19 Manufacturing industries

'Science finds, industry applies, man confirms.'
Anon, Chicago World Fair 1933

'We need methods and equipment which are cheap enough so that they are accessible to virtually everyone; suitable for small-scale production; and compatible with man's need for creativity. Out of these three characteristics is born non-violence and a relationship of man to nature which guarantees permanence. If one of these three is neglected, things are bound to go wrong.'
E. F. Schumacher, *Small is Beautiful*, 1974

What is meant by industry? In its widest and more traditional sense, the word industry is used to cover all forms of economic activity: **primary** (farming, fishing, mining and forestry); **secondary** (manufacturing and construction); **tertiary** (back-up services such as administration, retailing and transport); and **quaternary** (high-technology and information services/knowledge economy). In this chapter, the use of the term 'industry' has been confined to its narrowest definition, i.e. manufacturing. Manufacturing industry includes the processing of raw materials (iron ore, timber) and of semi-processed materials (steel, pulp), together with – where necessary – the assembling of these products (cars, computers).

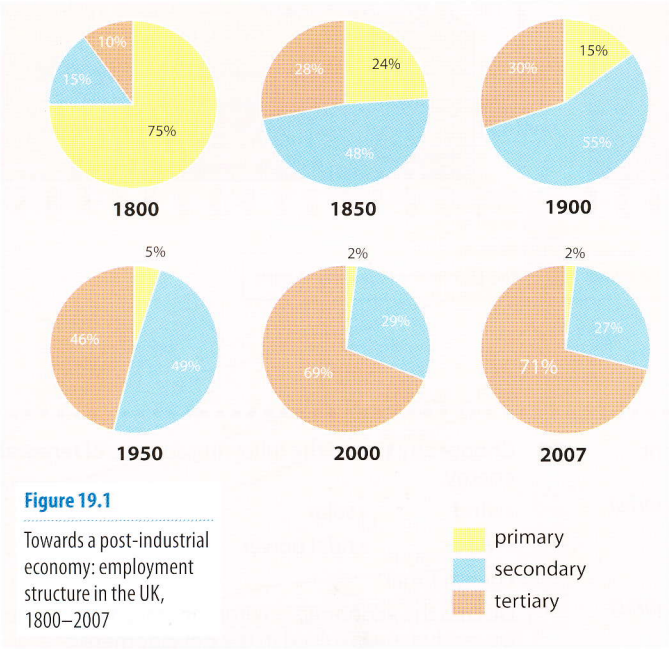


Figure 19.1
Towards a post-industrial economy: employment structure in the UK, 1800–2007

It needs to be pointed out, however, that while this definition may be convenient, it does create several major problems. Not the least of these problems has been the unprecedented transformation of the global economy in the last 20 or so years. This change has included rapid deindustrialisation and a growth of the service sector which has caused some advanced economies to view 'manufacturing' as almost peripheral compared with their increasing reliance, until the shockwaves of 2008, on banking and finance. At present, only some 27 per cent of the UK's working population are employed in manufacturing, a trend that is repeated across most of the developed market economies. This shift from an industrial to a post-industrial society is shown in Figure 19.1. In reality, it is also unrealistic to draw boundaries between 'manufacturing' and 'services'. Not only are the two integrated in reality through linkages (page 568 and Figure 19.2), buyer-supplier relations, etc., but many people who are officially classified as working in the manufacturing sector also have occupations that are service based (salespeople, administrators, accountants and financial advisers as well as those in research and development) within 'manufacturing' sector firms. It can be argued, with much justification, that it is conceptually (and empirically) unrealistic to sever manufacturing from services. This distinction becomes particularly problematic when discussing, for example, high-tech developments along the M4 (Places 86, page 566) as, by their nature, many firms are 'information-intensive' and knowledge based rather than production or materials based; or when describing the differences between the 'formal' and 'informal' sectors in less economically developed, less industrialised countries (page 574). Finally, the world financial events of 2008 showed countries, regardless of their level of economic development, just how interdependent the process of globalisation has made them (page 605).

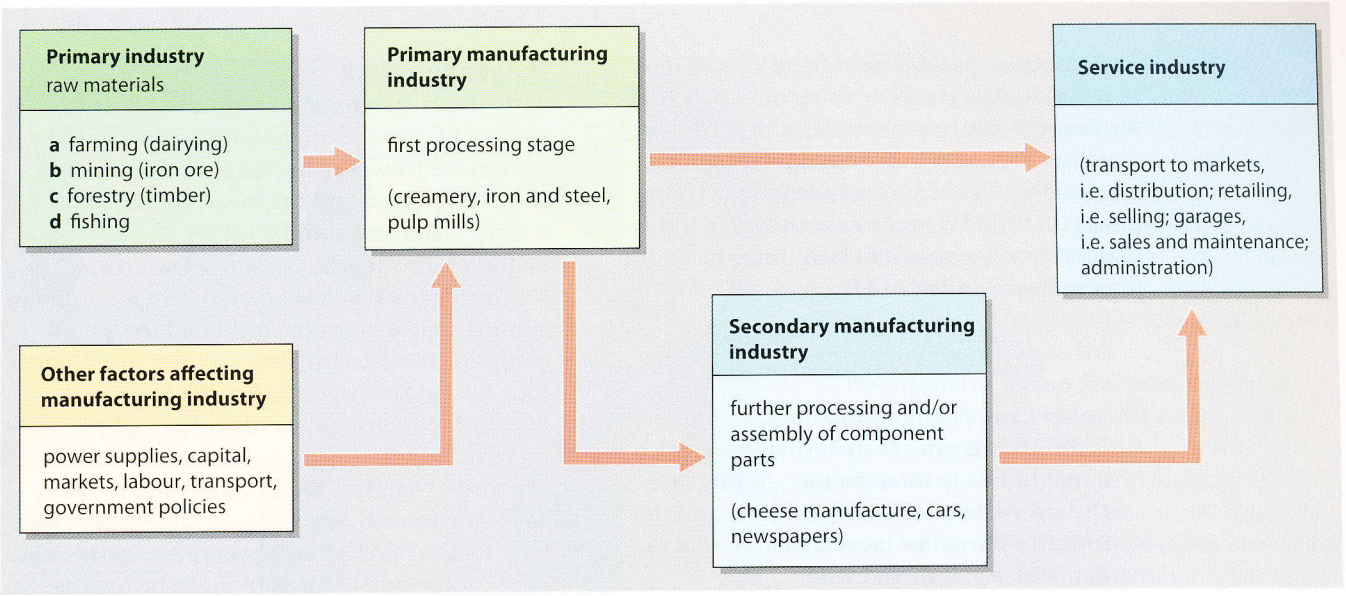


Figure 19.2
Linkages between various sections and types of industry

Traditional locations of industry

The processes which contribute to determine the location and distribution of industry are more complex and dynamic than those affecting agriculture. This means that the making of generalisations becomes less easy and the dangers of stereotyping increase. Reasons for this complexity include:

- Some locations were chosen before the Industrial Revolution and many more during it. Initial factors favouring a location may no longer apply today. For example, the original raw materials may now be exhausted (iron ore and coal in South Wales – Places 87, page 570) or replaced by new innovations (cotton by synthetic fibres) and sources of energy (water power by electricity).
- New locational factors which were not applicable last century include cheaper and more efficient transport systems, the movement of energy in the form of electricity, automation and new technologies such as email, the Internet and mobile phones.
- Some industries have developed from older industries and are linked to these former patterns of production even when the modern product is different (in Japan the Mazda Car Corporation began as a cork-making and then a machine-tools firm).
- Before the 20th century, industry was usually financed and organised by individual **entrepreneurs** who initiated and organised, usually for a profit, an enterprise or business; this included risk-taking, deciding what goods would be produced or services provided, the scale of production, and marketing. Nowadays these decisions are often taken far away from the site of a factory, originally by the state, now usually by **transnationals** (**multinationals**, page 573).
- Many factories now produce a single component and therefore are a part of a much larger organisation which they supply.
- The sites of some early factories were chosen by individual preference or by chance, i.e. the founder of a firm just happened to live at, or to like, a particular location (Unilever at Port Sunlight and Rowntree at York).

Factors affecting the location of manufacturing industry

Raw materials

Industry in 19th-century Britain was often located close to raw materials (ironworks near iron ore), sources of power (coalfields) or ports (to process imports), mainly due to the immobility of the raw materials which were heavy and costly to move when transport was then expensive and inefficient. In contrast, today's industries are rarely tied to the location of raw materials and so are described as **footloose** (see post-Fordism, page 561). There is now a greater efficiency in the use of raw materials; power is more mobile; transport of raw materials, finished products and the workforce is more efficient and relatively cheaper; components for many modern, and especially high-tech, industries are relatively small in size and light in weight; and some firms may simply rely on assembling component parts made elsewhere. A location close to markets, labour supply or other linked firms has become increasingly important.

Industries that still need to be located near to raw materials are those using materials which are heavy, bulky or perishable; which are low in value in relation to their weight; or which lose weight or bulk during the manufacturing process. **Alfred Weber**, whose theory of industrial location is referred to later, introduced the term **material index** or **MI**.

$$\text{MI} = \frac{\text{total weight of raw materials}}{\text{total weight of finished product}}$$

There are three possible outcomes.

1 If the MI is greater than 1, there must be a weight loss in manufacture. In this case, the raw material is said to be **gross** and the industry should be located near to that raw material, e.g. iron and steel:

$$\text{MI} = \frac{\text{6 tonnes raw material}}{\text{1 tonne finished steel}} = 6.0$$

2 If the MI is less than 1, there must be a gain in weight during manufacture. This time the industry should be located near to the market, e.g. brewing:

$$\text{MI} = \frac{\text{1 tonne raw material}}{\text{5 tonnes beer}} = 0.2$$

3 Where the MI is exactly 1, the raw material must be **pure** as it does not lose or gain weight during manufacture. This type of industry could therefore be located at the raw material, the market or any intermediate point.

Industries that lose weight during manufacture include food processing (butter has only one-fifth the weight of milk, refined sugar is only one-eighth the weight of the cane), smelting of ores (copper ore is less than 1 per cent pure copper, iron ore has a 30–60 per cent iron content; Places 84, page 563) and forestry (paper has much less mass than trees; Places 83, page 562). Industries that gain weight in manufacture include those adding water (brewing and cement), and those assembling component parts (cars, Places 85, page 565; and electrical goods, Places 86, page 566). In these cases, the end product is more bulky and expensive to move than its many smaller constituent parts.

Period	Source of power	Examples of location
early iron industry	charcoal	wooded areas (the Weald, the Forest of Dean)
later iron industry	waterwheels	fast-flowing rivers (River Don, Sheffield)
early steel industry	coal	coalfields (South Wales, north-east England)
present-day steel industry	electricity	coastal (Port Talbot)

Figure 19.3

Power supply and the location of iron and steelworks

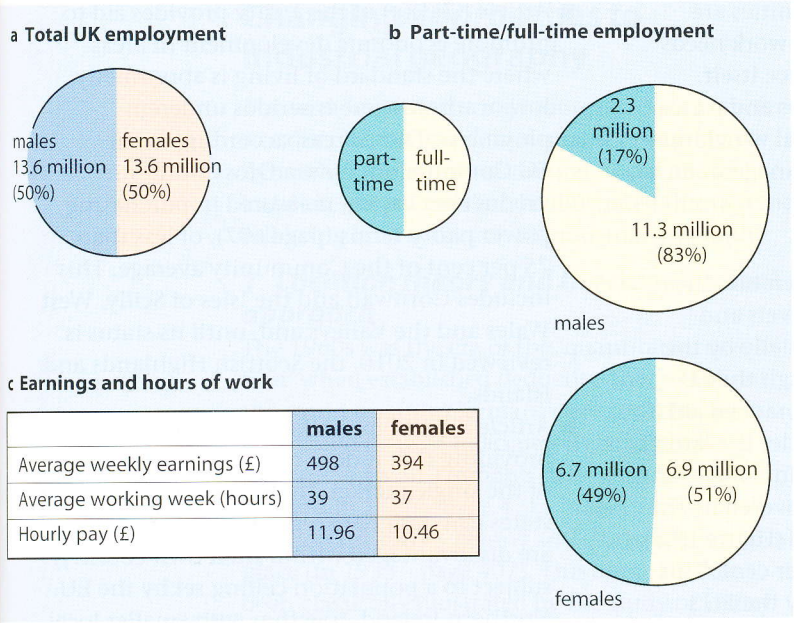
Power supplies

Early industry tended to be located near to sources of power, which in those days could not be moved. However, as newer forms of power were introduced and the means of transporting it were made easier and cheaper, this locational factor became less important (Figure 19.3).

During the medieval period, when water was a prime source of power, mills had to be built alongside fast-flowing rivers. When steam power took over at the beginning of the Industrial Revolution in Britain, factories had to be built on or near to coalfields, as coal was bulky and expensive to move. When canals and railways were constructed to move coal, new industries were located along transport routes. By the mid-20th century, oil (relatively cheap before the 1973 Middle East War) was being increasingly used as it could be transported easily by tanker or pipeline. This began to free industry from the coalfields and to offer it a wider choice of location (except for such oil-based industries as petrochemicals). Today, oil, coal, natural gas, nuclear and hydro-electric power can all be used to produce electricity to feed the National Grid. Electricity, in addition to its cleanliness and flexibility, has the advantage that it can be transferred economically over considerable distances either to the long-established industrial areas, where activity is maintained by **geographical inertia**, or to new areas of growth.

Transport

Transport costs were once a major consideration when locating an industry. Weber based his industrial location theory on the premise that transport costs were directly related to distance (compare von Thünen's assumptions, page 471). Since then, new forms of transport have been introduced, including lorries (for door-to-door delivery), railways (preferable for bulky goods) and air (where speed is essential). Meanwhile, transport networks have improved, with the building of motorways, and methods of handling goods have become more efficient through containerisation. For the average British firm, transport costs are now only 2–3 per cent of their total expenditure. Consequently, raw materials can be transported further and finished goods sold in more distant markets without any considerable increase in costs. The increasing reliance, since the late 1990s, on emails, the Internet and mobile phones (page 642) has speeded up the transfer of data, including orders and payments, both within and between firms – a major factor in the process of globalisation (page 605).



c Earnings and hours of work

	males	females
Average weekly earnings (£)	498	394
Average working week (hours)	39	37
Hourly pay (£)	11.96	10.46

Figure 19.4
UK employment data, 2007

The functioning of the present world depends upon a range of **space-shrinking technologies** that connect firms, workers, governments and consumers (i.e. commodity chains, page 643).

