INDUSTRIAL LOCATION AND COMPETITIVENESS

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Industrial Location and Competitiveness

The interaction between the extent of location advantages and the intensity of firm competition relative to the size of the market jointly determines the location of industrial activity. Technology, factor endowments, geography, and scale economies are influential for determining location advantages, while agglomeration, variety, proximity, and market access are important for determining the intensity of firm competition relative to the size of the market. This implies, as illustrated below, that sometimes what appears to be a minor change in the balance of the forces determining industrial location, may turn out to have drastic consequences for the global distribution of manufacturing activity. After a brief overview of the strong industrial sectors for a selection of countries, we provide some information on the ongoing process of globalization. Next, we review some of the forces determining industrial location and give recent changes, which are the result of these forces. Finally, we discuss the importance of local interactions between producers, consumers, and firms for determining competitiveness and the location of industrial activity.

Who produces (and exports) what? Revealed comparative advantage

Before turning to some of the explanations that have been put forward to explain the current distribution of the location of industrial activity, we briefly explain how to determine empirically which country holds a particularly strong position in the production of which good. Since the idea is that investigating a country's actual export flows 'reveals' the country's strong sectors, this procedure is known as establishing a country's "revealed comparative advantage". Based on the work of Bela Balassa, it is also known as the Balassa index. How does this work? Many countries are, for example, producing and exporting cars. To establish whether a country, say Japan,

holds a particularly strong position in the car industry, Balassa argued that one should compare the share of car exports in Japan's total exports with the share of car exports in a group of reference country's total exports. The Balassa index is therefore essentially a normalized export share. So if Japan's normalized export share for cars is higher than 1, Japan is said to have a revealed comparative advantage in the production of cars. As a measure for the 'reference' we restrict attention to the exports of 28 manufacturing sectors for the member countries of the Organization for Economic Cooperation and Development (OECD).

Figure 1. Top 2 revealed comparative advantage sectors, Japan and Finland [1]

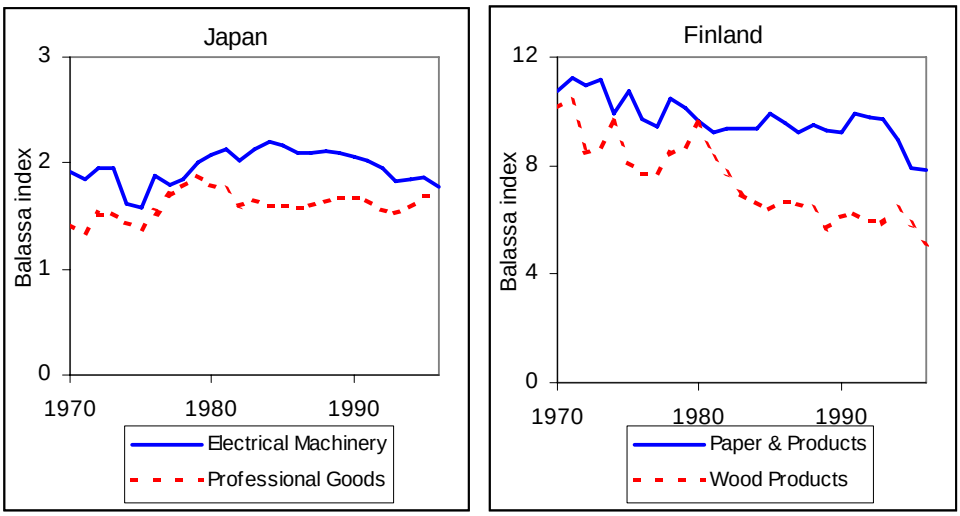


Figure 1 illustrates the evolution of the Balassa index in the period 1970-1996 for the two sectors with the highest Balassa index for Japan and Finland. The Balassa index is above 1, as it should be for the strong export sectors. Apparently, Japan has a revealed comparative trade advantage for electrical machinery and professional goods. Note the fairly small value of the highest Balassa index for Japan (about 2) compared to Finland (about 11). This can be attributed to the fact that Japan has a much larger

industrial base than Finland and exports a wider variety of goods, which makes it more difficult to achieve high values for the Balassa index. Finland's highest-ranking sectors are paper & products and wood products. This must have something to do with the easy availability of factor inputs, that is wood from the large Finnish forests, as discussed below.

