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Globalisation and Regional Economies:
Can OECD Regions Complete in Global Industries?

PART I

Chapter 2

Globalisation and the Spatial Reorganisation of Production

The drivers of change in regional economic structures are assumed to be linked to globalisation, notably the reorganisation of production. This chapter outlines the main drivers of globalisation and explores the role of multinational firms in this process and what this has meant for particular regions. It then reviews the changing geography of production and processes such as outsourcing and offshoring from the perspective of their impact on regions.

Introduction and key points

The processes of change in regional economies are often attributed to globalisation, usually in terms of the threats posed by opening of markets, and, less frequently, with respect to the opportunities that globalisation offers. This research supports other OECD work that indicates that deindustrialisation for most regions and in most sectors is more closely linked to productivity gains from technological advances and industry-level restructuring than to competition from low-wage economies as such. The recent crises that have hit industrial regions examined in this report seem to have more to do with sector-specific shocks, such as the crash in ICT-related stock values in 2000-01 or the slump in sport utility vehicle (SUV) sales in the US market, than to more direct drivers of globalisation.

Nonetheless, the reorganisation of production is having a major impact on the way firms think about how they organise production and where they locate different segments of the production process. Classic cost equations still matter, but the assessments made by large firms are increasingly complex and evolve very quickly. Moreover, the competition to retain and attract investment now involves not only traditional OECD regions but a wide range of newer entrants in OECD and non-OECD countries.

Key points

- Globalisation's main drivers – such as liberalisation and improvements in transport and communications – have had some direct impacts on spatial location of economic activities. For example, trade agreements can radically alter the location of production within countries.
- MNEs have been major beneficiaries of globalisation, which has allowed them to access new markets. In many regions the expansion of MNEs over the latter part of the 20th century created large numbers of jobs, helping to ground regional competitive advantages through the growth of supplier chains, specialised skills, etc.
- More recently, restructuring of MNEs – consolidation, M&As and break up of large firms – has had a major impact on regions. Changes in ownership of large firms, through mergers and other operations, have tended to reduce the embeddedness of firms in their "home" region, which has consequences for the stability of the regional enterprise base. At the same time, downsizing of these MNEs has released entrepreneurial talent that has contributed to dynamic start-up firms in some cases.
- Offshoring (defined as the outsourcing of activities abroad) is an issue, but does not appear as central as the restructuring of large firms or sector-specific shocks (such as in ICT) or even market shifts (such as the SUV sales slump and its impact on the Big 3 car makers).
- Outsourcing (defined as the production of inputs outside of the firm) appears to be broadening the structure of regional economies by changing the relationships among firms within the region. However, the reshaping of these relationships is often difficult and many supplier firms are under severe pressure.

- While internationalisation of R&D is well advanced, this has usually concerned OECD countries (investment by US firms in research facilities in the UK or in Sweden for example). Now, large firms are increasingly offshoring research to lower cost locations, potentially undermining the competitive advantage enjoyed thus far by OECD regions in knowledge generation.
- Innovation offshoring could pose a major challenge. For the moment, R&D in China and India by foreign firms focuses on very specific segments, but there are examples where full range R&D and product development is undertaken in these countries by MNEs.

Globalisation drivers and their spatial impacts

Although the term globalisation can have several meanings, from an economic perspective it refers to the increasing cross-border integration of production and markets for goods, services and capital. Globalisation has three main components: 1) increased trade in goods and services; 2) increased capital and labour flows; and 3) transfers of production facilities and/or technology. This process leads both to a widening of the extent and form of international transactions, and to a deepening of the interdependence between the actions of economic actors located in one country and those located in other countries (see for instance Narula and Dunning, 1998; OECD, 2006b; Ernst, 2006). These exchanges have increased in intensity and complexity over the past decade and are linking places that were hitherto remote from each other. The clearest (interrelated) evolutions in the world economy, include:

- New approaches to the organisation of production, notably fragmentation of production systems facilitated by ICT;
- The increasing dominance of multinational enterprises and the development of complex production networks involving large numbers of firms;
- A decoupling of product development and manufacturing, with product development undertaken often by firms that have no manufacturing assets; and
- A dramatic increase in the efficiency of ICT systems that co-ordinate these activities across long distance at high speed.

More open and accessible markets

The liberalisation process that has shaped globalisation over past decades has opened a range of opportunities for firms to reorganise the way goods are produced. Liberalisation of national utility and network service markets, for example, have made it possible for foreign firms to enter domestic markets that were previously protected. At the same time, newly privatised domestic firms have been freer to take advantage of new opportunities arising abroad. This trend has been reinforced by the liberalisation of international movements of capital and the more welcoming policies for FDI adopted in a growing number of countries.[1]

Market liberalisation can have important direct spatial impacts. Changes in trade patterns have resulted in significant region-level changes in demand for labour and the nature of skills as well as reorientations in investment flows. The impact of regional agreements such as the EU or NAFTA on the spatial location of production among members is a good example. When most Mexican firms produced for the domestic market, using local inputs, it was logical for them to be located close to both the suppliers and the consumers; *i.e.*, in or around Mexico City. Post-NAFTA, given that the United States is the

main market and source of most inputs, manufacturing and new investment concentrated near the US-Mexican border, rapidly changing the economic geography of Mexico and influencing that of the United States (OECD, 2004a).

Liberalisation therefore provides firms with a number of clear advantages that were less exploitable in the past. First, they now have a greater range of choices for market entry, be it via trade, licensing, subcontracting or franchising (*locational specialisation*). Second, they enjoy better access to external resources and capabilities that they may need to complement their core competencies (*outsourcing*). Third, there are far fewer constraints on the geographic dispersion of the value chain (*spatial mobility*). The ability of firms to exploit these advantages, aided by the improvements in communications, has transformed the value chain architecture upon which enterprises rely. These changes lead to an increasingly sophisticated fragmentation of production, the formation of new international alliances, and the creation of increasingly complex and extensive international supply chains.