Two important types of space-shrinking technologies are **transport systems**, examples of which are commercial jet aircraft and containerisation (page 636), and **communication systems**, which include satellite and optic-fibre technology, the Internet, mobile phones and the electronic mass media (radio and TV).

Today, the pull of a large market is more important than the location of raw materials and power supplies; indeed, it has been suggested that flexibility and rapid response to changing market signals are perhaps the most important determinants of location.

Industries will locate near to markets if:

- the product becomes more bulky with manufacture or there are many linkage industries involved (the assembling of motor vehicles)
- the product becomes more perishable after processing (bread is more perishable than flour); it is sensitive to changing fashion (clothes); or it has a short life-span (daily newspapers)
- the market is very large (north-eastern states of the USA, south-east England, or global)
- the market is wealthy
- prestige is important (publishing).

Labour supply

Labour varies spatially in its cost, availability and quality.

In the 19th century, a huge force of semi-skilled, mainly male, workers operated in large-scale 'heavy' industries doing manual jobs in steelworks, shipyards and textile mills. Today, there are fewer semi-skilled and more highly skilled workers operating in small-scale 'light' industries which increasingly rely upon machines, computers and robots. The cost of labour, especially in EU countries, can be high, accounting for 10–40 per cent of total production costs. Three consequences of this have been the introduction of mechanisation to reduce human inputs, the exploitation of female labour, and the use of 'cheap' labour in developing countries.

Traditionally, labour has been relatively immobile. Although there was a drift to the towns during the Industrial Revolution, since the First World War British people have expected respective governments to bring jobs to them rather than they themselves having to move for jobs. Certain industries often located in a specific area or place to take advantage of local skills (cutlery at Sheffield, electronics around Cambridge) but as transport improvements allowed greater mobility, firms were able to locate, and their workforce to travel, more freely. In emerging economies industries often locate in large coastal cities where they can attract large numbers of unskilled workers from surrounding rural areas (in China, Places 41, page 363), while in more developed countries space-shrinking technologies have allowed a greater number of people, both employees and self-employed, to work from home.

Similarly, the roles of women and trade unions have both changed. At the turn of the 21st century, half of Britain's workforce were women (Figure 19.4a), with an increasing number either seeking career jobs or prepared to work part-time (Figure 19.4b), even flexi-time, although many still have to accept a lower salary than males (Figure 19.4c). The role of trade unions has declined significantly as their membership numbers have fallen with the decline of the large 'heavy' industries.

Capital

Capital may be in three forms.

1 **Working capital** (money) which is acquired from a firm's profits, shareholders or financial institutions such as banks. Money is mobile and can be used within and exchanged between countries. Location is rarely constrained by working capital unless money is to be borrowed from the government which might direct industry to certain areas (see below). In Britain, capital is more readily available in the City of London, where most of the financial institutions are based.
2 **Physical** or **fixed capital** refers to buildings and equipment. This form of capital is not mobile, i.e. it was invested for a specific use.

3 **Social capital** and cultural amenities are linked to the workforce's out-of-work needs rather than to the factory or office itself. Houses, hospitals, schools, shops and recreational amenities are social capital which may attract a firm, particularly its management, to an area.

Government policies

Government policies attempt to even out differences in employment, income levels and investment. In Britain, this was initially by the British government; now it is through the EU. At present, areas can only receive financial aid if they conform to EU guidelines. Under the latest guidelines, which came into effect in 2007, the proportion of the UK population covered by the **Assisted Areas** will be 23.9 per cent (Figure 19.5) compared with the previous 30.9 per cent. This reduction in coverage reflects partly the EU's objective to reduce areas of state aid amongst longer-standing members so as to help new, poorer member states, and partly due to the UK's own sustained (until 2008) economic success. As Figure 19.5 shows, the Assisted Areas in the British Isles can be divided into two groups.

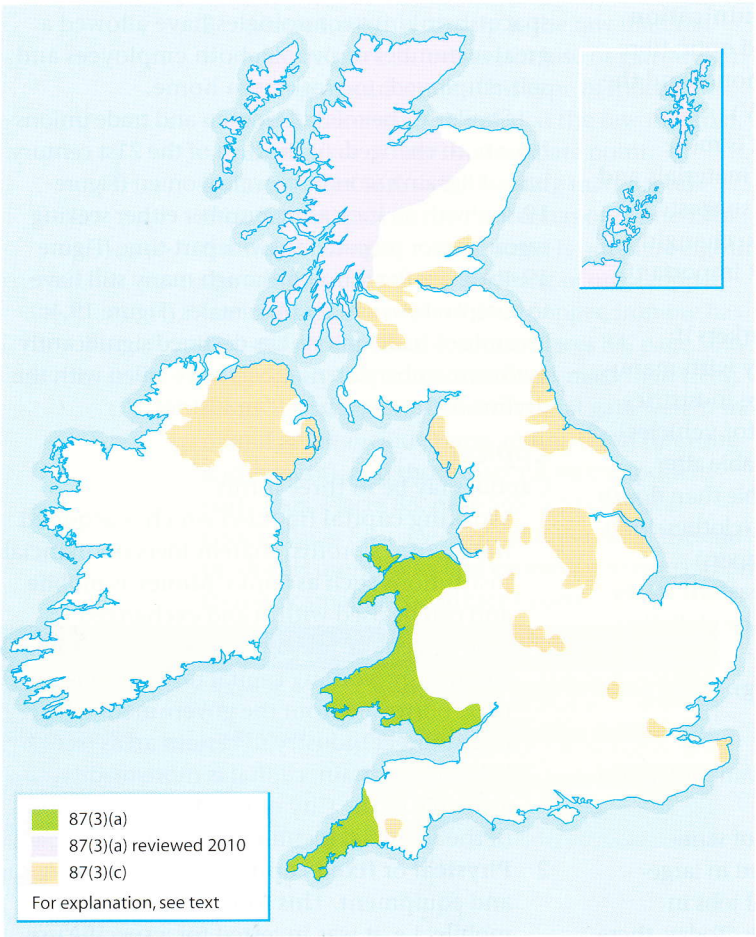


Figure 19.5
Assisted Areas in the UK, 2007–13

- Article 87(3)(a) of the Treaty provides aid to promote economic development in areas where the standard of living is abnormally low or where there is serious underemployment. These areas, according to the EU Commission, have a Gross Domestic Product per capita, measured in purchasing power parity terms (page 607), of less than 75 per cent of the Community average. This includes Cornwall and the Isles of Scilly, West Wales and the Valleys and, until its status is reviewed in 2010, the Scottish Highlands and Islands.
- Article 87(3)(c) permits aid to certain regions providing that it does not affect the working of the single market. In this instance, member states can designate regions that they feel are disadvantaged within their own country, subject to a population ceiling set by the EU. Northern Ireland, together with smaller locations in England, Scotland and Wales, fit this category.

Land

In the 19th century, extensive areas of flat land were needed for the large factory units. Today, although modern industry is usually smaller in terms of land area occupied, it prefers cheaper land, less congested and cramped sites and improved accessibility, as are to be found on greenfield sites on the edges of cities and in smaller towns. Now, partly due to pressure from environmental and influential local groups, attempts are being made to attract new industry, including service industries, to derelict and underused brownfield sites (page 441), or to former industrial premises (page 439), where existing infrastructures still exist.

Environment

The latter part of the 20th century saw an increasing demand by both managers and employees to live and work in an attractive environment. This led to firms moving away from large urban areas and relocating either in smaller towns that have easy access to the countryside, or on new science and business parks with landscaped green areas and ornamental lakes (Places 86, page 566).

Changing approaches to industrial geography

The term 'manufacturing industries' does not refer to a discrete, bounded, measurable entity, but is dynamic with profound cultural, social and political dimensions. This can be illustrated through the following brief evolution of industrial geography.

1 Location theory and the neoclassical approach

The 1960s was the era of the 'quantitative revolution' when established deductive theories about the world (mainly German) were tested to see if they could be used to accurately predict spatial patterns, e.g von Thünen's rural land use (put forward in 1826 – page 471), Weber's industrial location (in 1909 – below) and Christaller's central place (in 1933 – page 407). This approach has been classically illustrated by the study of Henry Ford's car industry (hence the term 'Fordism', Figure 19.13) with its assembly-line organisation. It has regained some credence since the late 1990s ('McDonaldisation').

2 Behaviouralism (late 1960s to early 1980s)

This examined the role of cognitive information and personal choice in determining decision-making and locational outcomes. While still focusing on locational issues and spatial behaviour, it concentrated more on detailed surveys and avoided the mathematical modelling that dominated the neoclassical approach.

3 Political economy (mid-1970s)

Writers such as David Harvey focused less on the idealised assumptions of rational economic man and perfect knowledge and more on how global political and economic forces (capitalism) shaped the space economy. This saw a shift in the main focus away from spatial patterns of industrial location towards structures of social relations. By 1990, this approach manifested itself in the **post-Fordism** debate (Figure 19.13) at a time when industry was showing greater flexibility both in production techniques and between institutions and industrial districts.

4 Cultural economic interpretations (post mid-1990s)

An even more recent 'cultural turn' has focused on hitherto neglected dimensions, such as gender (Places 96, page 608), which has placed a greater emphasis on the meanings of terms such as production, industry and labour.

Space here only permits a study of one industrial location model – Weber's – and a comparison between Fordism and post-Fordism.

Theories of industrial location

It has already been seen that 'models form an integral and accepted part of present-day geographical thinking' (Framework 12, page 352). Models, as in many branches of geography, have been formulated in an attempt to try to explain, in a generalised, simplified way, some of the complexities affecting industrial location. The most commonly quoted is that by Weber (1909) who based his model on the industrialist who seeks the lowest-cost location (LCL). Before looking more closely at this model, it must be remembered that it is an abstract framework which may be difficult to observe in the real world, but against which reality can be tested. It should also be pointed out that this model has a 'traditional' approach to industrial location applicable to a particular moment in time (history) and that there have, on other occasions, been alternative theories.

Weber's model of industrial location

Alfred Weber was a German 'spatial economist' who, in 1909, devised a model to try to explain and predict the location of industry. Like von Thünen before him and Christaller later, Weber tried to find a sense of order in apparent chaos, and made assumptions to simplify the real world in order to produce his model. These assumptions were as follows:

- There was an isolated state with flat relief, a uniform transport system in all directions, a uniform climate, and a uniform cultural, political and economic system.
- Most of the raw materials were not evenly distributed across the plain (this differs from von Thünen). Those that were evenly distributed (water, clay) he called **ubiquitous materials**. As these did not have to be transported, firms using them could locate as near to the market as was possible. Those raw materials that were not evenly distributed he called **localised materials**. He divided these into two types: gross and pure (page 554).
- The size and location of markets were fixed.
- Transport costs were a function of the mass (weight) of the raw material and the distance it had to be moved. This was expressed in tonnes per kilometre (t/km).
- Labour was found in several fixed locations on the plain. At each point it was paid the same rates, had equivalent skills, was immobile and in large supply. Similarly, entrepreneurs had equal knowledge, related to their industry, and motivation.
- Perfect competition existed over the plain (i.e. markets and raw materials were unlimited)

which meant that no single manufacturer could influence prices (i.e. there was no monopoly). As revenue would therefore be similar across the plain, the best site would be the one with the minimal production costs (i.e. the least-cost location or LCL).

Possible least-cost locations

Weber produced two types of locational diagram. A straight line was sufficient to show examples where only one of the raw materials was localised (it could be pure or gross). However, when two localised raw materials were involved, he introduced the idea of the **locational triangle**. Figure 19.6 summarises the nine possible variations based on the type of raw material involved.

1 One gross localised raw material. As there is weight loss during manufacture (the material index for a gross raw material is more than 1) then it is cheaper to locate the factory at the source of the raw material – there is no point in paying transport costs if some of the material will be left as waste after production (Figure 19.7a).

2 **a** One ubiquitous raw material or **b** one pure localised raw material gaining weight on manufacture (MI less than 1). If the raw material is found all over the plain (ubiquitous) then transport is unnecessary as it is already found at the market. If a pure material gains mass on manufacture then it is cheaper to move it rather than the finished product and so again the LCL will be at the market (Figure 19.7b).

3 One pure localised raw material. If this neither gains nor loses weight during manufacture (MI = 1), the LCL can be either at the market, at the location of the raw material, or at any intermediate point (Figure 19.7c).

4 Two ubiquitous (gross or pure) raw materials. As these are found everywhere, they do not have to be transported and so the LCL is at the market.

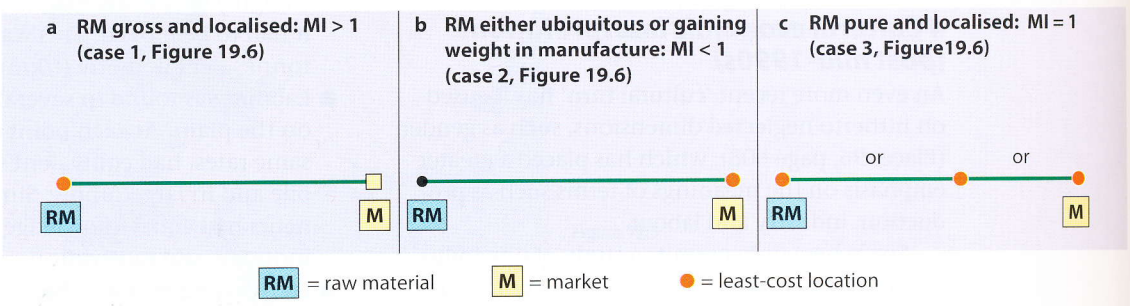
5 Two raw materials: one ubiquitous and one pure and localised. The LCL is at the market because the ubiquitous material is already there and so only the pure localised material has to be transported (Figure 19.8a). It will be cheaper to move one raw material than the more cumbersome final product.

