The initial equilibrium balanced forces for the production bundle as a whole; i.e., it is the bundle's average agglomeration and dispersion forces that mattered, where the average is across all manufacturing stages. Because the components will individually face a different balance of dispersion and agglomeration forces, the production location of some components will change. But in which direction?

While details will dominate in particular cases, the logic of trade in tasks suggests that unbundling tends to reduce concentration in the big market, but especially in upstream production stages. The key is that supply-linked agglomeration forces are systematically less important for production stages near the beginning of the value-added chain since these stages buy fewer traded inputs.

To see this, consider the stylized supply chain in Figure 15; parts are assembled into components that are in turn combined with more parts to produce the final good. It is immediately apparent that parts, components, and final assembly face different types of agglomeration forces. For all of them, demand-linked agglomeration forces matter since all of them must sell their output and thus output-selling trade costs matter. Parts, however, do not themselves buy intermediate inputs; they are, in the example, produced directly

from primary factors such as capital and labour. As a consequence, the production of parts is not subject to supply-linked agglomeration forces; i.e., input-buying trade costs are irrelevant. As far as dispersion forces are concerned, the key is that the advantages of lower labour costs in the small region apply equally pre- and post-unbundling. Now putting these observations together with the fact that the average agglomeration force matched the average dispersion force in the pre-unbundling equilibrium, the bundled spatial equilibrium will no longer be correct for parts. The dispersion forces for parts alone will outweigh the agglomeration forces and some of the parts making will be offshored.

Figure 15: A stylized supply chain

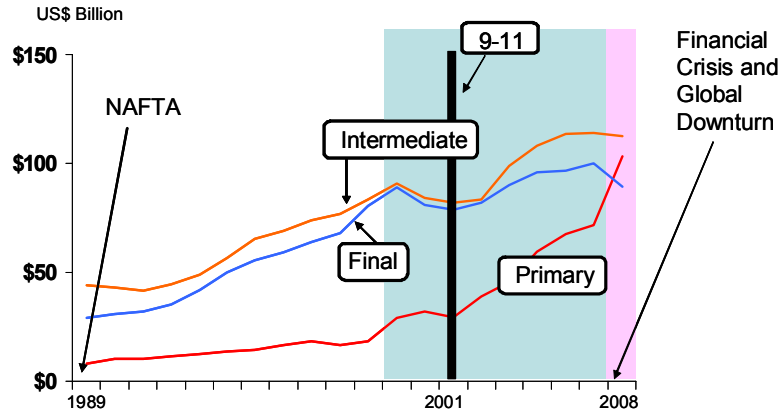


In Figure 14 terms, the agglomeration forces are “lighter” for parts than they were for the whole bundle, so rebalancing requires the fulcrum for the parts industry to shift leftward (i.e., the share of parts production in the big market will fall). Parts, in other words, will be outsourced and offshored to the small region because supply linkages are weaker for the initial production stages that use fewer intermediate goods. The recent data on the export of goods to the United States from Canada presented in Figure 16 provides some support for this within the North American context. Since 2003, there has been a notably faster rise in intermediate good exports to the United States, than final good exports.

This may not be the end of the story. The relocation of the parts industry may have a knock-on effect due to supply linkages. The shifting location of parts makers to the small region will make the small region more attractive to components manufacturers, in particular those that have a very high intermediate goods cost share and those for whom input-buying trade costs are high (e.g., for the parts that are particularly expensive to transport due to fragility or weight) and whose output-selling trade costs are low (e.g., for components that are easy and cheap to ship).

In short, the greater dispersion of parts makers dampens the attractiveness of the big region to component makers. This reduction in the “weight” of agglomeration forces for components triggers a leftward shift in the fulcrum for the components industry. This in turn will feed back to weaken the demand-linked agglomeration force in the parts industry, as the component firms are the customers for parts firms.

Figure 16: US Imports from Canada



Source: USITC DataWeb, based on HS 6-digit (5000+ categories)

The basic point of the knock-on effects can be rephrased as follows. As the parts must somehow get to the component maker's facility, and the components must somehow get to the final assembly plant, the question is whether it is more efficient to ship parts across the border to component makers, or to move the component makers' facilities to the same side of the border as the parts makers.

The same logic does not apply to final assembly since it is tied to the large region's massive consumer base. The shifting of parts and components to the small region reduces the supply-linked agglomeration forces in final assembly. However, unlike the parts and components segment of the industry, final assembly continues to face unaltered demand-linked agglomeration forces arising from the location of so many final consumers in the big market. Thus there is likely to be a less than proportional shift in final assembly to the small region.