Faster and cheaper communications

The reorganisation of production depends crucially on the speed and cost of the service links, both physical and electronic, that knit the components of production networks together (Jones and Kierzkowski, 2005). Advances in ICT have brought about drastic improvements in the ability to store, manipulate and distribute information. As a result, it has become cheaper and easier to manage distant and widely dispersed production networks.[2] Table 2.1 shows the dramatic fall in the price of telecommunications, with current prices below one-third of 1992 prices. Rapid developments in these technologies have increased tradability particularly in service sectors that were up to now only tradable to a limited degree and that in many regions now constitute an important source of employment.

The impact that ICT-enabled offshoring is likely to have on OECD labour markets has been the subject of intense discussion. What is clear is that the emergence of this form of offshoring has shifted the globalisation debate away from its limited focus on certain manufacturing sectors or manufacturing processes that concerned specific regions or region-types towards a more general concern about economy-wide impacts. Over the last couple of years this has led to concerns about a more generalised process of offshoring (the so-called "second wave") which would affect broader segments of OECD economies than the previous wave of offshoring which mainly involved relocation of labour-intensive manufacturing.

Advances in transport have also contributed significantly to the ability of firms to reorganise their production systems. A look at the growth of container ship transport capacity illustrates how this technology is driving the globalisation process. While the

Table 2.1. **The reduction in leased telephone line pricing (1992-2004)**

	Year			
2 Mbit/s line length	1992	1996	2000	2004
2 km	100	112	62	48
50 km	100	83	46	32
200 km	100	82	48	31

Source: OECD (2006), *OECD Information Technology Outlook*, OECD Publications, Paris.

merchant fleet has grown, the size of ships has also increased. Already container ships can reach more than 300 metres and can handle more than 9 000 containers. In the future, they could carry enough containers to fill a line of trucks 68 miles long (*The Economist*, 18 March 2006). In parallel, container handling technologies have reduced port turnaround times from three weeks for a bulk cargo ship to 24 hours for a container ship, leading to large reductions in inventory and storage costs for firms. Given that inventory and storage costs are often cited as reasons why supplier networks should be localised, the proven ability of firms to manage dispersed, transport-dependent production networks suggests that this argument in favour of clustering is now less relevant.

The declining fixed costs involved in different types of transportation are a major factor alongside labour costs and other input costs in determining where production will be located. The continuing evolution of these costs can rapidly change the location decision equation. Comparison of the relative competitive advantages of China and Mexico shows that transport and proximity advantages with respect to US markets still give Mexican exporters a significant cost and time advantage, but these can be more than offset in some sectors by labour cost differentials combined with falling transport costs (Table 2.2). Although the underlying explanations are not certain, China's share of US imports increased from around 8% in 1999 to near 14% in 2004. Over the same period, around one-fifth of *maquiladora* enterprises moved out of Mexico (OECD, 2005).

Table 2.2. **Comparison of average factor costs for Chinese and Mexican exports to the US**

	Mexico	China
Hourly wage in manufacturing (USD)	2.13	0.66
Hourly wage in clothing industry (USD)	2.45	0.88/0.68
Total cost of shipping a 40 foot container to the US (USD)	1 750	4 300
Average number of days in transit	2	12-18

Source: OECD (2005), *Economic Survey, Mexico*, OECD Publications, Paris.

The globalisation of firms and implications for regions

Multinational firms: their role in linking regional and global economies

Multinational firms have become the main actors of the globalisation process. While often MNEs are considered as a result of globalisation processes, they should also be seen as drivers in their own right. By 2004, the number of MNEs had risen to some 70 000 with at least 690 000 foreign affiliates, almost half of which are now located in developing countries. Between them, MNEs are responsible for two-thirds of global trade and 80% of investment (UNCTAD, 2005b). As the role of MNEs in the world economy has continued to grow, the decisions that these firms take has also become a more important factor driving further liberalisation. Hence, they are today more than ever an economic force behind globalisation.

The share of foreign affiliates in manufacturing output can be significant. American multinationals in manufacturing, for example, earn half of their turnover abroad and half of their employees are located abroad. Foreign-controlled high-tech employment now represents 40% of high-tech manufacturing employment in France and more than 50% of high-tech manufacturing turnover. For many OECD countries the share of intra-firm exports of affiliates under foreign control is also a large percentage of total national

exports. For example, in 2001, 31% of Swedish exports were intra-firm exports by non-Swedish MNEs, up dramatically from only 11% five years earlier in 1996. The comparable figure in 2001 was 37% for the auto industry and 19% for the pharmaceuticals industry (OECD, 2006e).

The increasing interlinking of national economies via MNEs has been given added momentum by the wave of mergers and acquisitions (M&A) and other forms of industry consolidation. In the 1980s and 1990s, a business model based on cross-border consolidation of production emerged, facilitated by opening of markets and relaxing of regulations governing international transactions. Many manufacturing and more recently service industries went through a major round of consolidation under which larger corporate entities were created. This consolidation was designed not only to provide market access and take advantage of trade liberalisation, but also to reduce costs in response to falling market demand and falling prices. The changes included rationalisation in all aspects of the business, from R&D and manufacturing to purchasing and back-office functions such as finance, logistics and advertising. This process resulted in fewer but larger companies, able to manufacture and sell globally.

In many cases, this consolidation process totally reshaped industries that had been relatively stable elements and major employers in regional economies for many years. The structure of the pharmaceuticals industry, for example, had changed little for most of the latter part of the 20th century. However, in the late 1980s the industry started a dramatic series of waves of international merger activity, creating new multi-country conglomerates. The first wave, in the late 1980s and early 1990s, saw the emergence of Bristol-Myers Squibb and Smith-Kline Beecham. The second wave started in 1994 when American Home Products merged with Ayers and Wyeth, followed a year later by the creation of Glaxo Wellcome, Pharmacia and Upjohn, and Hoechst, while in 1996, Novartis was created from Ciba-Geigy and Sandoz. In 2000, Pfizer merged with Warner Lambert and then acquired Pharmacia in 2002. The change in ownership of Pharmacia, for example, has had an important influence on the evolution of the Stockholm-Mälar region's biotechnology industry.