6 Two raw materials: one ubiquitous and the other gross and localised. The ubiquitous material is available at every location. As the gross material loses weight, the LCL could theoretically be at any intermediate point between its source and the market. However, if the mass of the product is greater than that

Figure 19.6
Least-cost locations dependent on types of raw material

Type(s) of raw material (RM) MI = material index	LCL at raw material	LCL at any intermediate point	LCL at market
1 one gross localised RM MI > 1	■		
2 one RM gaining weight or one ubiquitous RM MI < 1			■
3 one pure localised RM MI = 1		■	
4 two ubiquitous RMs (pure or gross)			■
5 two RMs (one ubiquitous, one pure)			■
6 two RMs (one ubiquitous, one gross)		(could be any site, according to amount of weight loss)	
7 two RMs (both pure)			■
8 two RMs (one pure, one gross)	■ (if big weight loss)	■ (if a small weight loss)	
9 two RMs (both gross)	■ (at RM with greatest weight loss)	■ (equal weight loss)	

Figure 19.7
Least-cost locations with one raw material



of the localised raw material, the LCL is at the market; if it is less, the LCL is at the location of the raw material; and if it is the same, the LCL is at the mid-point (Figure 19.8b).

7 Two raw materials: both localised and pure. In the unlikely event of the two raw materials lying to the same side of and in line with the market, the LCL will be at the market. If the materials do not conform with this arrangement but form a triangle with the market (Figure 19.9), the LCL is at an intermediate point near to the market. This is because the weight and therefore the transport costs of the raw material are the same as, or less than, those of the product.

8 Two localised raw materials: one pure and one gross. In this case, the industry will locate at an intermediate point (Figure 19.10a). The greater the loss of weight during production, the nearer the LCL will be to the source of the gross material.

9 Two raw materials: both localised and gross. If both raw materials have an equal loss of weight, the LCL will be equidistant between these two sources but closer to them than to the market (Figure 19.10b1). However, if one raw material loses more mass than the other, the industry is more likely to be located closer to it (Figure 19.10b2).

Weber claimed that four factors affected production costs: the cost of raw materials and the cost of transporting them and the finished product, together with labour costs and agglomeration/deglomeration economies (page 560).

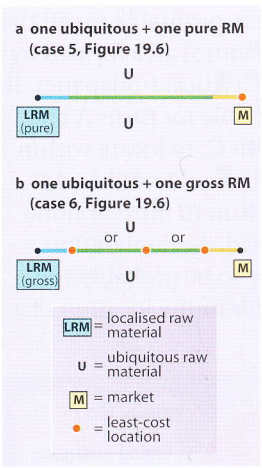
Spatial distribution of transport costs

As transport costs lay at the heart of his model, Weber had to devise a technique that could both measure and map the spatial differences in these costs in order to find the LCL. His solution was to produce a map with two types of contour-type lines which he called isotims and isodapanes.

An **isotim** is a line joining all places with equal transport costs for moving either the raw material (Figure 9.11a) or the product (Figure 9.11b). An **isodapane** is a line joining all places with equal total transport costs, i.e. the sum of the costs of transporting the raw material and the product (Figure 19.11c).

Figure 19.11a shows the costs of transporting 1 tonne of a raw material (R) as concentric circles. In this example, it will cost 5 t/km (tonne/kilometres) to transport the material to the market. Figure 19.11b shows, also by concentric circles, the cost of transporting 1 tonne of the finished product (P). The total cost of moving the product from the market to the source of the raw material is again 5 t/km. By superimposing these two maps it is possible to show the total transport costs (Figure 19.11c).

If a factory were to be built at X (Figure 19.11c), its transport costs would be 7 t/km (i.e. 2 t/km for moving the raw material plus 5 t/km for the product). A factory built at Y would have lower transport costs of 6 t/km (4 t/km for the raw material plus 2 t/km for the product). However, the LCL in this case may be at the source of the raw material, the market or any intermediate point in a straight line between the two because all these points lie on the 5 t/km isodapane.



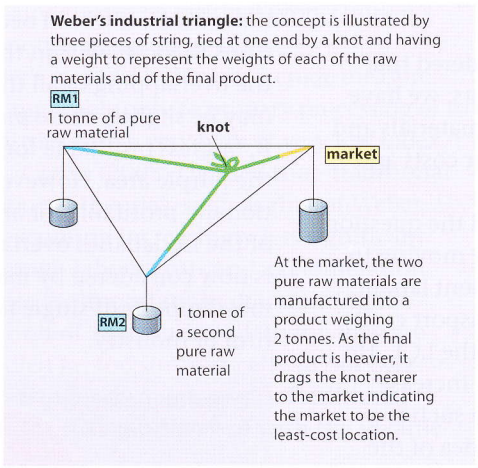


Figure 19.9

Least-cost locations with two localised pure raw materials, illustrating Weber's industrial triangle (case 7, Figure 19.6)

Figure 19.8

Least-cost locations with two raw materials, one of which is ubiquitous

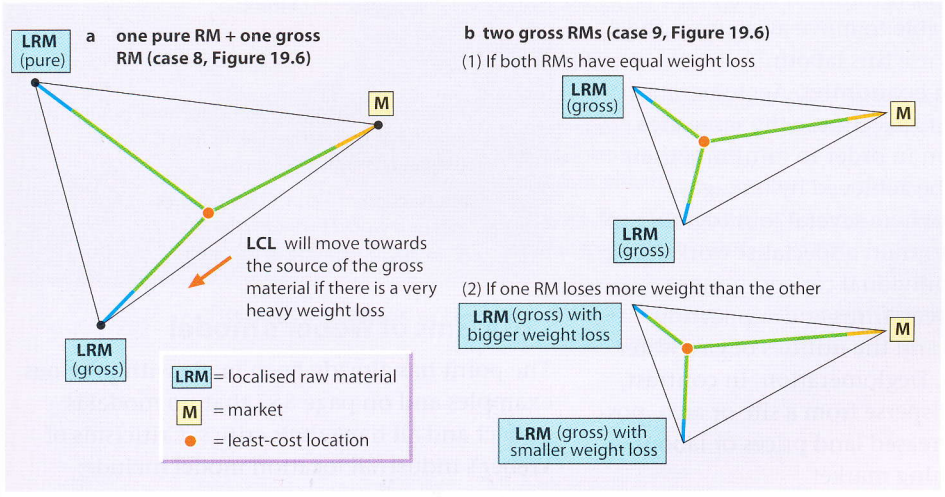


Figure 19.10

Least-cost locations with two localised raw materials, illustrating Weber's industrial triangle

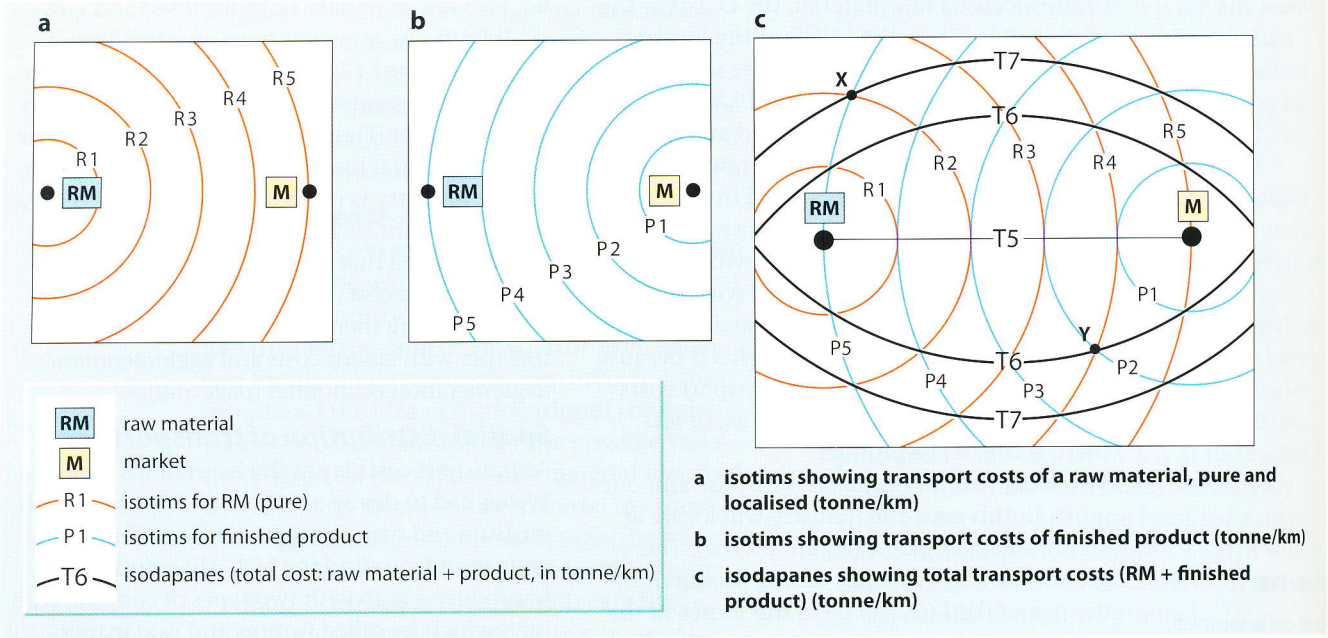


Figure 19.11
Isotims and isodapanes

The effects of labour costs and agglomeration economies

It has been stated that Weber considered that four factors affected production costs: we have seen the effects of the costs of raw materials and transport – let us now look at labour costs and agglomeration economies.

- **Labour costs** Weber considered the question of whether any savings made by moving to an area of cheaper or more efficient labour would offset the increase in transport costs incurred by moving away from the LCL. He plotted isodapanes showing the increase in transport costs resulting from such a move. He then introduced the idea of the **critical isodapane** as being the point at which savings made by reduced labour costs equalled the losses brought about by extra transport costs. If the cheaper labour lay within the area of the critical isodapane, it would be profitable to move away from the LCL in order to use this labour.
- **Agglomeration economies** Agglomeration is when several firms choose the same area for their location in order to minimise their costs. This can be achieved by linkages between firms (where several join together to buy in bulk or to train a specialist workforce), within firms (individual car component units) and between firms and supporting services (banks and the utilities of gas, water and electricity). Deglomeration, in contrast, is when firms disperse from a site or area, possibly due to increased land prices or labour costs or a declining market.

Figure 19.12 shows the **critical isodapane** for three firms. It would become profitable for all the firms to locate within the central area formed by the overlapping of all three critical isodapanes. It may be slightly more profitable for firms A and B, but less profitable for firm C, to locate within the purple area. However, it would not be additionally profitable for any firm to move if none of the isodapanes overlapped. Agglomeration is now considered by many to be probably the most important single factor in the location of a firm or industry.

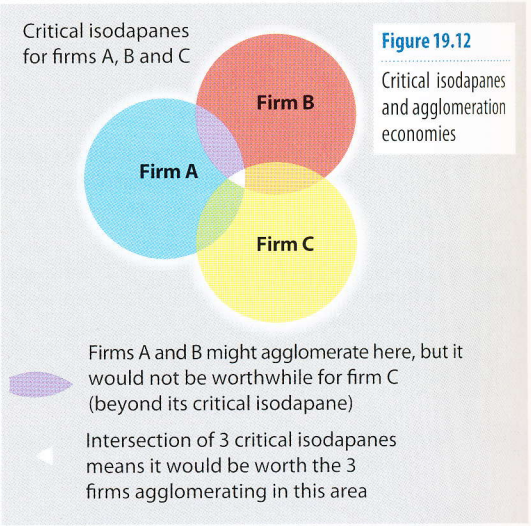


Figure 19.12
Critical isodapanes and agglomeration economies

Criticisms of Weber's model

The point has already been made with previous examples and on page 557 that no model is perfect and all have their critics. Criticisms of Weber's industrial location model include:

- It no longer relates to modern conditions – such as the present extent of government intervention (grants, aid to Enterprise Zones), improvements in and reduced costs of transport, technological advances in processing raw materials, the development of new types of industry other than those directly involved in the processing of raw materials, the increased mobility of labour and the increased complexity of industrial organisation (transnationals instead of single-product firms).
- Each country evolves its own industrial patterns and may be in different stages of economic development (pages 604–608).
- There are basic misconceptions in his original assumptions. For example, there are changes over time and space in demand and price; there are variations in transport systems; perfect competition is unreal as markets vary in size and change over a period of time; and decisions made by industrialists (who do not all have the same knowledge) may not always be rational (von Thünen's 'economic man', page 471).
- Weber's material index was a crude measure and applicable only to primary processing or to industries with a very high or very low index.
- Dr L. Crewe (2008) claimed that 'traditional locational theories, such as that of Weber, are becoming increasingly less significant. Although labour costs and agglomeration factors *are* important in determining the location of an economic activity, they are handled far too simplistically in our ever increasingly complex world. Traditional models often cannot cope with the volatile global system in which we now live, and in which technological change is both rapid and endemic. A whole range of organisational and institutional forces shape economic change within a global economy. The real problem is the interconnectedness and complexity of the various processes at work.'

Production process technologies

According to Coe, Kelly and Yeung (2007), there are three different kinds of industrial system co-existing in the present global economy (Figure 19.13). These are:

1 **Fordism** – where scale economies remain crucial, e.g. food processing and electronic components. Traditionally this was associated with mass production (Henry Ford's 1910s car factory in Detroit, USA) and today more likely with sweatshops (Case Study 21).

2 **Post-Fordism** – where the chief characteristic is flexibility which, by allowing the use of information technology and computerisation in machines and their operation, gives more control over the production process. It can be sub-divided into:

a **flexible specialisation**, when skilled workers use flexible machinery to provide a wider range of product to suit the smaller volumes of high-value or specialist goods that they produce, e.g. shoes and jewellery

b **flexible production**, originating in Japan, which combines information technologies with the flexible organisation of either workers or commodity chains (page 643).

Figure 19.13
Present-day industrial systems

Characteristic	Fordism	Flexible	
	Mass production	Specialisation	Production
Labour force	Division of labour: a few skilled organisers/managers. Large number of semi-/unskilled workers doing repetitive jobs.	Highly skilled.	Multi-skilled, flexible workers all with some responsibility. Work in teams.
Technology/machines	Complex but single-purpose. Hard to change product. Machines in a sequence linked by conveyor belt. Standardised products.	Simple, flexible machines. Non-standardised products.	Highly flexible methods. Relatively easy to change products.
Supplier relationship	Arm's length. Stocks held in factory to ensure supply, i.e. 'just-in-case'.	Close contact with customers and suppliers.	Very close links with suppliers. No stored stock, i.e. 'just-in-time' delivery.
Product (volume, value and variety)	Very high volume. Small range/ single product. Low value.	Low volume. Wide variety. High value.	Very high volume. Wide range. High value.