Table 1 Revealed comparative advantage in manufacturing (1996)

Australia	Finland	Italy	Portugal
Non-Ferrous metals	Paper & Products	Footwear	Footwear
Austria	France	Japan	Spain
Wood Products	Beverages	Electrical Machinery	Footwear
Belgium	Germany	The Netherlands	Sweden
Other manufacturing	Industrial Chemicals	Tobacco	Paper & Products
Canada	Greece	New Zealand	United Kingdom
Wood Products	Wearing Apparel	Food	Beverages
Denmark	Iceland	Norway	United States
Furniture & Fixtures	Food	Non-Ferrous Metals	Tobacco

In general, sectors with a high revealed comparative advantage tend to sustain this advantage for a fairly long time. Tobacco, for example, is always the sector with the highest Balassa index in the USA. The same holds for footwear in Italy and paper & products in Finland. Changes over extended periods of time are, however, also possible. Table 1 gives an overview of the sector with the highest Balassa index in 1996 for the 20 OECD countries. In general, the highest Balassa index for large countries is lower than for small countries. Note that paper & products is the highest-ranking sector for Finland and Sweden, both of which have extensive forests available. Also note that the labor-intensive footwear industry is the highest-ranking

[1] Unless otherwise specified, all information, figures and tables are taken from Van Marrewijk (2002).

sector for Spain, Portugal, and Italy. A closer look at the changes in the distribution of the Balassa index shows that:

- The mean value of the Balassa index is slowly increasing over time. This points to an increase in international specialization.
- There is a positive relationship between employment and industries with a high Balassa index.
- There is no clear-cut relationship between labor productivity and sectors with a high Balassa index.

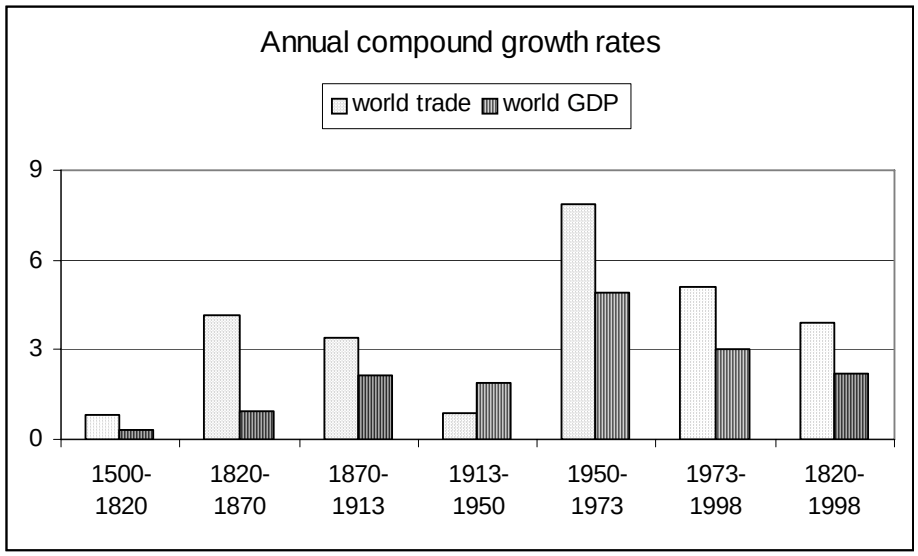
Two questions now come to the fore, why do countries tend to specialize in certain industries, and why do we find those industries in particular locations? In order to answer these questions we take a closer look at globalization.

Globalization

The trend toward increased interaction with distant markets and competition from foreign firms has been going on for at least 500 years, although not monotonically. During the 19th and early 20th century, for example, declining shipping rates and declining levels of protectionism resulted in a highly global world economy as measured by world trade as a percentage of world Gross Domestic Product (GDP). This reached a peak of about 8.7 percent just before the First World War, not to be matched again for another sixty years as a result of the inward looking behavior and protectionist tendencies associated with the two world wars and the Great Depression. Similarly, there were very large capital and migration flows before 1913. Net capital flows were as high as 10 percent of GDP for investor or recipient. In the period 1870-1910 no less than ten percent of the world population migrated to other countries,

mostly to the New World. The migration flows are now more restricted than in the 19th century, while capital flows can move more freely than ever before.

Figure 2 Growth in world trade and world GDP



Data source: A. Maddison (2001) The World Economy: A Millennial Perspective, OECD, Paris.