A similar pattern of increasingly large conglomerates was visible in the automotive (see Table 2.3). However, while the pace of mergers reached a peak around 2000, since then

Table 2.3. **The consolidated auto industry**

Group	Owned or linked brands
BMW	BMW, MINI, Rolls-Royce
DaimlerChrysler	Mercedes-Benz, Chrysler, Dodge, Jeep, Smart, Maybach, Freightliner
Fiat	Fiat, Lancia, Alfa Romeo, Ferrari, Maserati
Ford Motor Co.	Ford, Mercury, Lincoln, Volvo, Jaguar, Land Rover, Aston Martin, Mazda
General Motors	Chevrolet, Pontiac, Buick, Cadillac, Saturn, SAAB, Opel, Vauxhall, Holden, Daewoo, Isuzu, Suzuki
Hyundai Motor Co.	Hyundai, Kia, Asia
Renault-Nissan	Renault, Nissan, Infinity, Samsung, Dacia
PSA	Peugeot, Citroen
Toyota	Toyota, Lexus, Hino, Daihatsu
Volkswagen	Volkswagen, Audi, SEAT, Skoda, Bentley, Bugatti
AB Volvo	Volvo, Nissan Diesel, RVI, White-GMC

Source: Wells, Peter and Paul Nieuwenhuis (2006), "Global Outlook for the Automotive Sector: Future Drivers, Trends and Barriers", unpublished report, Centre for Automotive Industry Research and ESRC Centre for Business Relationships, Accountability, Sustainability and Society, Cardiff University.

the number of major consolidations has reduced. Predictions that the global automotive industry at the vehicle manufacturer level would soon be reduced to four or five major constellations or multi-brand groupings, for example, appear to have been premature. The well-documented example of DaimlerChrysler suggests that the strategic prescription of globalisation through merger and acquisition is easier in theory than in practice. Although further consolidation remains an option in the automotive as well as other industries, the changes in global markets for goods and services do not always favour increasingly large scale-economy-based operations. Exceptions to this rule include, for example, oil and newly opened tradable services.

On a regional scale, the impacts of these changes in complex global groupings can be very challenging for policy makers. As illustrated in Box 2.1 with an example from the car industry in the United Kingdom, alliances and consolidations meant the very rapid expansion and contraction of production facilities, with important impacts on employment of both blue collar and white collar employees on different continents.

Rapid and global-scale restructuring has given rise to some unexpected or undesirable features that regions have to cope with. From the perspective of regional policy makers, there are two particularly troublesome observations. First, the actual facilities get scant chance to enjoy a period of long-run stability during which key activities such as management, investment, training, etc., can be embedded in the region. Second, facilities and plants can become "victims" of change almost regardless of actual performance; they are simply in the wrong place at the wrong time. As will be discussed in the next chapter, evidence from the regions suggests that the nature of the operations carried out by large firms in a particular location (R&D, high-value production, routine assembly, etc.) determines whether or not they become embedded in a particular region and whether or not they profit from locally generated external economies (for example, whether they draw on spillovers from research carried out locally, etc.).

Box 2.1. **The complexity of organising production: a UK story**

1. BMW buys Rover and starts to plan a large facility to make engines at Hams Hall (United Kingdom), with an installed capacity of 400 000 units per annum to meet both BMW and Rover engine needs.
2. Honda, which had been supplying engines to Rover then of course sees sales of engines to Rover decline, and has surplus capacity at its plant.
3. BMW then splits from Rover, thereby losing all the potential revenue having invested in the development of new Rover models. BMW retains the Mini brand but the engines for the car have already been sourced via a joint venture with Chrysler in Brazil.
4. When Daimler-Benz merges with Chrysler to form DaimlerChrysler, BMW is suddenly in the position that their corporate rival is supplying a key component for the Mini, which is now a vital part of their product range.
5. Meanwhile, the BMW UK engine plant at Harris Hall has lost the prospect of Rover business and is running at under half capacity and is eventually sold off back to Rover. Rover, in turn, was unable to remake a viable business structure and finally went into liquidation.

Source: Wells, Peter and Paul Nieuwenhuis (2006), "Global Outlook for the Automotive Sector: Future Drivers, Trends and Barriers", unpublished report, Centre for Automotive Industry Research and ESRC Centre for Business Relationships, Accountability, Sustainability and Society, Cardiff University.

Reshaping the geography of production: outsourcing and offshoring

The challenge of fragmented markets

Enterprises working internationally are confronted with a very fragmented market structure. On the one hand, there are high value but low growth and segmented markets for most goods in OECD countries. On the other hand, there are expanding markets for lower-end products (but also luxury goods) in non-OECD countries. This has provoked a flurry of new business models designed to allow multinational firms to adapt to these different markets. Interestingly, in each of the sectors discussed here and in the regions that were studied, this process seems to be opening up opportunities for new entrants, including innovative SMEs.

An important industry response to the slow growth of mature markets has been to try to exploit segmentation in the market. That segmentation requires forms to target specific consumer needs or preferences through tailored, lower volume but higher margin products. This has involved a range of business strategies aimed at capturing market segments by diversifying product lines, shortening product life cycles and emphasising product innovation. Illustrative strategies include:

- *Stretching* – firms extend the brand range and increase the number of different products to capture more specific market segments;
- *Acquisition* – firms purchase an existing brand in order to capture market share;
- *Collapsing* – firms close an existing brand and focus on core products;
- *Revival* – firms revive a moribund brand or product to generate new market niches ("retro" styles, etc.); and
- *Innovation* – firms create a new brand or product line to capture new markets.

These strategies have resulted in an increased turnover of products, including more brands and models as well as shorter life cycles per model, among other results. The automobile industry illustrates the impact that these strategies have had on the products available for consumers. As indicated in the Table 2.4, there has been a huge increase in the number of models, body styles and variants brought to the UK market. Given that overall market volumes have not changed dramatically in the United Kingdom over this period, the table suggests that sales per variant have more than halved over the past decade. Industry specialists assume that the majority of models do not make money and will be cross-subsidised by the high-selling models. Despite the low profitability of many products, having a diverse range of offerings for the market is thought to represent a more stable production portfolio.