Industrial location: changing patterns

Four different types of industry have been selected as exemplars to try to demonstrate how the importance of different factors affecting the location of industry have changed through time. Their choice may reinforce the generalisation, by no means true in every case, that the more important locational factors in the 19th century were physical, while in modern industry they tend to be human and economic. They also show that while Weber's theory may have had some relevance in accounting for the location of older industries (remembering that it was put forward in 1909), it has less when explaining the location of contemporary industry.

The four industries are:

1 A primary manufacturing industry where, due to weight loss, the presence of raw materials and sources of energy is more important than the market and other economic factors (Places 83).
2 A secondary manufacturing industry initially tied to raw materials and sources of energy but in which economic and political factors have become increasingly more important (Places 84). This is an example of Fordism with its conveyor belt/assembly line production.
3 A secondary manufacturing industry where the nearness of a market and labour supply is more important than the presence of raw materials and sources of energy (Places 85). This illustrates flexible production (just-in-time).
4 Modern secondary (quaternary) manufacturing industries where human and economic factors are the most important (Places 86). This is an example of flexible specialisation (a footloose industry).

Places 83 Sweden: wood pulp and paper

There are three stages in this industry: the felling of trees, the processing of wood pulp (primary processing), and the manufacture of paper (secondary processing). In Sweden, most pulp and paper mills (Figure 19.14) are located at river mouths on the Gulf of Bothnia (Figure 19.15). Timber is a gross raw material which loses much of its weight during processing; it is bulky to transport; and it requires much water to turn it into pulp. Towns such as Sundsvall and Kramfors are ideally situated (Figure 19.15): the natural coniferous forests provide the timber; the fast-flowing Rivers Ljungan, Indals and Angerman which initially provided cheap water transport for the logs are a source of the necessary and cheap hydro-electricity; and the Gulf of Bothnia provides an easy export route. Paper has a higher value than pulp and it is convenient and cheaper to have integrated mills.

Weber's agglomeration economies, together with Fordism's mass production techiniques, seem to operate with the clustering of so many mills.

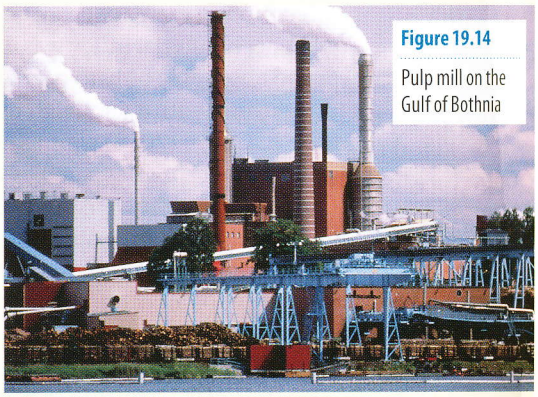


Figure 19.14
Pulp mill on the Gulf of Bothnia

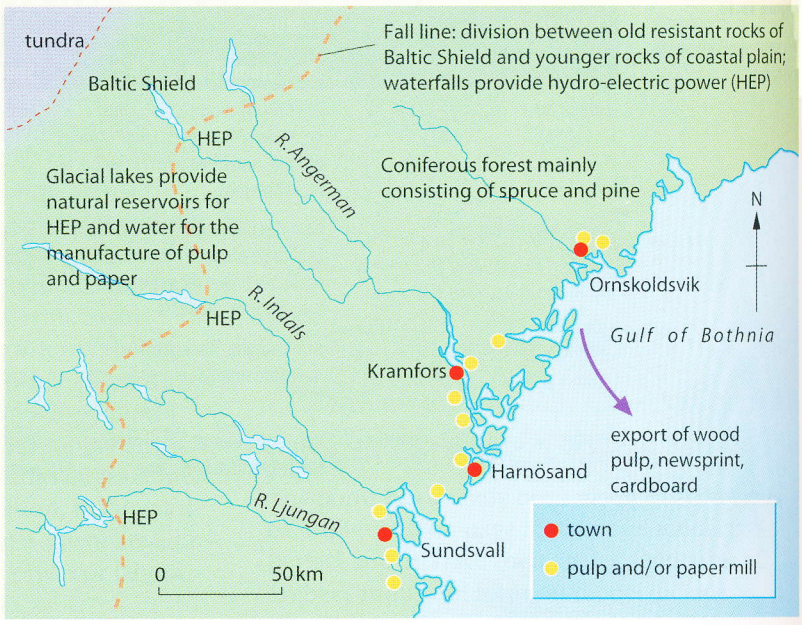


Figure 19.15
Location of wood pulp and paper factories in central Sweden

Places 84 UK: iron and steel

Although the early iron and later steel industries were tied to raw materials, modern integrated iron and steelworks have adopted new locations as the sources of both ore and energy have changed.

- **Before AD 1600** Iron-making was originally sited where there were surface outcrops of iron ore and abundant wood for use as charcoal (the Weald, the Forest of Dean, Figure 19.16a). Locations were at the source of these two raw materials as they had a high material index, were bulky and expensive to transport, had a limited market and could not be moved far owing to the poor transport system.
- **Before AD 1700** Local ores in the Sheffield area were turned into iron by using fast-flowing rivers to turn waterwheels as water provided a cheaper source of energy.
- **After AD 1700** In 1709, Abraham Derby discovered that coke could be used to smelt iron ore efficiently. At this time, it took 8 tonnes of coal and 4 tonnes of ore to produce 1 tonne of iron, and so new furnaces were located on coalfields. One of the first areas to develop was South Wales where bands of iron ore (blackband ores) were found between seams of coal. The advantages possessed by South Wales at that time are shown in Figure 19.17a. Later, the industry extended into other British coalfields. When local ores became exhausted, the industry continued in the same locations because of geographical inertia, a pool of local skilled labour, a local market using iron as a raw material, improved techniques reducing the amount of coal needed (2 tonnes per 1 tonne of final product), improved and cheaper transport systems (rail and canal) which brought distant mined iron ore, and the beginnings of agglomeration economies.
- **After 1850** Until the 1880s, the low ore and high phosphorus content of deposits found in the Jurassic limestone, extending from the Cleveland Hills to Oxfordshire, had not been touched. After 1879, the **Gilchrist–Thomas process** allowed this ore to be smelted economically. As iron ore now had a higher material index than coal it was more expensive to move. As a result, new steelworks were opened on Teesside, near to the Cleveland Hills deposits, and at Scunthorpe and Corby, on the ore fields. However, the major markets remained on the coalfields.

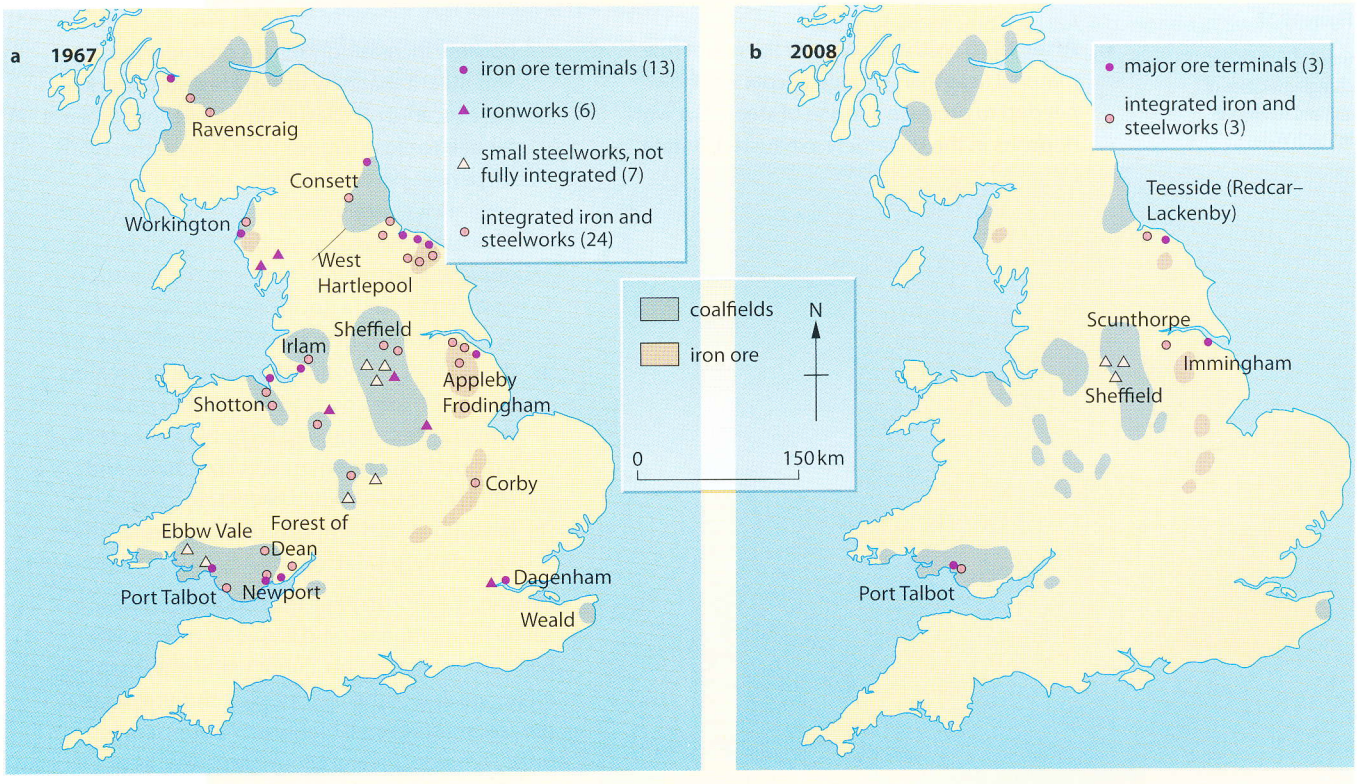


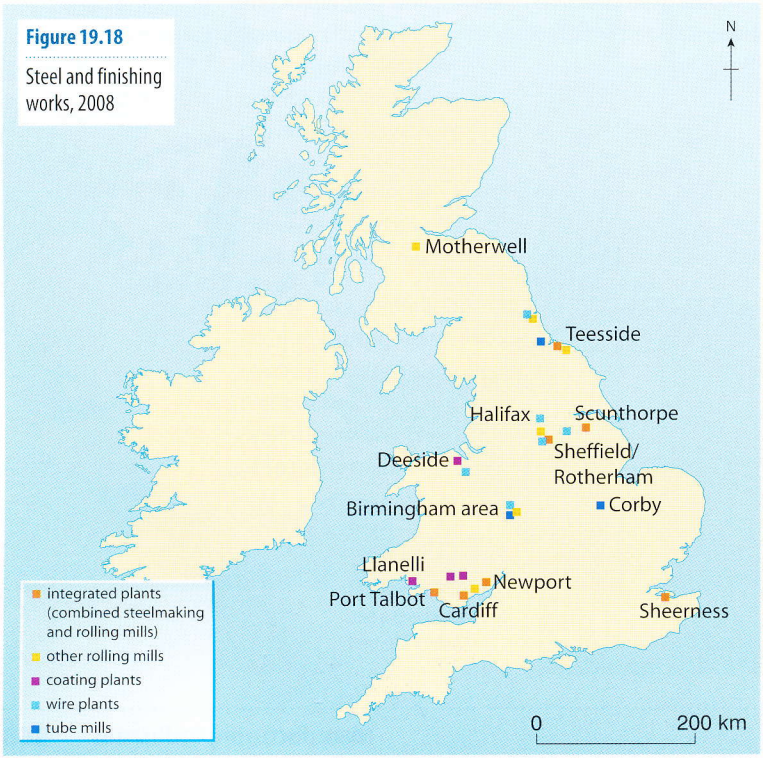
Figure 19.16
Location of iron and steelworks in England, Scotland and Wales

Period of time			a Location of early 19th-century iron foundries in South Wales (e.g. Ebbw Vale)	b Disadvantages of these early locations by 1960 (e.g. Ebbw Vale)	c Location of only remaining integrated steelworks in 2008 (Port Talbot)
Physical	Raw materials	Coal	mined locally in valleys	older mines closing	little now needed; imported
		Iron ore	found within the Coal Measures	had to be imported: long way from coast	imported from N Africa and N America
		Limestone	found locally	found locally	found locally
		Water	for power and effluent: local rivers	insufficient for cooling	for cooling: coastal sites
	Energy/fuel		charcoal for early smelting, later rivers to drive machinery; then coal	electricity from National Grid	electricity from National Grid using coal, oil, natural gas, nuclear power
	Natural routes		materials local; export routes via the valleys	poor; restricted by narrow valleys	coastal sites
	Site and land		narrow valley floor locations	cramped sites; little flat land	large areas of former sand dunes
Human and economic	Labour		large quantities of semi-skilled labour	still large numbers of semi-skilled workers	still relatively large numbers but with a higher level of skill; fewer due to high-tech/mechanisation
	Capital		local entrepreneurs	no investment	government and EU incentives
	Markets		local	difficult to reach Midlands and ports	tin plate industry (Llanelli) and the Midland car industry
	Transport		little needed; some canals; low costs	poor; old-fashioned; isolated	M4; purpose-built port
	Geographical inertia		not applicable	not strong enough	tradition of high-quality goods
	Economies of scale		not applicable	worked against the inland sites	one large steelworks more economical than numerous small iron foundries
	Government policy		not applicable	Ebbw Vale kept open by government help	having the capital, governments can determine locations and closures and provide heavy investment
	Technology		small scale: mainly manual	out of date	high-technology: computers, lasers, etc.

Figure 19.17
Growth, decline and changing location of iron and steelworks in South Wales

- **After 1950** With iron ore still the major raw material (less than 1 tonne of coal was now needed to produce 1 tonne of steel), but with deposits in the UK largely exhausted, Britain became increasingly reliant on imported ores. This meant that new **integrated steelworks** were located on coastal sites while those inland tended to close (Figure 19.16). Since the 1950s three new elements, unforeseen by Weber, became increasingly important in the location of new steelworks: government intervention, improved technology and reduced transport costs. It is a now a government/EU decision as to where any new steelworks (unlikely in the present economic climate) will be located, and which existing works will either close or remain open; improved technology has seen a reduction in raw materials consumed and workers needed; while lower transport costs have aided both imports of raw materials and exports of finished goods.

Figure 19.18
Steel and finishing works, 2008



Even so, the industry still uses complex machines set out in a sequence and linked by a conveyer belt system. At the Port Talbot works, raw materials enter one end of the factory, pass through several processing stages, all highly computerised, to finally emerge, several kilometres away, as a standardised end product. The steelworks is also part of a value added chain in a global industry.