Additional factors come into play in determining the location of production after unbundling.

- The labour intensity of the various unbundled parts and components will differ (in the initial bundled situation what mattered was the average labour intensity). Since a typical situation in the real world (and in the NEG theoretical models) is that equilibrium labour costs are higher in the big nation, relocation to the small nation is more likely, all else being equal, for labour-intensive stages of production.
- Relocation will entail higher transport costs (shipping to the big market), so relocation will tend to be more attractive for parts and components that are easily, cheaply, and reliably shipped.
- Unbundling may also change scale. Bundling may have prevented some of the components from achieving their most efficient scale of production. An example of this is "shared platforms" in the auto industry. For such components, unbundling, by allowing a single component factory to serve more than one final good producer, will raise the scale of production and result in a spatial grouping of production. The location of these large factories will involve the same balance of forces as in Figure 14.

5. Policy Issues

Having explained the basic conceptual framework – in particular the extension of the trade-in-tasks approach to allow for agglomeration economics (NEG) – we turn to a number of policy implications, starting with trade facilitation.

5.1 Impact of trade facilitation

The basic logic of agglomeration suggests that the US economy's size is an enormous advantage in attracting and keeping industry. But the large-market benefits of producing in the United States are set against the negatives stemming from local competition and higher wage costs. Presuming that most industries are on the downhill side of Figure 12, anything that makes US-Canada trade cheaper, faster, and more predictable will tend to erode the attractiveness of the United States's market size. This, in turn, would tend to promote Canada as a location for industry.

Notice that trade costs entered the equation in two ways: the cost of buying necessary intermediate goods from across the border, and the cost of selling output across the border. As the United States starts with a larger concentration of both customers and input producers, a reduction in either or both costs will reduce the United States's market size advantage and thus foster the location of industry in Canada. This is just a general prediction of Krugman's new economic geography approach: free trade reduces the large market's advantage. The point, however, can be augmented with considerations arising from production unbundling.

The first point to make is that production unbundling has the effect of putting into play a large number of industrial jobs that were previously bundled into larger plants – plants that were in turn attracted to the United States's large consumer market. More precisely, the NEG-cum-trade-in-tasks logic teaches us to think of unbundling as a large drop in the distance-related, input-buying trade costs. Before unbundling, it would have been prohibitively expensive to try to manage the sort of international supply chain we see today. Or to put it differently, firms located the production of parts and components close by – often in the same factory complex – in order to economize on input-buying trade costs broadly defined.

The second point returns to the interaction between pro-dispersion policies – like Canada's health care system, its production support, etc. – and trade costs. The example shown in Figure 13 is a rather general proposition. Indeed it is absolutely obvious once one sees that the advantages of being in the big market are eroded by lower trade costs. What this means is that the effectiveness of a particular pro-relocation policy will typically become magnified as trade costs fall. Trade facilitation, in short, can be a “force multiplier” for Canadian industrial policy.

The third point is that the unbundling allows dispersion forces to operate more finely on the value-added chain. Tasks, in other words, will tend to migrate to nations that have the most appropriate factor prices. This should help Canada to develop more finely defined strengths in manufacturing segments that correspond more precisely to natural comparative advantages.

5.2 Labour and industrial policy

One of the key dispersion forces fostering the location of industry in Canada is its low productivity-adjusted labour costs and favourable manufacturing incentives. (This paper does not address the social welfare consequences of such policies, but rather focuses

on their location effects.) As discussed above, these dispersion forces are magnified by lower trade costs. This suggests that the impact of attractive labour and policies could rise as trade within North America becomes cheaper and more reliable. The same is true of R&D policies that prove attractive to component producers. This, of course, is just the reverse of the point that trade facilitation is a force multiplier for industrial policy.

5.3 Most favoured nation tariff policy

The situation of Canada in North America is particular. It has a labour-cost advantage over the United States, but Mexico's wage cost advantage is far greater.

External trade policy can help meet this challenge. Lowering the cost of importing parts that are intensive in low-skilled labour is a direct response to the supply linkages created in Mexico by their abundance of such labour. As Robert Mundell (1957) noted decades ago, trade is a substitute for factor movements. The direct way to counter Mexico's advantage would be for Canada to "import" low-skilled labour. Mundell's insight, however, tells us that this is not necessary. Reducing tariffs and other border costs on low-skill-intensive parts will tend to offset the attractiveness of the Mexican market and US locations near the Mexican suppliers of these goods. After all, the key to these supply linkages is the price of the input. The input's production location is relevant only insofar as it affects the price. Providing Canadian component makers with competitively priced parts from third nations directly offsets the locational advantage created by the production of such parts in Mexico.