Table 2.4. **Variants in the UK car market, 1994-2005**

	Brand names	Models	Body styles	Variants
1995	56	211	309	1 580
2000	57	262	357	1 931
2005	54	323	376	3 155

Source: Wells, Peter and Paul Nieuwenhuis (2006), "Global Outlook for the Automotive Sector: Future Drivers, Trends and Barriers", unpublished report, Centre for Automotive Industry Research and ESRC Centre for Business Relationships, Accountability, Sustainability and Society, Cardiff University.

This need for segmentation has an important influence on the way firms organise production internally and externally. Firms in mature markets need a range of product offerings covering a growing number of segments, sub-segments and niches, unlike firms in developing markets where a limited product line may suffice. There has been a great deal of interest in the concept of flexible specialisation and productive systems that are capable of exploiting economies of scope and reacting quickly to meet changing demand. In the past, the emergence of just-in-time and similar business models based on Japanese tightly managed production systems were seen as a way to move large corporations away from vertical integration towards a more flexible structure without losing their control over the overall process. The global fragmentation of production can be seen as an extension of this ideal across national borders and with the benefit of much improved logistics and communications service links between the production sites.

Sourcing and location decisions: why firms relocate

The reconfiguration of the production system is based on firms making a range of decisions about how they break up production to make it more efficient and responsive. These decisions – on which activities to source outside the firm (and potentially across borders) and which ones to keep inside the firm (but possibly in a foreign affiliate) – are of crucial interest for both national and regional policy makers. The place of an investment decision within the wider sourcing/location strategy of a firm helps to determine the extent to which linkages and externalities develop with local firms, the employment generation potential and the skills upgrading that can be expected to accrue. For example, a pharmaceuticals MNE in Sweden engaged mainly in production noted that they are more or less self-sufficient and have little need to build synergies either with local suppliers or the regional innovation system. In contrast, another firm in the same industry but more involved in drug discovery and development underlined strongly the importance of being closely involved with innovators outside the firm.

Two types of decision need to be made by firms:

- *Sourcing*: which segments of the production in the value chain should be carried out in-house, and which part should be outsourced? Increasingly firms seem to opt to outsource segments of their production.
- *Location*: where should segments of production be located? What parts of the output should be produced (either in-house or by a subcontractor) in the home country *versus* what part should be produced abroad (again, either by the firm or an affiliate or by an independent subcontractor in that country)?

The principal decision on whether to produce internally or outsource has both industrial/technological and financial motivations. The goal may be to reduce inefficiencies that result from disincentives in a large firm (*agency theory*). For example, a firm may seek to enable technical operations to be carried out without incurring the managerial costs involved in setting this up in-house or to access specialised technical services. The decision to outsource is also linked to the costs of doing business with other firms (*transaction cost theory*). Such costs include the cost of necessary asset-specific investments and the risks involved such as contractual incompleteness and search efforts. Therefore, these costs must be compared against the potential savings due to lower production costs (OECD, 2007d). In some cases, even where the cost savings are not clear, firms opt to outsource in order to restructure and focus on core competencies or

move into new fields or to access expertise and technology that the firm has not been able to develop.

Globalisation has increased the use of offshoring (outsourcing abroad as distinct from outsourcing domestically) to produce a lower cost structure for production than is possible within the same country or economic area. Offshoring strategies usually move high-volume production that requires low skills or standard technologies to locations with lower fixed costs. This relocation can be either within the firm through a foreign affiliate or outsourcing to a contractor. The balance to be struck here is between a more reliable supplier source through an affiliate where feasible *versus* a potentially less reliable external contractor, either where the costs of establishing an affiliate are too high or where the process is sufficiently standardised to enable an arm's length approach (see Table 2.5 for some of the key constraints relating to offshoring).

The decisions are firm specific. Some firms are evidently more reluctant to source complex or high-value added activities externally, as these are often considered strategic or sensitive. There are numerous examples where firms in the same sector and even the same branch have very different approaches. Some leading computer and electronic companies outsource all component manufacture, while others (*e.g.*, Sony) tend to keep some component processes and systems software in-house and use these internal components and systems to maintain the uniqueness and quality of their key products. Texas Instruments now produces only components and has sold off its final product arm, while IBM has famously sold off its production businesses and is now focused principally on business support (Berger, *et al.*, 2005). Many car makers still prefer to have R&D close to production because of the need to refine new components through testing over a long period. Volvo, Fiat and the Big 3 in Detroit/south-east Michigan of the case study regions all keep R&D concentrated close to production sites, as do BMW and Renault. In all industries, there is probably a point at which complete disconnection of strategic functions (HQ functions) from R&D and of R&D from production leads to diseconomies, but it is also clear that there are many exceptions to the rule.

Depending on the industry, firms face different constraints in terms of sourcing options. The auto industry, for example, has been forced to adopt new sourcing strategies given the increase in the number of non-mechanical or non-traditional inputs in modern cars, mainly computer and electronic equipment. As a result, the level of outsourcing, including production of high-tech components, has increased dramatically. Pharmaceuticals companies still tend to keep facilities close to biotech hubs so that new ideas can be quickly identified, even if chemical and drug production is offshored. In contrast, the ICT industry seems less stable and as technologies have emerged and reshaped the industry, the geographical locations of production have altered more rapidly than in other sectors with the result that supply chains are very fluid and extended. These and other constraints affect regional clusters in different ways. Some constraints make local enterprise networks less cohesive, while others reinforce the proximity advantages that clusters offer.