Figure 2 illustrates that world trade flows have been increasing more rapidly than world production for the last 500 years, with the exception of the period 1913-1950. As a consequence, merchandise exports as a share of GDP rose gradually, although not monotonically, from about 1 percent in 1820 to more than 17 percent in 2000. After the Second World War many trade restrictions, which had hampered the globalization process, were relaxed under the guidance of what is now known as the World Trade Organization (WTO). Similarly, transportation costs have declined considerably. The cost of ocean freight transport, for example, declined by 70 percent between 1920 and 1990, while the cost of air transport declined by 84 percent between 1930 and 1990. But it was not only commodity trade that increased: thanks to technological breakthroughs in the information and communication industry, more and more services that used to be non-tradable became internationally tradable. These

technological advances not only stimulated trade of existing commodities but also created new products. All factors combined greatly stimulate world trade in goods and services, suggesting that the world economy is becoming a truly integrated economy.

From an historical point of view world trade has clearly become more important, but is the world-economy now fully integrated? The answer is no, as the following example illustrates. How much would a US citizen spend on foreign commodities in a fully integrated world without any trade barriers whatsoever? The US share in world GDP is roughly 25 percent. If a US citizen would be completely indifferent between domestic and foreign goods and services she would spend 25 percent on domestically produced goods and 75 percent on foreign goods. In reality the current share of US spending on foreign goods is only about 12 percent, so the globalization process may still have some way to go.

Technology

At the end of the 18th and the beginning of the 19th century two British economists, Adam Smith and David Ricardo, pointed at a fundamental force determining the location of industrial activity: technology differences leading to differences in relative production efficiency (comparative advantage). International trade is not simply an extension of the local market by adding international markets: it affects the industrial composition of countries. The theory of comparative advantage explains how countries gain from trade even if a country imports commodities which it could produce more efficiently itself, or exports goods to countries that can produce them more efficiently themselves. The key insight of Ricardo is a generalization of the concept of opportunity costs of production. In the case of, for example, shoes and

wine the opportunity costs of shoes is the amount of wine a country must forego in order to produce more shoes (the price of shoes in terms of wine). A country that is more efficient in producing both types of goods relative to another country might still direct all its resources to shoes if it is relatively more efficient in producing shoes than wine. For a country that prefers to consume both goods, the most efficient way to get wine is to internationally trade shoes for wine, instead of giving up some of the production of shoes and produce the wine itself. So, simply comparing the efficiency of wine producers between countries gives the casual observer the wrong answer, as he would probably predict that the country exports wine instead of shoes.

The relatively inefficient trading partner gains as well from international trade. As we are comparing relative efficiencies between countries the opportunity costs of shoes in terms of wine is higher in the less efficient country (the price of shoes in terms of wine is higher than in the efficient country). This country directs all its resources to the production of wine. By internationally trading wine for shoes it gets the shoes cheaper than by producing them itself. By comparing absolute productivity differences between industries in different countries one is easily misled. Sometimes workers and managers in certain industries claim that foreign competition is 'unfair' because they are at least as productive as their foreign counterparts but face 'too much competition', so something must be unfair. However, they might be unaware that other industries might have the comparative advantage in their country (and are even more productive compared to the trading partners).

This fundamental look at competitiveness of a country has large consequences for the industrial structure of a country. The relatively more efficient country will, in this