Places 85 Japan: car assembly

Japan's production of 8.6 million cars in 2006, which was 20.8 per cent of the world's total, kept it as the world leader ahead of Germany (5.1 m) and the USA (5.0 m). This has been achieved despite a lack of basic raw materials.

Japan has very limited energy resources for, although it produces hydro-electricity and nuclear energy, it has to import virtually all its coal, oil and natural gas requirements. Similarly, most of the iron ore and coking coal needed to manufacture steel also has to be imported. The result has been the location of the major steelworks on tidal sites found around the country's many deep and sheltered natural harbours. As only 17 per cent of the country is flat enough for economic development (for homes, industry and agriculture), most of the population also has to live in coastal areas and around the harbours. The five major conurbations, linked by modern communications, provide both the workforce and the large, affluent, local markets needed for such steel-based products as cars (Figure 19.19). Within these conurbations are numerous firms engaged in making car component parts. This agglomeration of firms limits transport costs and conforms with Weber's concept that industries gaining weight through processing (car assembly) are best located at the market. As many of the smaller, older and original firms have amalgamated into large-scale companies, the extra space required for their factories has had to come from land reclaimed from the sea (Figure 19.20). These new locations, despite the high costs of reclamation, make excellent sites from which to export finished cars to all parts of the world. The large local labour force contains both skilled and semi-skilled workers who, as well as being educated and industrious, are very loyal to their firm. The car industry, which has received considerable government financial assistance, has an organisation which centres around teamworking, worker involvement, total-quality management, and 'just-in-time' production (this is when various component parts arrive just as they are needed on the assembly line, thus avoiding the need to store or to overproduce). The Japanese car industry has a high level of automation and uses the most modern technology: it produces three times the number of cars per worker as does western Europe. The assembled cars are reliable and universally acceptable in design which means, together with the shift from mass production to lean, or flexible, production, that the Japanese have gained strong footholds in world markets. To expand further into these markets, the Japanese have either built overseas assembly plants or have amalgamated with local companies so that more cars can be produced close to the large urban markets within western Europe and the USA, e.g. Honda at Swindon, Nissan at Sunderland, and Toyota at Burnaston and Deeside in the UK.

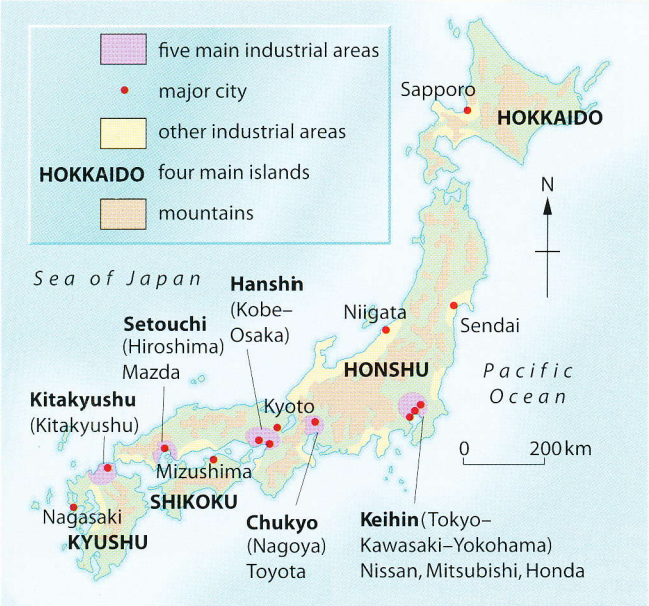


Figure 19.19
Major industrial areas in Japan

Figure 19.20
Mazda's Hofu car plant, built on land reclaimed from the sea

Places 86 The M4 and M11 corridors: high-tech industries

The term **high-technology** refers to industries that have developed within the last 35 years and whose processing techniques often involve micro-electronics, but may include medical instruments, biotechnology and pharmaceuticals. These industries, which collectively fit into the **quaternary** sector (page 552), usually demand high inputs of information, expertise and research and development (R&D). They are also said to be **footloose** (the modern term is **flexible specialisation**) in that, not being tied to raw materials, they have a free choice of location (Figure 19.13). However, they do tend to occur in clusters in particular areas, forming what Weber would have called 'agglomerated economies', such as along the M4 and M11 corridors in England (also Silicon Glen in Scotland, Silicon Valley in California and Grenoble and the Côte d'Azur in France). By locating close together, high-tech firms can exchange ideas and information and share basic amenities such as connecting motorways.

Two of the major concentrations of high-tech industries in Britain are along the M4 westwards (Sunrise Valley) from London to Reading, Newbury ('Video Valley'), Bristol (Aztec West) and into South Wales; and the M11 northwards to Cambridge (Figure 19.21). Transport is convenient due to the proximity of several motorways and mainline railways, together with the four main London airports. Transport costs are, in any case, relatively insignificant as the raw materials (silicon chips) are lightweight and the final products (computers) are high in value and small in bulk. Even so, it has been argued that two of the main reasons for high-tech development in this part of Britain were:

1 the presence of government-sponsored research establishments at Harwell and Aldermaston and of government aerospace contractors in the Bristol area

2 its attractive environment, e.g. the valley of the Thames and the nearby upland areas of the Cotswolds, Chilterns and Marlborough Downs (Figure 19.21), and its proximity to cultural centres, e.g. London, Oxford and Cardiff.

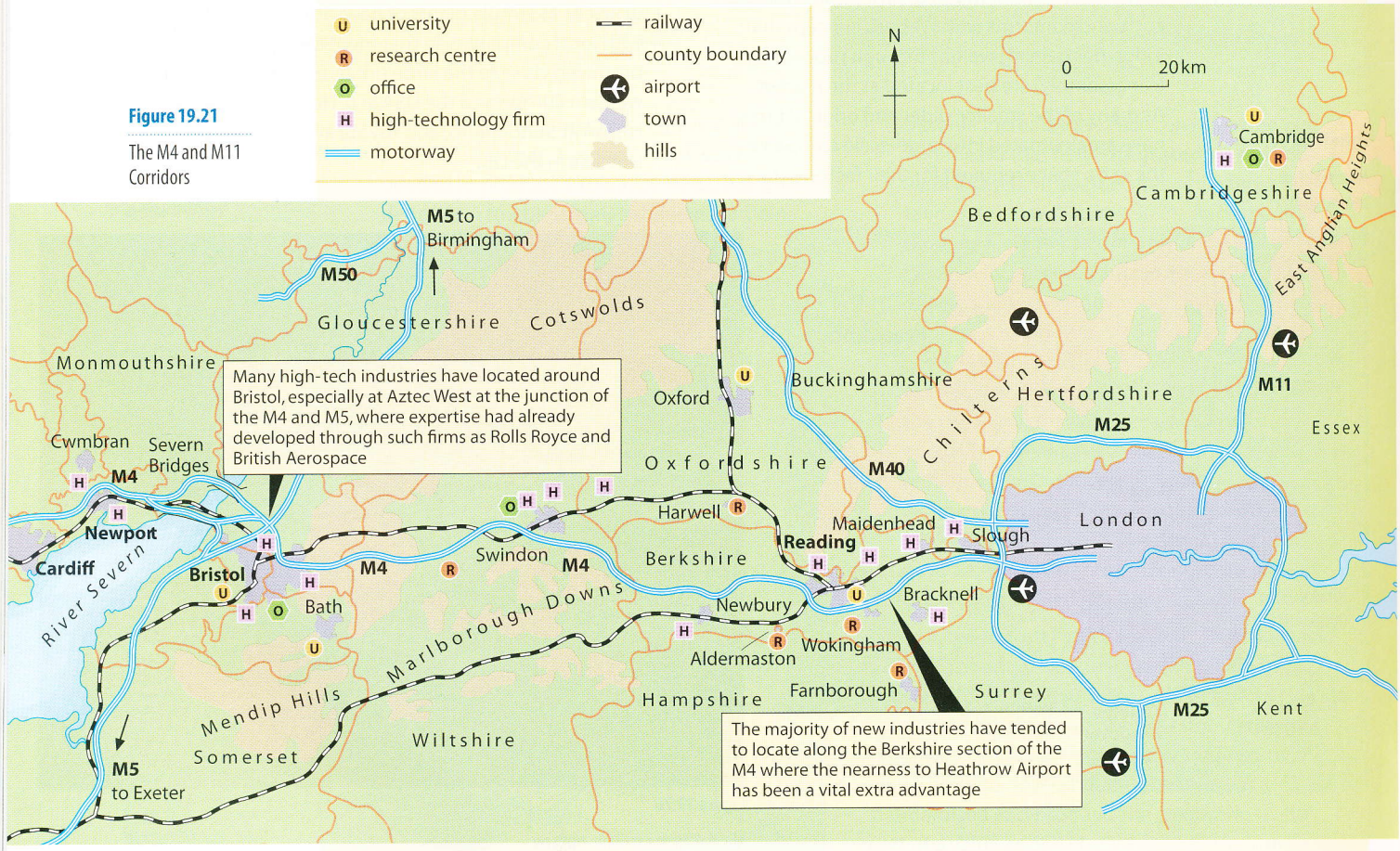


Figure 19.21
The M4 and M11 Corridors

Most firms that have located here claim that the major factor affecting their decision was the availability of two types of labour:

- Highly skilled and inventive research scientists and engineers, the majority of whom were university graduates or qualified technicians. These specialists, whose abilities were in short supply, could often dictate areas where they wanted to live and work, i.e. areas of high environmental, social and cultural quality. The proximity of several universities (Figure 19.21) provided a pool of skilled labour and facilities for R&D.
- Female workers who either tended to be plentiful as an increasing number of career-minded women were among those who had recently moved out of London and into new towns and suburbanised villages (page 398), or were prepared to accept part-time/flexi-time jobs (Figure 19.4).

Science parks are often joint ventures between universities and local authorities. They are usually located adjacent to universities on edge-of-town greenfield sites where, because the land is of lower value, there is plenty of space for car parking, landscaping (ornamental gardens and lakes) and possible future expansion.

The Cambridge Science Park (Figure 19.22) has been developed in conjunction with Trinity College, Cambridge. Opened in 1972, the success of early firms soon attracted more (agglomeration economies), so that by 2008 there were 109 companies employing about 5000 people. Existing companies can be divided into those making electronics, scientific instruments, drugs and pharmaceuticals (biomedicinal), with a strong emphasis on scientific R&D. Only selected firms, using the high-quality, flexible buildings for specific purposes, are allowed to locate in the business park. Almost one-quarter of these firms are medium-sized, each employing between 20 and 49 workers. Some 70 per cent of the park, which covers 62 ha, is left as open space with trees, grass and ornamental gardens with lakes (Figure 19.23). As this, and other business and science parks in the Cambridge area, continue to develop, new housing has to be provided, e.g. at Cambourne (Case Study 14A), and building pressure increases on the surrounding transport system and countryside (Figure 14.22).

Figure 19.22
The Cambridge Science Park

Figure 19.23
Layout of the Cambridge Science Park

Industrial linkages and the multiplier

When Weber introduced the term 'agglomeration economies', he acknowledged that many firms made financial savings by locating close to, and linking with, other industries. The success of one firm may attract a range of associated or similar-type industries (cutlery in Sheffield), or several small firms may combine to produce component parts for a larger product (car manufacture in Coventry). **Industrial linkages** may be divided into **backward linkages** and **forward linkages**:

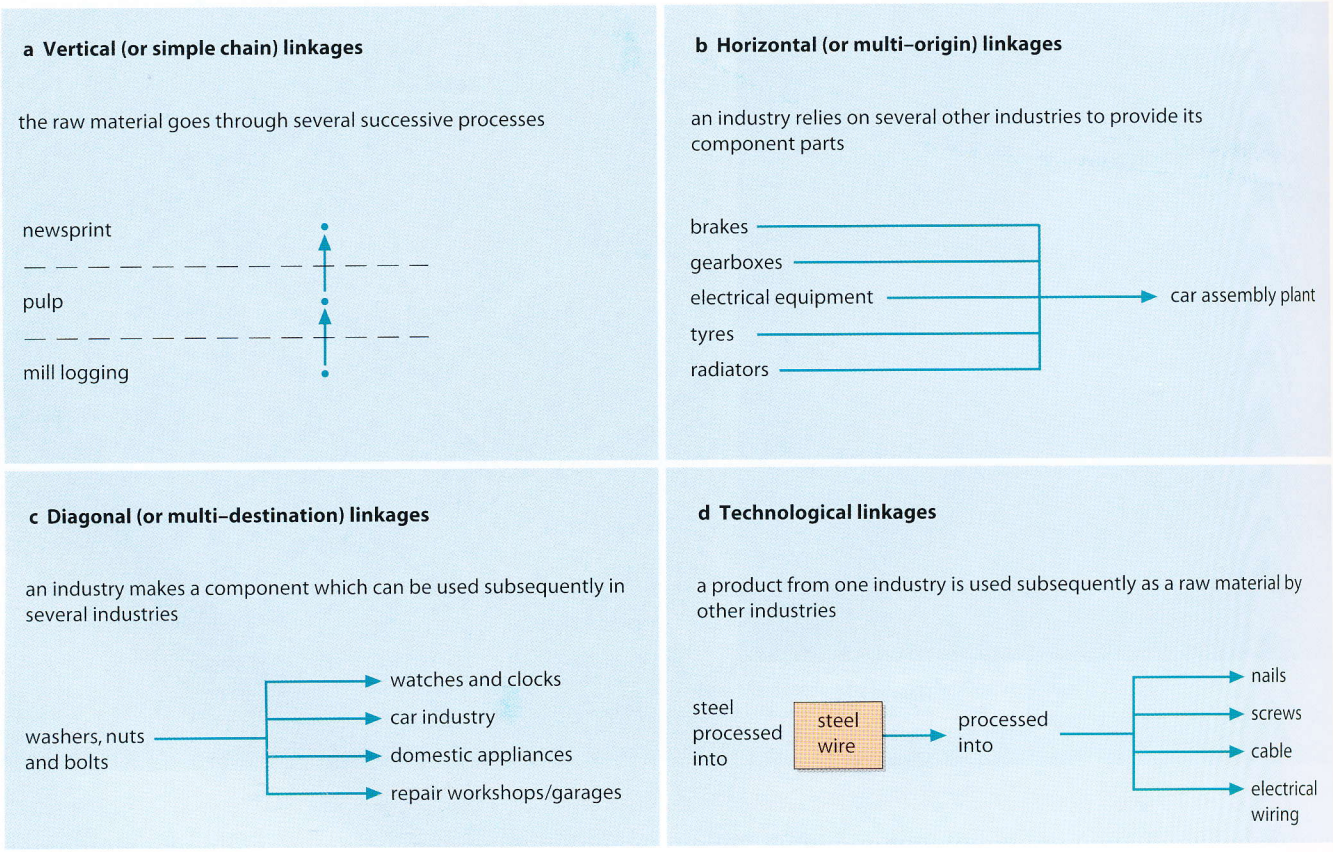
backward linkages		**forward linkages**
to firms providing raw materials or component parts	← FACTORY →	to firms further processing the product or using it as a component part

A more detailed classification of industrial linkages is given in Figure 19.24. The more industrially advanced a region or country, the greater is the number of its linkages. Developing countries have few linkages, partly because of their limited number of industries and partly because few industries go beyond the first stage in processing – the simple chain in Figure 19.24a. Industrial linkages may result in:

- energy savings
- reduced transport costs
- waste products from one industry forming a raw material for another
- energy given off by one process being used elsewhere
- economies of scale where several firms buy in bulk or share distribution costs
- improved communications, services and financial investment
- higher levels of skill and further research
- a stronger political bargaining position for government aid (the securing of EU funding now depends upon having a network of linked organisations).