The impact of offshore outsourcing on business performance and regional economies is difficult to measure, but has become an important politically charged question (see Table 2.5). Internal or external offshoring of production for high volume or low margin products or brands can be an effective way to free up investment for more capital-intensive

Table 2.5. **Summary of the impacts of offshoring and possible constraints**

Medium-term employment impacts		Factors unfavourable to offshoring
Positive	Negative	
• Growth in consumers' income • Improved competitiveness and productivity in enterprises • Export growth • Control of inflation • Better returns on capital	• Fall in real wages of a certain category of worker • Deterioration in terms of trade • Possible decline in capacity for innovation • Loss of tax revenues • Regional effects	• Inadequate quality of goods and services supplied • Failure to meet delivery times • Higher costs than anticipated • Failure to respect intellectual property • Technological change • Management difficulties

Source: OECD (2007d), "Offshoring and Employment: Trends and Policy Implications" (DSTI/EAS/IND[2007]2).

investments in the home country. For example, according to the French *Direction des relations économiques extérieures* (DREE), the ten industrial sectors that invested most abroad between 1997 and 2000 (relocation and direct investment taken together) created more than 100 000 new jobs during the same period (an argument used to answer criticism of the negative impacts of delocalisation). When extended to regions, the argument is that the relocation of low-value production with associated job losses frees up labour for more productive activities. Estimations of the positive impact of offshoring vary, but a commonly cited McKinsey report puts the figure at USD 1.44 of value for each USD 1.00 offshored from the US economy (McKinsey Global Institute, 2005). A study by the French CEPII found that for EUR 1.00 invested abroad by a French firm, EUR 0.59 of exports are generated in comparison to only EUR 0.24 of imports.

The fall in manufacturing employment in many OECD countries and regions has often been blamed on offshore outsourcing and relocation of production by domestic and foreign-owned companies. As was mentioned earlier, evidence from OECD work on manufacturing (Pilat, *et al.*, 2006; OECD, 2007d) and from the case study regions converges on the point that the decline in manufacturing output in most sectors is due in very large part to productivity growth, rather than to the displacement of domestic workers through outsourcing or relocation strategies.[3] Nonetheless, even if the actual economic impact of delocalisation of enterprises is limited or even negligible at the national level, delocalisation of enterprises often has a devastating impact on the regions concerned. As such, there is strong pressure on the central government to take steps to prevent delocalisations and to limit their negative effects on regional economies.

Offshoring for market proximity: it is no longer simply a matter of production cost

While relocation of production to lower cost countries has tended to be for production cost reasons, proximity to emerging markets is now an increasingly important motivation.

The growth of manufacturing in Asia has been driven by integration into production networks, rather than by direct competition with OECD countries in conventional final product markets. In other words, a significant share of growth in non-OECD countries has been driven by fragmentation of production and thus by the decisions taken by globalising firms. For example, the share of parts and components in total manufacturing exports from developing East Asia is much higher than for OECD countries (28% as compared with 17% for EU countries) and up to 40% for some countries, notably Malaysia, the Philippines and Singapore. The implication of this is that East Asian countries tend to be strongly (and

perhaps increasingly) dependent on production networks driven by multinationals located in OECD countries, rather than becoming more independent manufacturers. In other words, non-OECD countries tend to be location options for specific types of production process (though probably increasingly high value and complex segments of the production process) (Ernst, 2006).

Increasingly, the relocation of economic activities is also occurring so that product development (as well as production) is close to the major and less well-known markets in order to be responsive. According to this model, new technology and creativity in services are driven as much by consumer preferences in new markets as by innovation for existing markets. As such, a key factor in the choice of location for some industries is the use of expanding markets as test-beds and sources of product improvement and innovation. In the field of mobile communications, the Asian market for 3G services is expected to drive future innovation rather than continuing technological improvements originating from the industry's current concentrations in the United States, Finland and Sweden. The regional implications of this trend relate mainly to the potential refocusing of innovation related investment away from OECD hubs towards the development of new centres that are better able to respond to these market signals.

Sales in emerging markets are often at the very low cost end of the product ranges of major consumer goods (mobile handsets, TVs, cars, etc.), including "no frills, no features" models. Industry experts predict that demand is likely to grow rapidly for products that are less over-engineered and that address essential user needs neglected by market leaders that have tended to make new products more technology intensive. This new market is proving to be very lucrative. In the ICT sector, industry analysts expect that mobile products will be increasingly aimed at this lower income mass market. Most handset suppliers are already moving their base handset prices down from EUR 30-50 down to EUR 20 to gain access to this market. In a decade, analysts expect the price to have declined even further – to perhaps EUR 10 and even lower. Therefore, the strategy for the major handset suppliers has fundamentally changed. Those concentrating mainly on the high end, such as Samsung, have already seen their market share fall in 2006, while Nokia attributes its climb in market share to successful entry to the low end globally, which it had previously not focused on.

Analysis of the biopharmaceuticals, ICT and auto industries suggests that OECD producers are scrambling to move into these markets either directly or in co-operation with local partners.[4] There is some concern that if they do not do so, manufacturers from emerging economies such as China and India will exploit these profitable markets and then begin to target established markets in OECD countries with low-cost, technologically stripped-down products. This has already happened in some low technology consumer goods, such as the Giant bicycle brand (Berger, *et al.*, 2006). Two other examples in biopharma and ICT illustrate the potential for non-OECD countries firms to effectively penetrate these low-end markets in OECD countries.

- One of the most significant recent events in the pharmaceuticals industry was the February 2006 acquisition of Germany's fourth-largest generics manufacturer Betapharm by the Indian company Dr Reddy's. The sum involved (EUR 480 million) is not huge compared with many M&As in the pharmaceutical industry, but the other main bidder was also an Indian company, Ranbaxy, suggesting that in the generics market at least, new entrants from non-OECD countries are starting to challenge incumbents. This

is important because a significant number of major drugs and pharmaceuticals products are currently passing out of patent and entering the generics market.

- Chinese companies such as Huawei and ZTE are already undercutting prices of the traditional OECD telecommunications equipment vendors, and further low-cost technologies of a WiMax and mesh nature are expected. If these companies are successful in developing significant market weight, then they can be more active in developing and applying their own formats, standards and systems in competition with those used by current market leaders in OECD countries.

It was clear in the case study regions that the era of one-way investment is over and that investors from non-OECD countries are increasingly present in OECD regions. Regions in Sweden and Canada noted that production facilities in their region had recently been purchased by Asian manufacturers who were interested in acquiring new technologies and production processes. Even in Italy's industrial districts, the strong presence of Chinese investors has been noted. One report estimated that around 200 out of 3 200 clothing firms in the province of Modena are now Chinese owned (quoted in Berger, *et. al.*, 2005). The case study of Porto Digital in Brazil is interesting because while they are looking to bring in investment from abroad they are not focusing on ICT companies in the United States or in Europe but more on establishing alliances with investors from countries such as India, China and Russia.