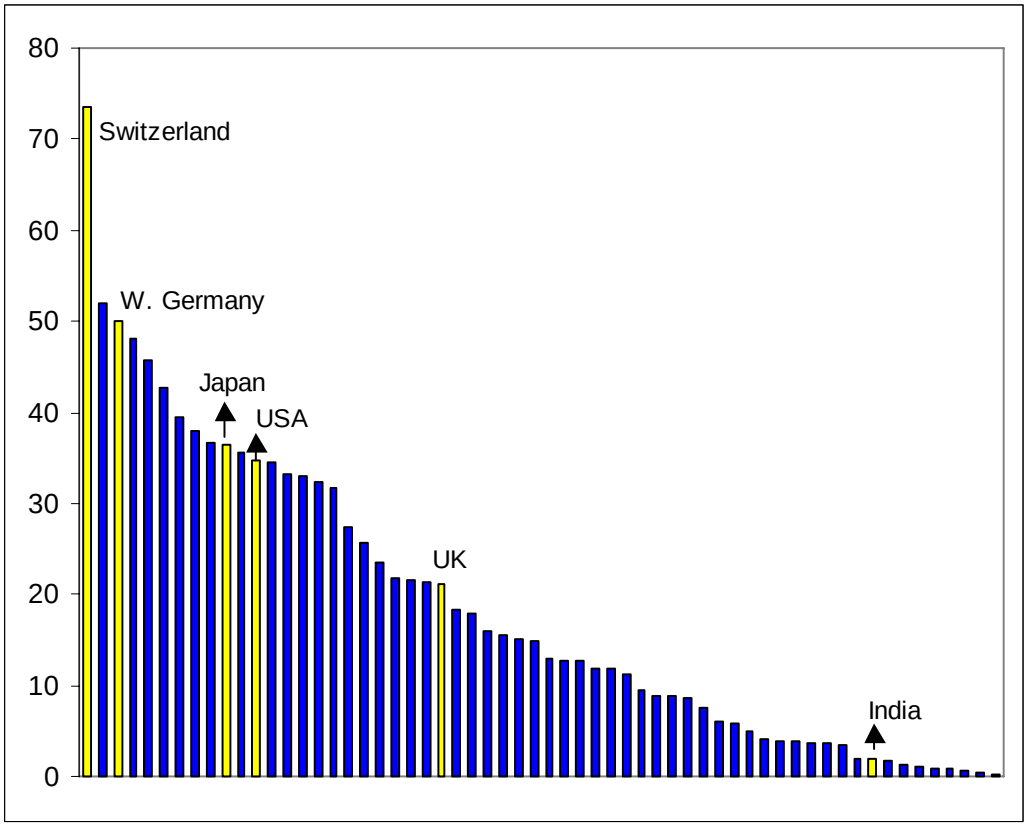
example, specialize in the production of shoes and the relative inefficient country will specialize in the production of wine. The industrial structure of both countries is very different in autarky than under free trade: in autarky they will both have a shoe industry and a wine industry, whereas under free trade the countries will specialize in one of the two industries. Whether this specialization will be complete depends on many factors, such as the relative size of the trading partners. But the key insight here is that relative and not absolute efficiencies determine the international location of industries. If we look at an actual example of trade between the EU and Kenya, we note that the productivity of Kenya is lower in both Food products and Chemical products: value added per person in the Food sector is $233 in Kenya compared to $45,341 in the EU, and for chemical products the value added per person is $452 in Kenya compared to $154,537 in the EU. Still Kenya has an net export surplus of Food to the EU, and the EU a net export surplus of chemical products to Kenya, because in relative terms Kenya is more efficient in Food products, whereas the EU is relatively more efficient in chemical products. What we do not know at this point is how these differences in comparative advantage come about. We will now turn to this issue in more detail.

Factor endowments

At the beginning of the 20th century two Swedish economists, Eli Heckscher and Bertil Ohlin, pointed at another force determining the location of industrial activity: differences in availability of factors of production. Heckscher and Ohlin observed that different goods were produced using different intensities of the factors of production. The production of textile, for example, uses labor intensively, whereas the production of machines uses capital intensively. Since India has a lot of labor available this factor

of production tends to be relatively cheap there. Similarly, since Germany has a lot of capital available this factor of production will be relatively cheap there. Consequently, textile, the production of which uses a lot of labor, tends to be relatively cheap in India while machines, the production of which uses a lot of capital, tend be relatively cheap in Germany. Thus, India will export textile to Germany and import machines from Germany. As the intensity of international competition increases (lower transport costs and removal of other trade barriers) India will increasingly specialize in the production of labor-intensive textile and Germany will increasingly specialize in the production of capital-intensive machines.

Figure 3 Capital stock per worker × $1000 (1990)