Louise Crewe has stressed the 'increasingly critical importance of local linkages in ensuring competitive success, and the need to emphasise how agglomeration is becoming an increasingly important factor in explaining industrial location'. In the fashion quarter of Nottingham's Lace Market, for example, 85 per cent of all firms are linked to others, e.g. supplier links, manufacturers, retailers, local intelligence, and so on. Other examples of linkages and industrial location include the Motor Sport valley in Oxfordshire and car assembly in the West Midlands, together with both the fashion and jewellery agglomerations and the semiconductor clusters in California and the UK (Places 86).

Figure 19.24
Types of industrial linkage



The multiplier effect and Myrdal's model of cumulative causation

If a large firm, or a specialised type of industry, is successful in an area, it may generate a **multiplier effect**. Its success will attract other forms of economic development creating jobs, services and wealth – a case of 'success breeds success'. This circular and cumulative process was used by **Gunnar Myrdal**, a Swedish economist writing in the mid-1950s, to explain why inequalities were likely to develop between regions and countries. Figure 19.25 is a simplified version of his model.

Myrdal suggested that a new or expanding industry in an area would create more jobs and so increase the spending power of the local population. If, for example, a firm employed a further 200 workers and each worker came from a family of four, there would be 800 people demanding housing, schools, shops and hospitals. This would create more jobs in the service and construction industries as well as attracting more firms linked to the original industry. As **growth poles**, or points, develop there will be an influx of migrants, entrepreneurs and capital, together with new ideas and technology. Myrdal's multiplier model may be used to explain a number of patterns.

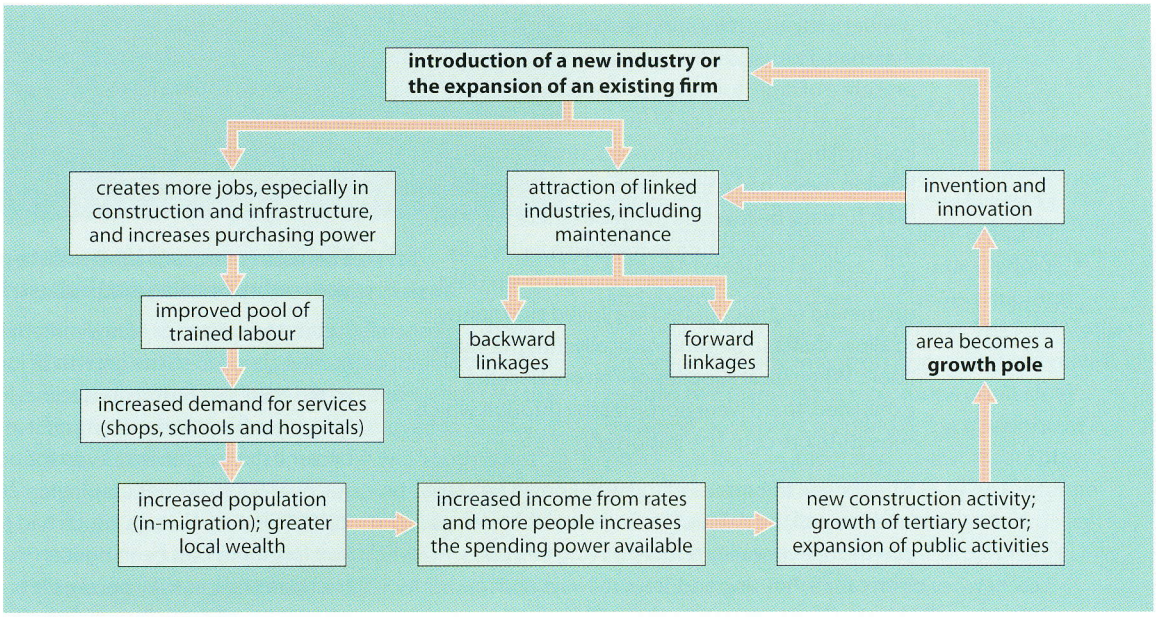


Figure 19.25
A simplified version of Myrdal's model to show development of an industrial region

1 The growth of 19th-century industrial regions (South Wales and the Ruhr) and districts (cutlery in Sheffield, guns and jewellery in Birmingham and clothing in Nottingham).
2 The development of growth poles (page 617) in developing countries (São Paulo in Brazil and the Damodar Valley in India), where increased economic activity led, in turn, to multiplier effects, agglomeration economies and an upward spiral resulting in core regions (Places 87 and Places 98, page 618). At the same time, cumulative causation worked against regions near the **periphery** where Myrdal's **backwash effects** included a lack of investment and job opportunities.
3 The creation of modern government regional policies which encourage the siting of new, large, key industries in either peripheral, less developed (Trombetas and Carajas in Amazonia) or high unemployment (Nissan and Toyota in England) areas in the hope of stimulating economic growth. This policy is more likely to succeed if the industries are labour intensive.

Industrial regions

Much of Britain's early industrial success stemmed from the presence of basic raw materials and sources of energy for the early iron, and the later iron and steel, industries; the mass production of materials using the processed iron and steel; and the development of overseas markets. During the 19th century it was the coalfields, especially those in South Wales, northern England and central Scotland, which became the core industrial regions. However, as the initial advantages of raw materials (which became exhausted), specialised skills and technology (no longer needed as the traditional heavy industries declined) and the ability to export manufactured goods (in the face of growing overseas competition) were lost, these early industrial regions have become more peripheral. Recent attempts to revive their economic fortunes have met with varying success (Places 87).

Places 87 South Wales: industrial growth, decline and regeneration

Pre-1920: industrial growth creating a core region

The growth of industry in South Wales was based on readily obtainable supplies of raw materials (Figure 19.17a). Coking coal and blackband iron ore were frequently found together, exposed as horizontal seams outcropping on steep valley sides. Their proximity to each other meant that the area around Merthyr Tydfil and Ebbw Vale (Figure 19.26) was ideally suited for industrial development (Weber's least-cost location for two gross raw materials, Figure 19.10b). Added to this was the presence of limestone only a few kilometres to the north, and the expertise of the local population in iron-making where waterwheels, driven by fast-flowing rivers, had earlier been used to power the blast furnace bellows. By the 1860s there were 35 iron foundries operating in the Welsh valleys. By the time the more accessible coal had been used up, mining techniques had improved sufficiently to allow shafts to be sunk vertically into the valley floors. When local supplies of iron ore became exhausted, there were ports nearby through which substitute ore could be imported.

'Thus began the spread of the well-known industrial landscape of the Valleys. Pits crammed themselves into the narrow valley bottoms, vying for space with canals, housing and, later, railways and roads. Housing began to trail up the valley sides, line upon line of terraces pressed against the steep slopes [Figure 19.27]. The opening-up of the underground coal seams resulted in massive immigration, much of it from rural areas. Working conditions, living conditions and wages were deplorable while health and safety standards underground were poor. Housing was overcrowded as the provision of homes, financed by the local entrepreneur ironmasters, lagged far behind the supply of jobs.'

The rapid increase in coalmining and iron-working partly resulted from the growth of large overseas markets as both products were mainly exported. Transport to the Welsh ports first involved simply allowing trucks to run downhill under gravity. Later, canals and then railways were used to move the bulky materials. While Barry, Cardiff and Newport developed as exporting ports, Swansea and Neath grew as 'break of bulk' ports smelting the imported ores of copper, nickel and zinc. **Break of bulk** is when a transported product has to be transferred from one form of transport to another – a process that involves time and money. It was easier and cheaper, therefore, to have had the smelting works where the raw materials were unloaded, rather than transporting them inland.

The inter-war and immediate post-war years: depression and industrial decline

Just as the existence of raw materials and overseas markets had led to the growth of local industry, so did their loss hasten its decline. Iron ore had long since been exhausted and it increasingly became the turn of coal, even though there were still over 500 collieries employing 260 000 miners in 1925. The steelworks which had replaced the iron foundries had been built on the same inland, cramped sites; as they became less competitive mainly due to rising transport costs, so they became increasingly dependent on government support (Figure 19.17b). Overseas markets were lost as rival industrial regions with lower costs and more up-to-date technology were developed overseas. The difficulties of an economy reliant on a narrow industrial base, dependent on an increasingly out-of-date infrastructure, and unable to compete with overseas competition, led to major economic, social and environmental problems.

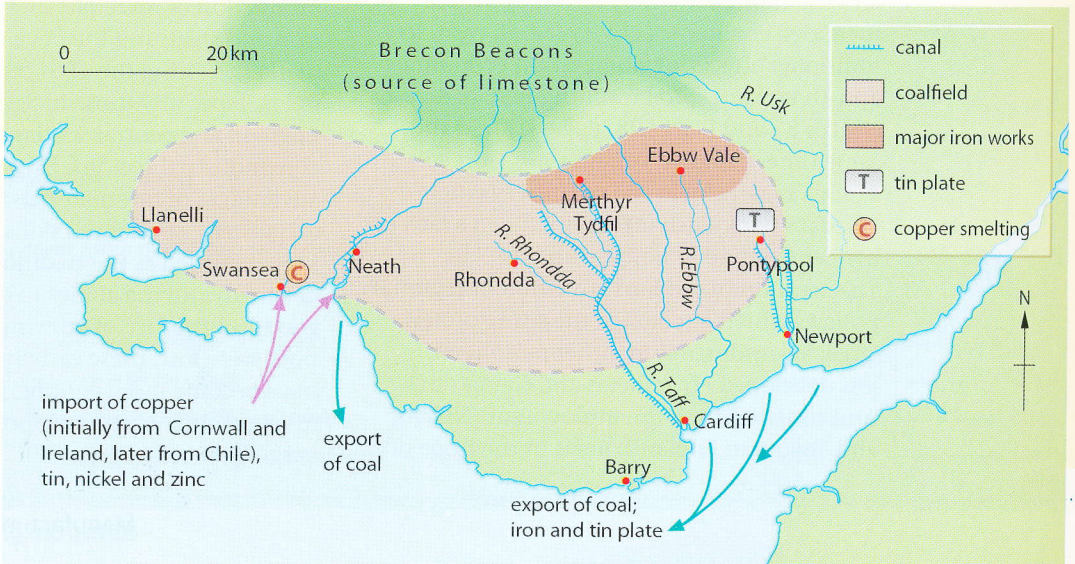


Figure 19.26
Early industrial development in South Wales

Figure 19.27
Industry, communications and terraced housing strung along the valley floor and lower valley sides: Rhondda Fawr, looking towards Treorchy, mid-Glamorgan

Towards the present: industrial diversification in a peripheral area

Steel-making and non-ferrous metal smelting have been maintained, partly due to geographical inertia, despite a significant fall in output and workers. As the centre of gravity for steel-making moved to coastal sites, so too did the location of the two South Wales integrated works, to Llanwern (closed 2001) and Port Talbot (Figures 19.17c and 19.28). Tin plate, using local steel, is produced at Trostre near Llanelli (the Felindre works near Swansea closed in 1989), while the Mond nickel works near Swansea is the world's largest (Figure 19.28).

The major factor to have affected industry in the region in the last 50 years has been government intervention (or lack of it, depending on your political views). The Special Areas Act of 1934 saw the first government assistance which set up industrial estates at Treforest, Merthyr Tydfil and Rhondda (Figure 19.28), while Cwmbran became one of Britain's first new towns (1949). Much of the former coalfield remains an Assisted Area (Figure 19.5). The last NCB colliery closed in 1994, although the Tower Colliery, near Merthyr Tydfil, reopened privately between 1995 and 2008. At present coal comes from seven opencast mines, and a current planning application, if successful, would make one of those – Ffos-y-Fran, also near Merthyr Tydfil – the largest in Europe (there is strong local opposition to the scheme).

Two local areas of exceptionally high unemployment, Swansea and Milford Haven Waterway, were designated two of Britain's 27 Enterprise Zones (page 439). The Swansea EZ included five parks – the Enterprise (commerce and light industry), Leisure (recreation facilities), Riverside (heritage and environmental schemes), City (retailing) and Maritime (housing and cultural) Parks. The Ford Motor Company took advantage of government incentives to build two plants in the region, one of which, at Bridgend, has been expanded. It was government policy that built an integrated steelworks at Ebbw Vale in 1938, and which closed it in 1979. The future of Port Talbot is also in government hands. A policy to decentralise some government departments has seen vehicle licensing moved to Swansea and the Royal Mint to Llantrisant (Figure 19.28). Improvements in communications have included the M4, the Heads of Valleys Road, the InterCity rail link, and Cardiff international airport – some of which were financed by EU funds.