Innovation offshoring: the key challenge for regions

As discussed above, an emerging business model emphasises the need to tap into market signals from emerging markets and develop products that respond to these high growth markets. The strategy is based on the geographical coincidence between low-cost production sites and key markets. A related phenomenon is innovation offshoring, which extends this model to the core R&D functions that until recently have taken place almost exclusively in OECD countries.

There is abundant evidence that R&D has been internationalised within the OECD area. The share of national manufacturing R&D expenditure accounted for by foreign-owned companies can be very high indeed, even in countries that have strong business R&D systems such as the United Kingdom and Sweden. In all countries included in the OECD survey (except Canada) the growth of R&D by foreign affiliates was faster than for domestic firms. Global corporations source R&D internationally for three main reasons: 1) the cost and complexity of technology development means that skilled partners have to be sourced from a wider area; 2) there are innovation hot-spots related to particular new technologies that are very location specific, and to be involved firms need a local presence; and 3) national R&D and innovation systems can be limited in scope and present "lock in" characteristics (OECD, 2006a).

As a result, global corporations are increasingly relying on innovation offshoring through global innovation networks, in OECD and non-OECD countries (Table 2.6). These networks are both global in reach but also tap into very local assets (Ernst, 2006). Large European ICT and biotechnology or pharmaceuticals companies will obviously have an R&D presence in Silicon Valley and Cambridge/Boston respectively in order to monitor trends. The case study regions show, however, that foreign-owned R&D labs are also present in smaller centres such as Montreal, Ottawa and Eindhoven. And while car production in the Detroit/south-east Michigan region is in crisis, the region remains a key

Table 2.6. **Foreign-controlled affiliates' share of manufacturing R&D expenditure: selected countries**

Country	%
Italy	37.3
Canada	37.9
United Kingdom	40.1
Sweden	41.2
Slovak Republic	41.5
Spain	42.6
Australia	45.4
Portugal	48.8
Czech Republic	59.0
Ireland	74.2
Hungary	77.1

Source: OECD (2006b), *Measuring Globalisation: OECD Economic Globalisation Indicators*, OECD Publications, Paris.

R&D hub for automotive research and a wide range of related technology fields, with foreign MNEs and major suppliers all having an R&D presence in the region.

Even apparently self-sufficient regional hubs are now internationalised to a large degree. Around a quarter of US biotech companies are located in two major Californian clusters, in San Diego and Los Angeles. But this does not mean that US biotech is inward looking. A study of biomedical alliances in 2001-2003 by the Center for Strategic Economic Studies shows that while US companies are extremely active in their home market, they are using alliances to make substantial product and technology or other acquisitions from continental Europe, the United Kingdom, and Canada (Rasmussen, 2004). The number of US alliances with these three countries was 508, roughly equivalent to 30% of the number of internal alliances within the United States. The United States is also a significant source of technology and product development for other countries in the field of biotechnology. There are 791 alliances to purchase from US "developers" by "client" firms in Europe (462), the United Kingdom (186), and Japan (143).

Until recently this internationalisation involved relatively few countries, almost entirely within the OECD. However, a 2005 survey of the world's largest R&D spenders found that China was identified as the most attractive location for future R&D. The leading global corporations that participated in the survey agreed that they intend to increase their offshore outsourcing of R&D to Asia. China is now the third most important offshore R&D location after the United States and the United Kingdom, with India sixth and Singapore ninth (PACTAD, 2005). The growth of Asian destinations has been very strong. For example, Asia's share in the overseas R&D by US firms has quadrupled from 3% of a total of USD 12 billion in 1994 to 12% out of USD 20 billion in 2002 (Ernst, 2006). The region's main attractions include lower-cost knowledge workers, large and increasingly sophisticated markets, and policies aimed at developing innovative capabilities. Global companies offshore stages of innovation to Asian affiliates to tap into the lower-cost talent pool and innovative capabilities of the region's leading export economies. This has led to the establishment of *intra-firm* global innovation networks (GINs). But global firms also outsource some stages of innovation to specialised Asian suppliers as part of complex *inter-firm* networks.

The expansion of Asian markets is an important motivation for major multinationals to have some product development capability in the region. Large corporations have already started moving some types of R&D closer to production sites, both with complete labs (*e.g.*, by Nokia, Ericsson, NEC, DoCoMo, Motorola, etc.). They also make investments in local small suppliers of advanced technology, such as when Motorola's venture capital arm invested in three Chinese wireless companies in March 2006 (FierceMoCo, 2006). Texas Instruments India provides a good example of how global firms have established integrated R&D labs in Asia that conduct leading-edge projects, including conceptualisation and architectural innovations (Ernst, 2006). The R&D centre opened in 1985 and by 1998 was responsible for the entire design process for certain chips. It now has a global development mandate for new products across a wide range of products and employs more than 2 500 researchers.

Once "upstream" facilities are established in specific locations in emerging markets, there appears to be a tendency to move to more demanding projects (in terms of greater integration of tasks and growing technological complexity). In order for MNEs to be able to recruit and retain key talent, they need to provide increasingly demanding projects. While MNEs used to dominate markets for top talent in China and India, they now need to compete with local firms. The increasing importance for MNEs of designing products that respond directly to the large markets in non-OECD countries is likely to speed up this process.

In other words: once local cluster development reaches a critical mass, there seems to be a qualitative change. A few years ago, survey research in China and India found a consensus that "the capacity to support and sustain core research is still relatively underdeveloped here", even in first-tier locations like Shanghai or Bangalore. That consensus now has been eroded. The issue now is whether (or how quickly) key firms (MNEs and domestic firms) in these locations will locate more demanding functions to these locations (Ernst, 2006). In these cases, lead firms will have a vested interest in seeing the density of the local innovation system or cluster increase. Several of the case study regions reported that local manufacturing firms had been bought up by either Chinese and Indian firms, probably in order to access technology and operational expertise in domestic hubs.