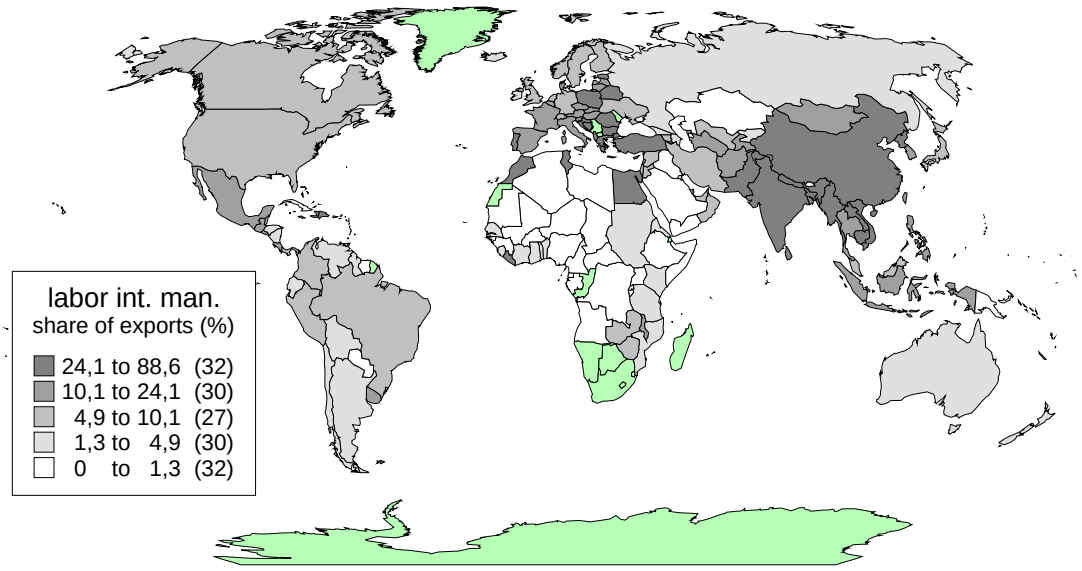


If differences in the availability of factors of production determine in part where an industry will locate, the question obviously arises if these differences are substantial or not. Focusing only on the distinction between capital and labor, this question is not so easy to answer because it requires us to aggregate many different varieties of capital and labor into one aggregate measure. The construction of a consistent data set that can be compared for a large number of countries is therefore complicated and involves a lot of work. Figure 3 illustrates the distribution of the capital stock per worker for the 60 countries for which data are available in the most widely used data set (Summers and Heston). Swiss workers had the highest capital stock per worker available ($73,459). Workers from Sierra Leone had the lowest capital stock per worker ($223). We therefore expect Switzerland to produce mostly capital-intensive goods and Sierra Leone labor-intensive goods.

To see if the prediction of specialization in accordance with the availability of factors of production is empirically verified, we should distinguish more goods and more factors of production. This is done, for example, on the website of the International Trade Center (ITC, see http://www.intracen.org), the joint UNCTAD/WTO organization. To classify international trade flows, it distinguishes 5 factors of production and 257 final goods. The ITC aggregates the 257 final goods into 5 broader categories based on the intensity of the 5 factors in the production process, namely (i) primary products, (ii) natural-resource intensive products, (iii) unskilled-labor intensive products, (iv) technology intensive products, and (v) human-capital intensive products. For example, the ITC classifies 31 goods as 'unskilled-labor intensive manufacturing' products, incorporating pipes, various textiles, and clothing, glass, pottery, ships, furniture, footwear, and office supplies. For the 151 countries for

which the ITC provides data, total exports of unskilled-labor intensive manufactures in 1998 were equal to $610 bn, some 13 percent of all exports. With a value of $78 bn China is the world's largest unskilled-labor intensive manufactures exporter, including ships, shoes, and wearing apparel, followed by Italy with a value of $48 bn (including furniture, footwear, and pullovers). Despite the fact that unskilled-labor intensive manufactures represent a sizable 43 percent of Chinese and 24 percent of Italian exports, neither country makes it to the top 10 list of world exporters of unskilled-labor intensive manufactures in relative terms, the majority of which are located in Asia. The top 3 is formed by Nepal (carpets), Bangladesh (clothing and textiles), and Pakistan (cotton and textiles). The dependence on the exports of unskilled-labor intensive manufactures for these countries is high, ranging from 89 percent for Nepal to 62 percent for 10^{th} ranked Albania. Figure 4 shows the relative dependence of countries on the exports of unskilled-labor intensive manufactures. These are clearly concentrated in South-East Asia and Central Europe.