5.4 Unbundling and rules of origin

Any nation that applies preferential tariffs must have rules of origin (ROOs) to guide customs officials. These rules, however, have de facto been used to influence the location of industry. The traditional view is that strict ROOs foster the production of upstream intermediate goods. The trade-in-tasks framework, suitably extended to allow for cluster economics, can provide some new insights.

Unbundling has and will continue to alter the politics and economics of ROO. In a nutshell, ROOs are a way of bundling together the tariff protection enjoyed by upstream and downstream producers. Insofar as unbundling further fragments a sector, it tends to erode the coalitions backing tariff-protection bundling (i.e., strict ROO).

5.4.1 The basic economic effects of rules of origin

The basic impact of unbundling is to make the ROO coalitions more difficult to manage. As production stages are separated spatially, especially when their ownership is also separated, the intrinsic conflicts between parts makers and parts buyers become more problematic, especially when the outsourced parts are moved outside the nation. It may be the case that ROOs are saving industry jobs, but whose? As unbundling and spatial dispersion of upstream manufacturing proceeds, the nationalistic argument for ROOs tends to get blurred. Moreover, if unbundling results in a multiplication of firms, it will make political organization more difficult.

5.5 Product standards and unbundling

Citizens expect their governments to impose health, safety, and environmental standards on the goods they buy. As intermediate inputs are an essential element in many

final goods, it is also natural to impose standards on upstream products as well as consumer products. But product standards also play a protection role (Baldwin 2000). Unbundling suggests that pressures for this sort of protection will unwind from the beginning of the value-added chain and moving forward. There is a close analogy with the logic concerning ROOs and MFN tariffs.

As manufacturing becomes unbundled and geographically dispersed, especially when parts production is both outsourced (produced by a different company) and offshored (produced in a different nation), firms that “won” from the protection provided by idiosyncratic standards may find themselves turned into losers. That is, as unbundling turns large companies into buyers of parts, there will be increasing pressure to lower costs by adopting international standards. This basic logic parallels that concerning the difficulties of maintaining coalitions in favour of strict ROO.

As far as policy is concerned, the usefulness of this insight is to avoid developing industry that will not be viable once international norms are adopted, especially in upstream stages of the value-added chain.

There is a second logic that suggests unbundling will favour the adoption of international standards. As discussed above, unbundling may allow certain segments of the production chain to achieve the minimum efficient scale that was not possible when they were tied to an individual downstream firm. That is, the unbundled firm can, by selling to more than one downstream firm, achieve greater economies of scale. But once firms start selling to more than one final good producer, they may face the problem of multiple standards. Since lowering these costs is likely to be in the interest of buyers and the sellers, this aspect of unbundling may foster the elimination of standards-based protection. To put it differently, overlapping standards becomes more of a problem when the supply chain gets unbundled and dispersed around the world. For policy makers, this suggests that efforts be made to advance the internationalization of industrial standards.

6. Concluding thoughts

The globalization of manufacturing will surely continue, and the globalization of services production is just starting. Two of the forces driving this globalization are the rising competitiveness of emerging economies’ producers (China, India, etc.) and the advancing sophistication and falling cost of communication and information management systems.

On the rise of the emerging market manufactures, little needs to be added to the voluminous discussion; suffice it to say that a growth takeoff has begun in these nations. While they may find growth gets harder as they approach the productivity frontier, it looks certain that they will at least reach the output per person of nations like Korea or Taiwan. That would mean a fourfold increase in output, with a more than proportional rise in manufacturing output. Such a large increase in selling and buying power will greatly magnify the pull and push factors driving globalization. The world’s economic landscape will surely continue to flatten as far as manufacturing is concerned.

On the advance of communications technology, there is no end of the ways things could improve. If today’s most advanced teleconferencing technology (large screens, multiple cameras and microphones, etc.) became as cheap and widespread as online telephony is now, trade in services would be revolutionized; the need for face-to-face meetings would be greatly diminished. The unbundling of the service sector has only just begun, hindered as it is, by the fact that it is still very expensive to move people around the

world (falling airfares are offset by rising opportunity costs of time) and it is still necessary for many service producers to interact in person, at least periodically.

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