The R&D offshoring process is not limited to Asia. Eastern European countries and some other non-OECD counties have been targeted for investment in R&D and product development facilities both to help develop expanding markets in those countries/regions, and also as lower cost sites for design and development of products targeted to OECD countries. For example, many ICT companies are establishing software development centres in other emerging market economies in close proximity to clients. This move is often referred to as near-shoring and includes development centres in eastern Europe to service the western European market and Latin American countries to service the United States, Spain and Portugal.

In addition, firms from Korea, Taiwan, China, India and Singapore are also beginning to establish their own global innovation networks, focusing on accessing innovation hubs in OECD countries. Thus far, these Asian GINs are still at an early stage of their development, but their expansion seems to be gathering momentum. This trend has added a new dimension to Asia's network integration which is now moving beyond manufacturing to include research and product development. The expansion of Huawei's R&D system into the US and Sweden is a good example of the trend, and also illustrates the location-specific attributes that Huawei is looking for in its choice of R&D sites.

Table 2.7. **Huawei's Global Innovation Network**

Location	Main activity
Kista, Stockholm, Sweden	Base station architecture and system design, analogue-mixed signal systems, algorithms
Moscow, Russia	Algorithms, RF design
Bangalore, India	Embedded SW and platforms
Plano/Dallas, Texas, United States	Mobile data service, optical, VoIP

Source: Ernst, Dieter (2006), "Innovation Offshoring: Asia's Emerging Role in Global Innovation Networks", *East-West Center Special Report,* in co-operation with the US Asia-Pacific Council, July, *www.eastwestcenter.org/res-rp-publicationdetails.asp?pub_ID=2006*.

These deeper forms of network integration through inward and outward R&D investments are likely to pose new challenges for policies to support innovation in regions, but they might also provide new opportunities. Specifically, under what conditions can these two-way networks add sources of learning as well as business linkage opportunities for firms in OECD regions, hence broadening a region's options for innovation-led regional development strategies.

Whatever the long-term impacts for regions in the OECD, the evidence of strong market growth by non-OECD firms in research-intensive industries is clear. For example, developing countries have increased their share of foreign patent applications to the US Patent and Trademark Office (USPTO). Whereas developed countries in 2003 still accounted for 83% of all foreign patent applications to the USPTO, the share of developing countries and south-east Europe and the CIS has risen particularly fast. Between the periods 1991-1993 and 2001-2003, it jumped from 7% to 17%. The annual average number of applications from these countries increased from around 5 000 to almost 26 000 between the two periods (see Table 2.8).

Table 2.8. **Patent applications from developing countries and south-east Europe and CIS in the United States, by residence of inventor, 1991-2003**

Period averages

Region/economy	Average 1991-1993	Share of foreign (%)	Average 2001-2003	Share of foreign (%)	Change between periods (%)
Developing economies	5 121	6.63	25 322	16.78	394.5
Developed countries*	71 805	92.94	124 905	82.77	73.9
Domestic applications	93 445	..	183 566	..	96.4

Note: * In the new United Nations classification, the total for developed countries includes the new EU members.

Source: Original source: United States Patent and Trademark Office, Information Products Division, Technology Assessment and Forecast Branch, special tabulations, Washington, DC, February 2005.

Source: Adapted from UNCTAD (2005b), *World Investment Report 2005: Transnational Corporations and the Internationalization of R&D*, United Nations New York and Geneva, Table A.III.3, p. 321.

Future globalisation trends

The trends described above give an idea about how regional economies are changing and some of the evolutions in economic activity that lie behind these changes. Regions then have to decide what is a sound basis for decision-making on investment and strategy given these trends. At a regional level, the performance of firms can be affected by a number of external shocks or changes that are beyond the control of firms but that affect dramatically their competitiveness. Three such influences include: 1) changes in market demand; 2) disruptive technologies; and 3) uncertainties relating to globalisation process more generally.

Changes in market demand

Changes in market demand will alter the production location equation in the coming decades, with implications for firms in OECD countries. The rise of developing countries in world trade and investment will be increasingly related to changes in demand rather than simply participation in production. Overall, GDP per capita should increase faster in developing countries (3.5% p.a.) than in high income countries (2.4% p.a.). This combined with demographics suggests that the major growth in the medium term will come not in OECD markets but in certain emerging markets. Forecast market growth in the automotive industry, for example, for the period 2001 to 2020 shows the stark difference between market demand in different regions of the world (see Table 2.9). The region-level implications of this are not clear, other than that worldwide employment in car manufacturing is likely to increase, assuming no disruptive technologies or unforeseen market changes. The challenges involved in meeting demand in the car industry (see Box 2.2) are likely to be mirrored across the range of other commodity and consumer goods for which demand has been stable but is now expanding rapidly.

Table 2.9. **Regional market growth forecasts, automotive industry, to 2020**

Millions of cars

Region	2001	2005	2010	2020
North America	19.6	21.5	23.0	24.0
Western Europe	16.6	15.0	15.0	15.0
Asia Pacific	12.4	18.5	21.7	30.0
Central/eastern Europe	2.5	3.0	4.5	10.0
South America	2.4	3.0	4.0	7.0
Middle East	1.3	2.0	3.0	3.0
Africa	0.8	1.0	5.0	12.0
TOTAL	55.9	64.0	76.2	100.0

Source: Wells, Peter and Paul Nieuwenhuis (2006), "Global Outlook for the Automotive Sector: Future Drivers, Trends and Barriers", unpublished report, Centre for Automotive Industry Research and ESRC Centre for Business Relationships, Accountability, Sustainability and Society, Cardiff University.

Disruptive technologies

Regions, like firms, have to address the issue of disruptive technology and the impact that breakthrough technologies can have on regional economies. Classically, industrial locations generate economies of agglomeration. The co-location of related activities results in a dense network of suppliers, a workforce with the many and varied skills required, and the diverse milieu of supportive activities and businesses from machine tool suppliers to training consultancies. However, disruptive technologies can change this paradigm. New technologies can be either a huge windfall for a regional economy, as for example with Silicon Valley or, more recently, Helsinki's mobile phone industry and internet clusters in southern California. But new technologies can also be a significant threat, undermining the competitive advantage of established firms and regions.