Figure 4 Unskilled-labor intensive manufacturing exports; share, 1998

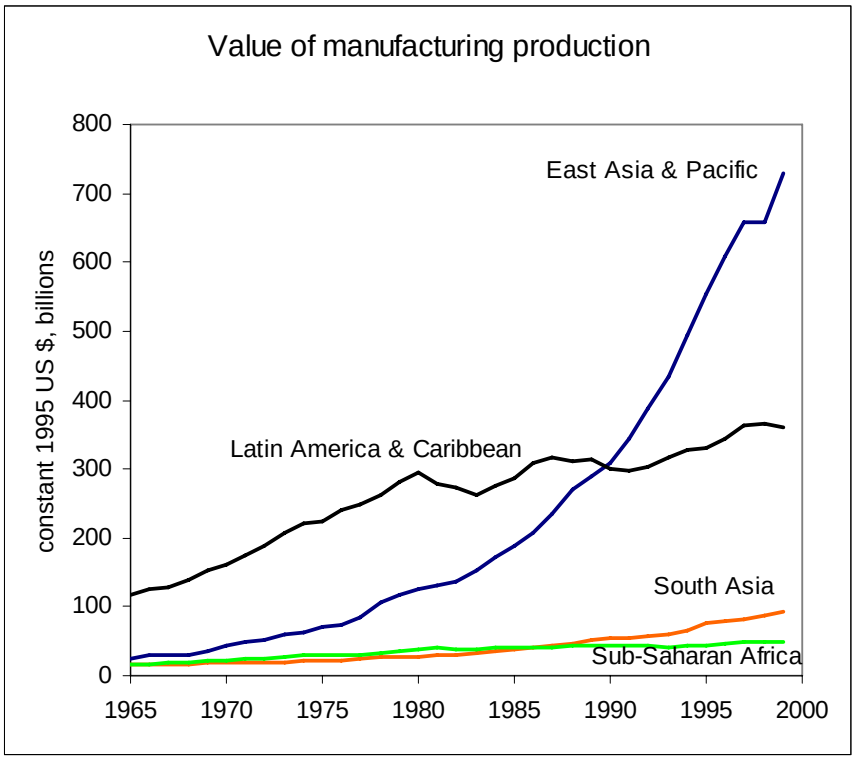


Dynamics

The above explanations on the location of industrial activity, based on technology differences and the availability of factors of production, together with the ongoing process of globalization, based on the elimination of trade barriers, reductions in transport costs, and technological improvements, suggests that we should observe fundamental shifts in the structure of global industry. This is indeed the case, as illustrated in Figure 5 for four of the seven global regions identified by the World Bank: (i) East Asia and Pacific (including China and Indonesia), (ii) Latin America and the Caribbean (including Brazil and Mexico), (iii) South Asia (SAS; including India), and (iv) Sub-Saharan Africa (including Nigeria and South Africa). Measured in constant 1995 US dollars (that is: corrected for inflation) these four regions produced a total of $173 billion of manufactures in 1965. This increased more than seven times (by about 6 percent per year) to $1233 billion in 1999. The distribution of the production of manufactures for the four regions changed drastically in this period. The increases in the Sub-Saharan and Latin American regions were modest, or about

3.4 percent per year in both cases, rising from $16 billion to $49 billion in Sub-Sahara Africa and from $117 billion to $361 billion in Latin America. As is well known, most countries in these regions have not actively promoted international trade and specialization throughout most of this period. The South Asia region, with its increasingly outward-looking development strategy, saw its production level of manufactures rise more substantially from $15 billion to $93 billion, about 5.5 percent per year. The East Asia & Pacific region, with its predominantly outward-looking development strategy throughout most of this period, experienced very rapid growth and saw its production level of manufactures rise more than 28 times in 34 years, from $26 billion to $730 billion, or about 10.4 percent per year.

Figure 5 Dynamics of the location of industrial production



Data source: World Bank development indicators CD-ROM (2001)

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The spectacular rise of the production of manufactures in the East Asia & Pacific region demonstrates the power of the forces underlying the globalization process and the speed at which changes in industrial location can take place. It does not indicate, as is frequently suggested, that manufacturing activity disappears in the developed countries. For example, the European countries now forming a monetary union produce about twice as much manufactures than the entire East Asia & Pacific region. Moreover, this level is still rising, although slowly. Instead, the developed countries are increasingly shifting their economic structure toward producing a wide range of services. There is another aspect of the international economic interactions, associated with these observations, that deserves our attention: more than 75 percent of the world trade flows are to and from the high-income countries (West Europe, North America, and Japan). Indeed, the majority is from one high-income country to another high-income country. For example, the intra - West European trade flows alone account for more than 27 percent of world trade. Since it is hard to see how differences in technology and factor abundance can fully clarify these large trade flows, we now turn to some other forces underlying the global economic structure.

Intra-industry trade, scale economies and variety

The international trade flows between similar high-income countries are not only very large, they are also characterized by intra-industry trade. This refers to the fact that many countries simultaneously export and import very similar goods and services; intra-industry trade is therefore trade within the same industry or sector. Germany, for example, exports many cars to France and simultaneously imports many cars from France as well. Why does Germany do this? Intra-industry trade is measured using the Grubel-Lloyd index, which ranges from zero (if a country only imports or only

exports a particular good) to one (if a country's exports of a good are exactly as high as its imports of that good). Table 2 summarizes the extent of intra-industry trade in 1995 for a selection of countries. Take the USA as an example. Averaged over all countries no less than 71.7% of US trade can be categorized as intra-industry trade. This is, however, unevenly distributed. US trade with the Asian newly industrialized countries (41.4% intra-industry trade), and Latin America (66.0% intra-industry trade) has a lower intra-industry trade component than US trade with the NAFTA countries (73.5%) or the OECD countries (74.0%). Similarly, the high overall level of intra-industry trade for France (83.5%) is the combination of low intra-industry trade levels with respect to Latin America (22.9%) and Southeast Asia (38.7%), and high intra-industry trade levels with respect to NAFTA (62.7%) and the OECD (86.7%). Table 2 also illustrates the lower intra-industry trade levels for developing nations (for example 10.0% for Bangladesh), such that we may conclude that intra-industry trade is more prevalent among developed nations and that similar developed nations are largely engaged in trading similar types of goods between themselves.