Figure 19.28
Recent industrial development in South Wales

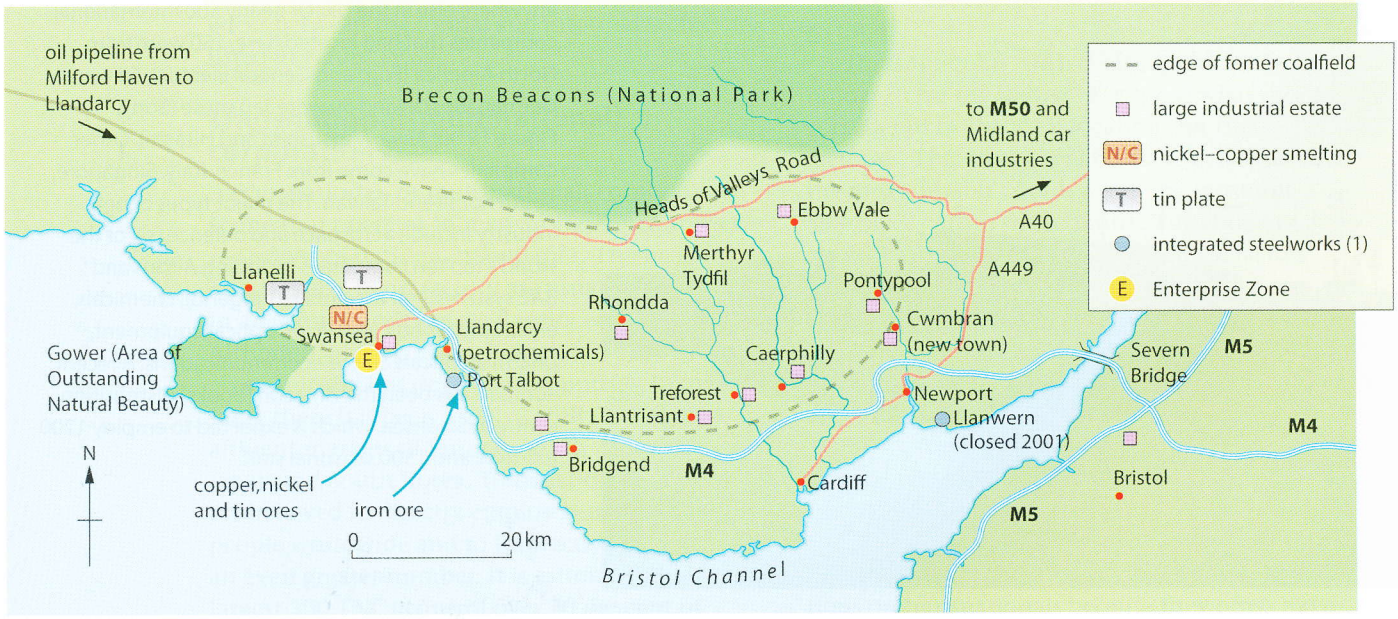


Figure 19.29
Swansea Enterprise Park, west Glamorgan

Money has also been spent on landscaping old industrial areas which had been scarred either by metal-smelting industries (lower Swansea Valley) or by slag (Ebbw Vale) and colliery waste tips (Aberfan – Case Study 2B). The Ebbw Vale Garden Festival (1992), sited on part of the former steelworks, was part of a larger scheme aimed at creating new jobs, improving housing, renovating old properties and improving the local environment (page 439). Other schemes, some funded by the WDA (see below), include tourist and cultural facilities such as the Welsh Industrial and Maritime Museum in Cardiff's newly created Marina area and the international sports village in Cardiff Bay.

The Cardiff Bay project, environmentally controversial, was aimed at improving transport and housing as well as providing jobs and retailing and leisure opportunities.

Figure 19.30
Sony's CTV European headquarters at Pencoed, Bridgend, occupies a 25 ha site

The Welsh Development Agency (WDA) was set up in 1976 'to attract high-quality investment, to help the growth of Welsh businesses and to improve the environment' (Figure 19.29). It saw as its main advertising points:

- a workforce that was skilled (although it needed retraining for the new-style high-tech industries)
- low labour costs, high productivity and good labour relations
- a well-developed transport infrastructure with modern road, rail and air links
- the availability of advanced factory sites with quality buildings at competitive rates
- a local market, and access to a national and the international market
- low rates and rents for firms wishing to locate in either the Development or Intermediate Areas (Figure 19.5)
- lower house prices and cost of living than south-east England
- the University of Wales with its five separate colleges
- the Welsh countryside, including the Pembrokeshire Coast and Brecon Beacons National Parks and 500 km of Heritage Coastline (including the Gower Peninsula), and the Pembrokeshire Coast footpath.
- the Welsh culture, including music, the performing arts and sport.

At the beginning of the 21st century, South Wales had a more varied and broad economic base than it had ever had before, with both manufacturing and inward investment growing at a faster rate than anywhere else in the UK. Of nearly 500 international companies that had located here, 150 were from North America (Ford and General Electric), 60 were German (Bosch) and 50 were Japanese (Sony, Figure 19.30; Aiwa, Matsushita and Hitachi). Other companies have come from France, Italy, Singapore, South Korea and Taiwan. The major types of new industry include aerospace and defence (six of the world's top ten companies including Airbus and BAE systems), car assembly (Bridgend), chemicals, electronics, medical devices, optical equipment, pharmaceuticals and telecommunications. A recent addition has been the Amazon (books) distribution centre at Swansea, which is expected to employ 1200 full-time and 1500 seasonal staff.

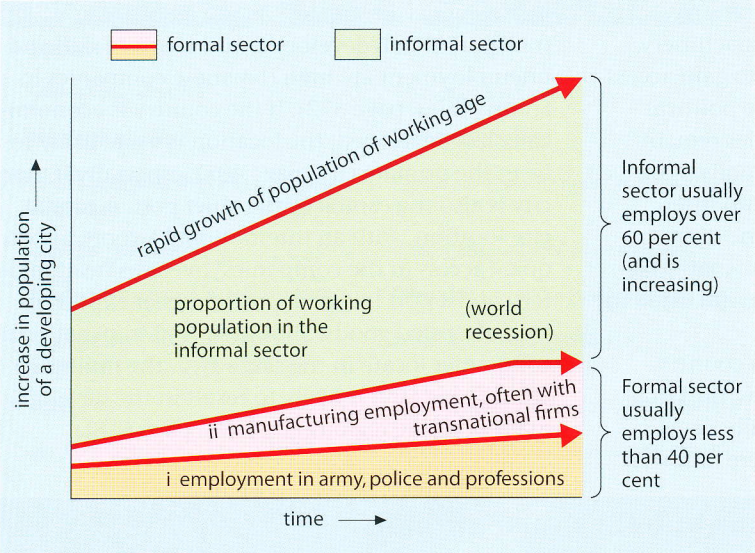


Figure 19.31

Growth in the informal sector

Industry in economically less developed countries

In cities in economically less developed countries, the number of people seeking work far outweighs the number of jobs available. As these cities continue to grow, either through natural increase or in-migration, the job situation gets continually worse. The UN estimates that in developing countries, on average, only about 40 per cent of those people with jobs work in the **formal sector** (Figure 19.31). These jobs, which are permanent and relatively well paid, include those offered by the state (police, army and civil service) or by overseas-run **transnational (multinational) corporations**, which are a major feature of globalisation (Chapter 21). The remaining 60 per cent – a figure which the UN claims is rising – have to seek work in the **informal sector**. The main differences between the formal and informal sectors are listed in Figure 19.34.

Transnational (multinational) corporations

A transnational, or multinational, corporation is one that operates in many different countries regardless of national boundaries. The headquarters and main factory are usually located in an economically more developed country. Although, at first, many branch factories were in economically less developed countries, increasingly there has been a global shift to the more affluent markets of Europe, North America, Japan and South Korea. Transnationals (TNCs) are believed to directly employ nearly 50 million people worldwide and to indirectly influence an even greater number. It is estimated that the largest 300 TNCs control over 70 per cent of world trade (compared with only 20 per cent in 1960) and produce over half of its manufactured goods. The largest TNCs have long been car manufacturers and oil corporations but these have, more recently, been joined by electronic and high-tech firms. Several of the largest TNCs have a higher turnover than all of Africa's GNP in total.

Advantages to the country	Disadvantages to the country
Brings work to the country and uses local labour	Numbers employed small in comparison with amount of investment
Local workforce receives a guaranteed income	Local labour force usually poorly paid and have to work long hours
Improves the levels of education and technical skills of local people	Very few local skilled workers employed
Brings inward investment and foreign currency to the country	Most of the profits go overseas (outflow of wealth)
Companies provide expensive machinery and introduce modern technology	Mechanisation reduces the size of the labour force
Increased gross national product/personal income can lead to an increased demand for consumer goods and the growth of new industries and services	GNP grows less quickly than that of the parent company's headquarters, widening the gap between developed and developing countries
Leads to the development of mineral wealth and new energy resources	Raw materials are usually exported rather than manufactured locally, and energy costs may lead to a national debt
Improvements in roads, airports and services	Money possibly better spent on improving housing, diet and sanitation
Prestige value (e.g. Volta Project)	Big schemes can increase national debt (e.g. Brazil)
Widens economic base of country	Decisions are made outside the country, and the firm could pull out at any time
Some improvement in standards of production, health control, and recently in environmental control	Insufficient attention to safety and health factors and the protection of the environment

Figure 19.32

Advantages and disadvantages of transnational (multinational) corporations

Transnationals, with their capital and technology, have the 'power' to choose what they consider to be the ideal locations for their factories. This choice will be made at two levels: the most suitable country, and the most suitable place within that country. The choice of a country usually depends on political factors. Most governments, regardless of the level of economic development within their country, are prepared to offer financial inducements to attract transnationals which they see as providers of jobs and a means of increasing exports. (Sony, Figure 19.30, was reputed to have been offered better inducements to locate at Bridgend rather than in Barcelona.) Many governments of economically less developed countries, due to a greater economic need, are prepared to impose fewer restrictions on transnationals because they often have

to rely on them to develop natural resources, to provide capital and technology (machinery, skills, transport), to create jobs and to gain access to world markets (Places 88). Despite political independence, many poorer countries remain economically dependent (neo-colonialism) on the large transnationals (together with international banks and foreign aid). Some of the advantages and disadvantages of transnational corporations to developing countries are listed in Figure 19.32.

Transnationals, having selected a country, then have to decide where to locate within that country. If the country is economically developed, the location is likely to be where financial inducements are greatest, land values are low, transport is well developed, and levels of skill and unemployment are high (Japanese companies in South Wales, page 572). If the country is economically less developed, the location is more likely to be in the primate city (page 405), especially if that city is also the capital or the chief port. A capital city location, with an international airport, allows quick access to the companies' overseas headquarters; and a port location enables easier export of manufactured goods. Should several transnational companies locate in the same area, the multiplier effect (page 569) is likely to result in the development of a core region (Places 98, page 618).

Places 88 Pune, India: a hub for transnationals

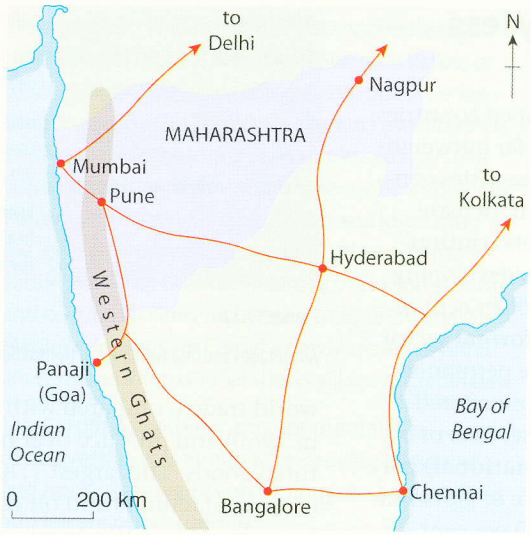


Figure 19.33 Location of Pune in India

Pune, a city of 5 million inhabitants, lies 150 km south-east of Mumbai in the western coastal state of Maharashtra. It is known as the 'Oxford of the East', as it has nine universities, and 'The Detroit of India' due to the presence of numerous global car TNCs. Its rapid industrial growth has partly been due to congestion, pollution, lack of space and exceptionally high property prices in nearby Mumbai (population 18.2 million), as well as to its own advantages.

Pune has good transport links, especially with the port and financial centre of Mumbai. It is also on the 'Golden Quadrilateral', a four-lane expressway that links Bangalore, Chennai, Kolkata, Delhi and Mumbai, as well as being on a main rail line and having its own airport. Its climate is healthier than that of Mumbai, being 650 m above sea-level, which makes it less humid, and, lying in the rain shadow to the east of the Western Ghats, it receives only 650 mm of rain a year compared with Mumbai's 2200 mm (Figure 9.57).

Pune's universities produce large numbers of skilled graduates and Mercedes-Benz founded an international school for professional people from overseas. The state of Maharashtra is viewed positively as a manufacturing and commercial centre as it is less prone to industrial strikes and corruption which affect other parts of India. Other favourable factors that are important when trying to attract TNCs include its good health care service and a reliable supply of water and electricity.

Pune has also benefited from the setting up, in 1960, of the Maharashtra Industrial Development Corporation (MIDC) which offers business incentives that include exemptions from electricity duty and stamp duty, refund on Octroi (a tax applied to goods entering and leaving an area) and special financial help, together with interest rate subsidies for the textile industry – incentives that are not available in Mumbai. Among the TNCs that have located in and around Pune are automotive corporations (Daimler-Chrysler, Fiat, General Motors, Mercedes-Benz, Skoda, Tata Motors and Volkswagen), electrical companies (Panasonic, Philips, Siemens and Whirlpool), technology centres (Barclays, HSBC and John Deere) and outsourcing call centres (Next and British Gas).

The informal sector

A large and growing number of people with work in developing countries have found or created their own jobs in the informal sector (Figure 19.34).