These innovations are sometimes driven purely by invention, meaning the creation of a new process or product. But in the sectors reviewed here, they are also often a response to an external push such as new regulations, standard setting, environmental concern, etc. At the same time, nobody knows which technologies will emerge victorious in the long term. There are uncertainties over whether the technologies will work in a satisfactory

Box 2.2. **Meeting demand from emerging markets: the car industry**

Should expansion continue to occur in the key large, emerging markets around the world, there is a need both for new capacity and for that capacity to be in new locations. So, the market expansion requirement in a robust growth scenario is for a further 45 million units per annum output by 2020. This is roughly double the output of 2001. Also, capacity is rarely used at 100% all the time – though there has been some improvement in capacity utilisation over the last ten years. A good working assumption is that 75% utilisation of normal installed capacity is break-even for any one plant or the industry as a whole. At 75% capacity utilisation there would be a need for an installed vehicle assembly plant capacity of 60 million extra cars per annum by 2020 to meet currently expected demand.

In order to simplify the calculation, an average plant size of 400 000 units capacity per annum is assumed. On this basis, to expand capacity by 45 million units would require some 112 plants, while expansion to 60 million units would require a staggering 150 plants: or nine full-sized plants per annum from 2003 till the year 2020. Given a requirement to build 112 plants, this means a cumulative investment cost to the vehicle manufacturers of about USD 280 billion. With 150 plants that investment cost rises to USD 370 billion.

Souce: Wells, Peter and Paul Nieuwenhuis (2006), "Global Outlook for the Automotive Sector: Future Drivers, Trends and Barriers", unpublished report, Centre for Automotive Industry Research and ESRC Centre for Business Relationships, Accountability, Sustainability and Society, Cardiff University.

manner, over whether they will meet the demands of government regulators, and whether consumers will accept them, among other issues.

In the automotive industry, a disruptive technology has emerged in the form of the fuel cell. The current global centre of the fuel cell business is Vancouver not in Detroit or another of the major car producing regions. There is an emerging cluster of fuel cell related activities around Ballard, supported and promoted by the British Columbia regional government and by entities such as Fuel Cells Canada. A deliberate attempt has been made to leverage the first-mover advantages held by Vancouver, and thereby stake a claim in the potentially massive fuel cell market of the future. In effect, this is an attempt to emulate the Silicon Valley phenomenon.

While fuel cell cars are still some way from production, there are a whole range of new technical innovations in the power generation systems of vehicles that are being developed to respond to environmental and market demands. These might not reshape the industry as dramatically as fuel cells, but they could change the industrial landscape (and change the way the car industry interfaces with government and regulators). This is an example of an external driver being internalised by the industry and being turned into a competitive tool. In the long term, such a scenario will of course make the industry more sustainable, both from an economic and an environmental viewpoint. By implication, in the future individual vehicle manufacturers, their technology partner suppliers, and/or particular locations will be looking more aggressively to establish market technology leadership. In this sense, Toyota's promotion of hybrid engines could accelerate the deployment of fuel cell vehicles as the firm's clear strategy is to benefit from its first-comer advantage and its ability to help set standards.

Uncertainties concerning globalisation drivers

More generally, whether economic change will continue at the same rate in the future as in the past is an open question. Two of the main engines that drive globalisation – liberalisation and progress in transport – may run out of steam. Further liberalisation is increasingly difficult to achieve because the issues to be addressed are more controversial and more actors are involved in the decision-making process. Further expansion of transport – notably the two fastest increasing components of the transport sector (road and air transport) often appear to be largely unsustainable. Moreover, other factors such as geopolitics or security, environmental concerns such as climate change, or demographic change could slow or undermine the process in different ways.

Growing emissions of greenhouse gases, for example, is raising concern about environmental costs of current consumption patterns, leading to the implementation of measures that could influence the globalisation process in the future. On the one hand, globalisation of production could be adversely affected, for instance if the measures put in place contribute to curb traffic directly or raise the cost of transport. Moreover, concern over global warming may induce governments to impose trade sanctions on countries that do not meet basic environmental standards. On the other hand, given the global nature of the problem, there will be increasing pressures from state and non-state actors to implement global solutions, such as the creation of markets for emission trading rights and international co-operation for the development of clean energy sources. While these issues are not currently changing the way that the reorganisation of production is taking place, in the future they could have a strong influence on the economic logics that are driving the location of production at the moment.

Notes

1. The vast majority (87%) of regulatory changes tended to make conditions more favourable for foreign companies to enter and operate. Most of these measures implied further liberalisation of investment regimes; 95 of the measures involved new promotional efforts (including various types of incentives) and 37 greater investor protection. In terms of regional distribution, Asia and Oceania accounted for 30% of the new measures, followed by the transition economies (22%), Africa (21%), developed countries (14%) and Latin America and the Caribbean (13%) (UNCTAD, 2005a).
2. Theorists of the reorganisation of production often point to these cost and time savings as being the principal motors for reshaping production processes. Jones and Kierzkowski, for example, note that the increasing returns to scale of the functions that link dispersed production processes are the main source of productivity gain that make the process viable, or in other words, the quality of service links makes disagglomeration a viable alternative to agglomeration as the basis for industrial location (Jones and Kierzkowski, 2005).
3. Available research suggests that jobs lost to offshoring account for only a small percentage of aggregate job losses. According to the European Monitoring Centre on Change (EMCC) in Dublin, offshoring by European firms is responsible for less than 5% of total job losses in Europe, far behind bankruptcies, shut-downs and restructuring.
4. However, many industry experts are also still cautious about recommending partnerships between Western and Asian firms within the biotech sector. Ernst and Young, for example, state that merger and acquisition risk in China "still may be too high for many multinational companies to bear" (Ernst and Young, 2005). Boston Consulting Group echo this to some extent concerning biopharmaceuticals, insisting that outsourcing R&D to China is a strategic choice that signals commitment to the country and can help strengthen relationships with key opinion leaders and officials, but the report goes on to stress that this "won't achieve major cost savings for global biopharmaceuticals companies" (Wong, *et al.*, 2005).

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