Table 2 Intra-industry trade index, manufacturing sector 1995 (3-digit level, %)

Country	World	OECD 22	NAFTA	East Asia Dev.	Latin America
Australia	36.6	17.5	16.0	39.2	41.6
Bangladesh	10.0	3.5	1.7	3.4	8.0
Chile	25.7	10.1	11.5	3.6	47.8
France	83.5	86.7	62.7	38.7	22.9
Germany	75.3	80.1	61.2	36.2	22.8
Japan	42.3	47.6	45.7	36.1	7.0
Malaysia	60.4	48.5	57.9	75.0	10.4
Hong Kong	28.4	20.2	25.2	19.9	13.6
UK	85.4	84.0	72.5	46.6	38.6
USA	71.7	74.0	73.5	41.4	66.0

Obviously, the goods and services produced by firms in the same industry are not, in fact, identical. Everyone acknowledges that a Volkswagen Golf is not the same as a Peugeot 206. They are similar products, delivering similar services, produced using a similar technology, such that they are classified in the same industry, but they are not the same. That is, we should distinguish between goods and services which are imperfect substitutes, as consumers demand many different varieties of similar, but not identical, products in the same industry. In addition, we have to explain why the domestic industry does not provide an arbitrarily large number of varieties to cater to the preferences of consumers. Going back to the Germany - France car example, it is clear that Volkswagen has the ability and technology available to produce a car virtually identical to the Peugeot 206, and is thus able to fulfill demand for that type of product. Large initial investment costs, spread over several years, are required, however, before such a new type of car is designed, developed, tested, and can be produced. These large investment costs, giving rise to increasing returns to scale, are the primary reason for Volkswagen, or other German car manufacturers, to produce only a limited number of different varieties. This also implies that a car manufacturer, being the only producer of a particular variety, has considerable market power, which it takes into consideration when maximizing profits. In short, to explain intra-industry trade flows requires: (i) consumer preferences with a demand for different varieties of similar products, (ii) increasing returns to scale in production, limiting the diversity in production which the market can provide, and (iii) a market structure of imperfect competition consistent with the phenomenon of increasing returns to scale. These aspects, and their interaction, also explain why proximity of demander and supplier is important and why clustering of economic activity is so prevalent.

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Proximity and clustering

Economic activity is clearly not randomly distributed across space. Clustering of people and firms, at various levels of aggregation (continents, countries, regions, cities, and even within cities), is the rule and not the exception. Clustering certainly holds for industrial or manufacturing production, also for specific industries. Examples are the car-manufacturing cluster around Detroit, the film industry in Hollywood, the tapestry industry in Belgium, the financial district in London, or the fashion industry in Paris. The question arises as to why location matters. Basically, two answers exist. The first answer is that natural advantages account for the clustering phenomenon. This answer is essentially based on (geographic) technology advantages and factor abundance, as explained above. Special circumstances can influence the productivity of the factors of production, like whether a region is land-locked or not. To a large extent these natural (dis)advantages are given, that is they are not man-made. The second, and somewhat more complicated, answer to the clustering phenomenon is that it is caused by the interactions between different economic agents. More specifically, clustering arises as a result of positive external economies of scale, which lowers a single firm's average costs of production if the industry-wide output increases. The 19th century British economist Alfred Marshall already gave three examples of external economies of scale: (i) an increase in industry-output increases the stock of knowledge for every single firm, lowering the costs and increasing the output of the individual firm, (ii) a large industry-wide output supports the existence of a local market for specialized inputs, and (iii) a large local market makes labor market pooling possible. These positive externalities imply that firms (in an industry) want to be located close together, a supply-side concentration force. If we combine this with, for example, the costs of transporting goods and

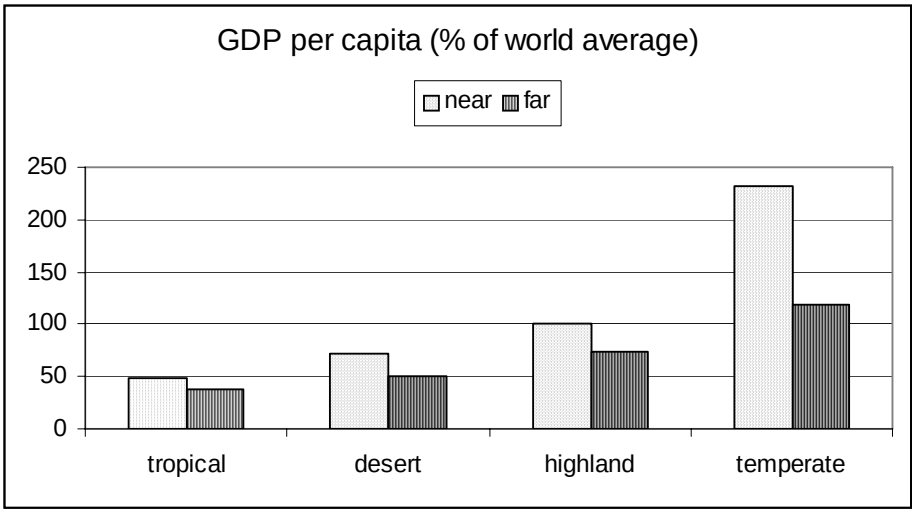
services, firms also want to be located close to a large market, a demand-side clustering force. Both types of clustering forces are 'endogenous', that is determined by the economic interaction between consumers, workers, and firms. The exact location is then not so important and could be largely determined by chance or historical accident. New York, for example, was initially an attractive location because of its natural harbor. However, for the past 150 years or so New York has been an attractive location to establish a firm or migrate to simply because it is a large agglomeration, which provides all possible intermediate goods and services, a well-connected large market, and all sorts of specialized (labor) inputs.

Interaction

Although the distinction between the two types of explanations for economic clustering is useful, this distinction is not razor-sharp since both determinants are not independent. The main difference is that natural (dis)advantages pre-determine a location's production structure whereas this is not the case with the external economies of scale. It was not destined that Seattle or Silicon Valley should become home to a relatively large part of the US aircraft or computer industry, respectively. A small initial advantage can be enough to set in motion a process of self-reinforcing economies of scale. Industrial location is then historically determined or path-dependent. Only a large shock (like Boeing's decision to relocate its headquarters) or a substantial change in transportation costs due to globalization or to economic integration at large, could lead firms to decide to re-locate and could thereby bring about a change in the spatial distribution of economic activity. The two types of forces are, however, also interdependent. A land-locked country will, on average, be engaged in less trade. Since trade constitutes a vital transmission mechanism for

information or knowledge spillovers, firms will find that their competitiveness is hurt when they locate in a land-locked country. Empirical research estimates, for example, that almost 20 percent of the concentration of US industries can be explained by natural advantages. The impact of the balance between these various forces is aptly illustrated in Figure 6, which distinguishes between four climate zones (tropical, desert, highland, and temperate) and whether a region is land-locked or not (near = less than 100 km from the coast, far = more than 100 km from the coast). The figure shows not only that different climate zones lead to different per capita income levels, but also that within each climate zone a land-locked region is disadvantaged relative to a region along the coast.

Figure 6. Impact of geography on income level



Data source: J.D. Sachs, A.D. Mellinger, J.L. Gallup, The Geography of Poverty and Wealth, Scientific American, March 2001, pp. 62-67.

Initiated by the work of the American economist Paul Krugman, the economics literature is integrating the various forces described above in trying to determine the industrial location decisions of firms in a consistent framework under the label "geographical economics". The focus of attention is whether the ongoing process of

globalization, measured as a decrease in the costs of interaction (transport costs, trade restrictions, cultural barriers, technological change, etc.), tends to reinforce a core-periphery pattern in location, or not. To benefit from external economies of scale and to minimize on interaction costs, manufacturing firms have an incentive to locate where demand is relatively high or where the supply of their inputs is abundant, that is a firm wants to locate where other firms and also workers have chosen to locate. A core-periphery pattern is, however, not inevitable. If the costs of interaction are either very low or very high an equal spatial distribution (spreading) of manufacturing activity results. For an intermediate range of interaction costs, a core-periphery pattern results. The results in this literature therefore strongly suggest that the ongoing process of globalization will initially favor the establishment of core-periphery patterns in industrial location, as illustrated in Figure 5. As the globalization process continues, however, and the costs of interaction fall below some critical level, firms will start to re-locate from the core to the periphery as the advantage of being close to large markets dwindles. This return to a spreading pattern of industrial location leads to more rapid increases in real income in the disadvantaged locations. Since, on a global scale from the late 19th century onwards, the actual changes in the distribution of economic activity between countries and the changes in the degree of economic integration match the predictions of the geographical economics literature quite well, this may be good news for the future of the currently disadvantaged climate zones and land-locked regions, although the time frame within which these positive changes may occur is more likely measured in centuries than decades.

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