'This sector covers a wide variety of activities meeting local demands for a wide range of goods and services. It contains sole proprietors, cottage industries, self-employed artisans and even moonlighters. They are manufacturers, traders,

	Formal	Informal
ription	Employee of a large firm	Self-employed
	Often a transnational	Small-scale/family enterprise
	Much capital involved	Little capital involved
	Capital-intensive with relatively few workers; mechanised	Labour-intensive with the use of very few tools
	Expensive raw materials	Using cheap or recycled waste materials
	A guaranteed standard in the final product	Often a low standard in quality of goods
	Regular hours (often long) and wages (often low)	Irregular hours and uncertain wages
	Fixed prices	Prices rarely fixed and so negotiable (bartering)
	Jobs done in factories	Jobs often done in the home (cottage industry) or on the streets
	Government and transnational help	No government assistance
	Legal	Often outside the law (illegal)
	Usually males	Often children and females
of job	Manufacturing: both local and transnational companies	Distributive (street peddlers and small stalls)
	Government-created jobs such as the police, army and civil service	Services (shoe cleaners, selling clothes and fruit)
		Small-scale industry (food processing, dress-making and furniture repair)
ntages	Uses some skilled and many low-skilled workers	Employs many thousands of low-skilled workers
	Provides permanent jobs and regular wages	Jobs may provide some training and skills which might lead to better jobs in the future
	Produces goods for the more wealthy (food, cars) within their own country so that profits may remain within the country	Any profit will be used within the city: the products will be for local use by the lower-paid people
	Waste materials provide raw materials for the informal sector	Uses local and waste materials

Figure 19.34

Differences between 'formal' and 'informal' sectors

transporters, builders, tailors, shoemakers, mechanics, electricians, plumbers, flower-sellers and many other activities. The [Kenyan] government have recognised the importance of these small-scale ***jua kali*** enterprises [Places 89] and a few commercial banks are beginning to extend loans to these new entrepreneurs who are themselves forming co-operatives. There are many advantages in developing these concerns. They use less capital per worker than larger firms; they tend to use and recycle materials that would otherwise be waste; they provide low-cost, practical on-the-job training which can be of great value later in more formal employment; and, as they are flexible, they can react quickly to market changes. Their enterprising spirit is a very important national human resource.'

Central Bank of Kenya

The governments of several developing countries now recognise the importance of such local ventures as Kenya's *jua kali* which, apart from creating employment, provide goods at affordable prices. India, for example, encourages the growth of co-operatives to help family concerns, under the 'Small Industries Development Organisation', by setting up district offices that offer technical and financial advice. Under its Development Plans, the manufacture of 600 products will be exclusively reserved for small firms and family enterprises.

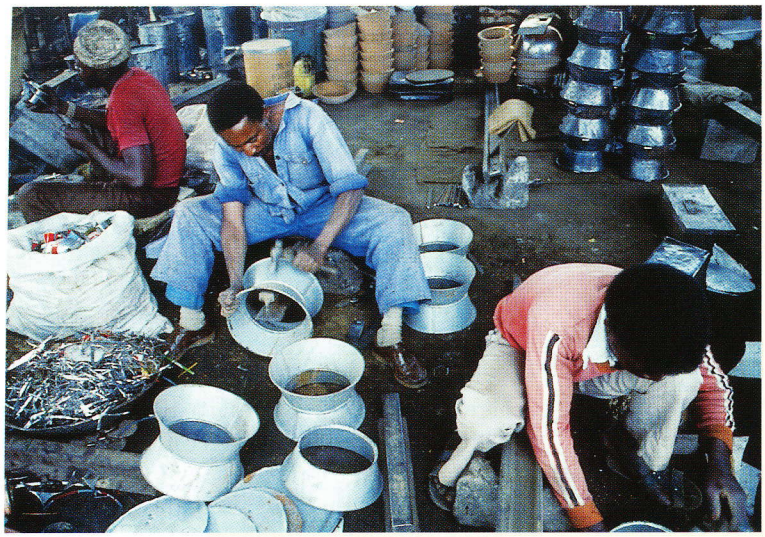
Children, many of whom may be under the age of 10, form a significant proportion of the informal-sector workers. Very few of them have schools to go to and, from an early age, they go onto the streets to try to supplement the often meagre family income. They may try to earn money by shining shoes or selling items such as sweets, flowers, fruit and vegetables.

Places 89 Nairobi, Kenya: *jua kali* workshops

Jua kali means 'under the hot sun'. Although there are many smaller *jua kali* in Nairobi, the largest is near to the bus station where, it is estimated, over 1000 workers create jobs for themselves (Figure 19.34). The plot of land on which the metal workshops have been built measures about 300 m by 100 m. The first workshops were spontaneous and built illegally as their owners did not seek permission to use the land, which did not belong to them. As more workshops were set up and the site developed, the government was faced with the option of either bulldozing the temporary buildings, as governments had done to shanty settlements in other developing countries, or encouraging and supporting local initiative.

Realising that the informal workshops created jobs in a city where work was hard to find, the government opted to help. The Prime Minister himself became personally involved by organising the erection of huge metal sheds which protected the workers from the hot sun and occasional heavy rain.

Groups of people are employed touring the city collecting scrap. The scrap is melted down, in charcoal stoves, and then hammered into various shapes including metal boxes and drums, stoves and other cooking utensils, locks and water barrels, lamps and poultry water troughs (Figure 19.35). Most of the workers are under 25 and have had at least some primary education. The technology



they use is appropriate and sustainable, suited to their skills and the availability of raw materials and capital. Most of the products are sold locally and at affordable prices.

It is estimated that there are approximately 600 000 people engaged in 350 000 small-scale *jua kali* enterprise units in Kenya. This figure needs to be compared with the 180 000 recorded as employed in large-scale manufacturing and the 2.2 million total in all areas of the non-agricultural economy. *Jua kali* form, therefore, a most significant part of the total employment picture.

Figure 19.35

Jua kali workshops

Intermediate (appropriate) technology

Dr E.F. Schumacher developed the concept of **intermediate technology** as an alternative course for development for poor people in the 1960s. He founded the Intermediate Technology Development Group (ITDG) in 1966, now renamed Practical Action, and published his ideas in a book, *Small is Beautiful* (1973). Schumacher himself wrote:

> 'If you want to go places, start from where you are.
>
> If you are poor, start with something cheap.
>
> If you are uneducated, start with something relatively simple.
>
> If you live in a poor environment, and poverty makes markets small, start with something small.
>
> If you are unemployed, start using labour power, because any productive use of it is better than letting it lie idle.
>
> In other words, we must learn to recognise boundaries of poverty.
>
> A project that does not fit, educationally and organisationally, into the environment, will be an economic failure and a cause for disruption.'

In 1988 the ITDG stated that:

> 'Essentially, this alternative course for development is based on a local, small-scale rather than the national, large-scale approach. It is based on millions of low-cost workplaces where people live – in the rural areas – using technologies that can be made and controlled by the people who use them and which enable those people to be more productive and earn money.'

These ideas challenged the conventional views of the time on aid. Schumacher said:

> 'The best aid to give is intellectual aid, a gift of useful knowledge ... The gift of material goods makes people dependent, but the gift of knowledge makes them free – provided it is the right kind of knowledge, of course.'

To illustrate this he quoted an old proverb:

> 'Give a man a fish and you feed him for a day; teach him how to fish and he can feed himself for life.'

The first part of this might be seen as the traditional view of aid where 'giving' leads to dependency. The second part, 'teaching', is a move in the direction of self-sufficiency and self-respect. Schumacher added a further dimension to the proverb by saying: 'teach him to make his own fishing tackle and you have helped him to become not only self-supporting but also self-reliant and independent'.

In most developing countries, not only are high-tech industries too expensive to develop, they are also usually inappropriate to the needs of local people and the environment in which they live. Examples of intermediate, or **appropriate technology** as it is now known (Places 90), include:

- labour-intensive projects; since, with so many people already being either unemployed or underemployed, it is of little value to replace workers by machines
- projects encouraging technology that is sustainable and the use of tools and techniques designed to take advantage of local resources of knowledge and skills
- the development of local, low-cost schemes using technologies which local people can afford, manage and control rather than expensive, imported techniques
- developing projects that are in harmony with the environment.

Places 90 Kenya: Practical Action projects

Practical Action (formerly known as ITDG – see page 576) is a British charitable organisation that works with people in developing countries, especially those living in rural areas, by helping them to acquire the tools and skills needed if they are to raise themselves out of poverty and meet the UN's Millennium Development Goals (page 609). Practical Action helps people to meet their basic needs of food, clothing, housing, energy and jobs. It also uses, and adds to, local knowledge by providing technical advice, training, equipment and financial support so that people can become, in Schumacher's words, 'more self-sufficient and independent' (page 576). Although Practical Action operates globally, the following examples are taken from Kenya. They are all:

- suitable for the local environment (local raw materials and climate)
- appropriate to the wealth, skills and needs of the local people.

1 Improved building materials include roofing tiles that are made from a mix of cement, sand and water (and sometimes a pigment if a different colour is required). They are left in their moulds for a day to cure (but not to dry), placed in a reservoir of water for a week and finally covered with plastic, as a protection against the hot sun, and allowed to dry slowly for three weeks. They are cheaper than commercially produced tiles, as they do not need firing, and lighter (Figure 19.36).

2 In another scheme, lime and natural fibres are added to soil to produce 'soil blocks'. Soil is important because it can be obtained locally, can easily be compressed and, once heated, retains its heat. Soil blocks are replacing the more expensive concrete blocks and industrially produced bricks.

3 Other projects have helped to improve ventilation and lighting in existing houses. Traditionally, most Kenyan women cooked on wooden stoves in houses that had no chimneys and few windows. The result was a smoky and unhealthy atmosphere. To reduce reliance on wood and charcoal, which may be difficult and/or expensive to obtain, and to improve living conditions, Practical Action has helped to train potters to produce two types of improved cooking stoves (Figure 19.37): the *mandaleo* for wood-burning stoves in rural areas, which are made from ceramic; and the *jiko* for charcoal-burning stoves in urban areas, which are made from recycled scrap metal, often in *jua kali* workshops (Places 89), to which potters add a ceramic lining. The new stoves, based on traditional designs, reduce smoke, improve women's health and pay for themselves within a month. They also reduce the amount of time rural families have to spend collecting firewood (page 543) and the cost that urban families have to pay for charcoal, and help to conserve a rapidly declining natural resource.

4 Practical Action has also helped the Maasai improve their houses. This has been done by adding a thin layer of concrete reinforced with chicken wire over the old mud roof; adding a gutter and downpipe which leads to a water barrel (saving a likely long trek to the nearest river, Figure 21.11); and adding a small window and chimney cowl to make the inside of the house lighter and less smoky, which improves health.

Figure 19.36
Roofing tiles

Figure 19.37
New cooking stoves

Newly industrialised countries (NICs)

Newly industrialised countries (NICs) is a term applied to a select group of developing countries that, over the last three or four decades, have sustained a high rate of economic growth (Figure 19.38). They have out-performed all the more developed countries, mainly due to their competitive edge in manufacturing. Although Brazil and Mexico were among the first NICs, most are located in eastern Asia. Encouraged by Japan's success, governments in other countries in Asia's Pacific Rim set out to improve their standard of living by:

- encouraging the processing of primary products, as this added value to their exports
- investing in manufacturing industry, initially by developing heavy industries such as steel and shipbuilding, and later by concentrating on high-tech products
- encouraging transnational firms to locate within their boundaries (many countries now have their own TNCs)
- grouping together to form ASEAN (Figure 21.34) to promote, among other aims, economic growth
- having a dedicated workforce that was reliable and, initially, prepared to work long hours for relatively little pay
- long-term industrial planning.

The term **'tiger economies'** was first given to Hong Kong, Singapore, South Korea and Taiwan because of their ferocious growth after 1970. This growth continued during the 1980s at a time when economic growth in the developed world was slowing down. Since then, Malaysia (the most successful, Places 91), Thailand and, to a lesser extent, Indonesia and the Philippines, have also emerged as NICs. The latest, and likely to be the largest if it maintains its present unprecedented rate of growth, is China (Case Study 19). China and India together have become known as the **emerging countries**.

Figure 19.38

Annual economic growth rate (%) – NICs in eastern Asia and the emerging countries

		1981–90	1991–2000	2001–05	2007
NICs	Hong Kong	7.1	4.7	4.3	6.8
	Indonesia	6.3	4.3	4.7	5.6
	Japan	4.1	1.3	1.4	2.7
	Malaysia	5.1	7.2	4.5	5.9
	Philippines	1.1	3.0	4.7	5.4
	Singapore	7.0	7.7	4.0	7.9
	South Korea	10.1	6.1	4.5	5.0
	Taiwan	5.2	6.5	3.2	4.7
	Thailand	7.6	4.5	5.1	5.0
Emerging countries	China	9.5	10.5	9.5	10.7
	India	3.1	4.5	5.1	5.0

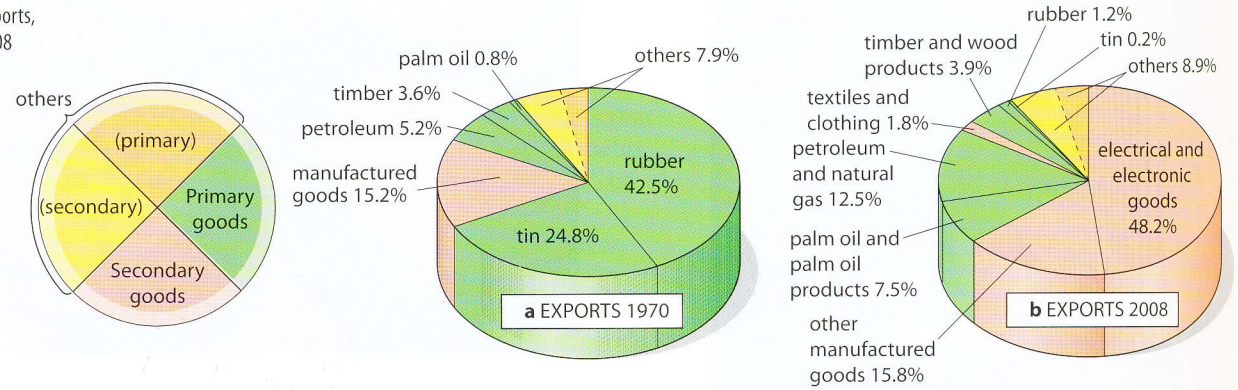
Places 91 Malaysia: a newly industrialised country

Until the 1980s, Malaysia's economy was based on primary products such as rubber and palm oil (Places 68, page 483), timber (Places 76, page 520), tin (Places 79, page 523) and oil (Figure 19.39a). The government at that time proclaimed its vision of Malaysia becoming a fully developed and industrialised nation by the year 2020. Since then the country has emerged as the leader of the second wave of Asian 'tiger economies', averaging – between 1990 and mid-1997 – an annual growth rate of 8 per cent. This allowed the World Bank to classify Malaysia as an 'upper middle income country', no longer a developing country. This was achieved without high inflation or unmanageable foreign aid.

Malaysia's economic development was based on its pivotal position as a gateway to ASEAN (Figure 21.34), it being a springboard to eastern Asia, its affordable land and liberal investment rules,

Figure 19.39

Malaysia's changing exports, 1970 and 2008



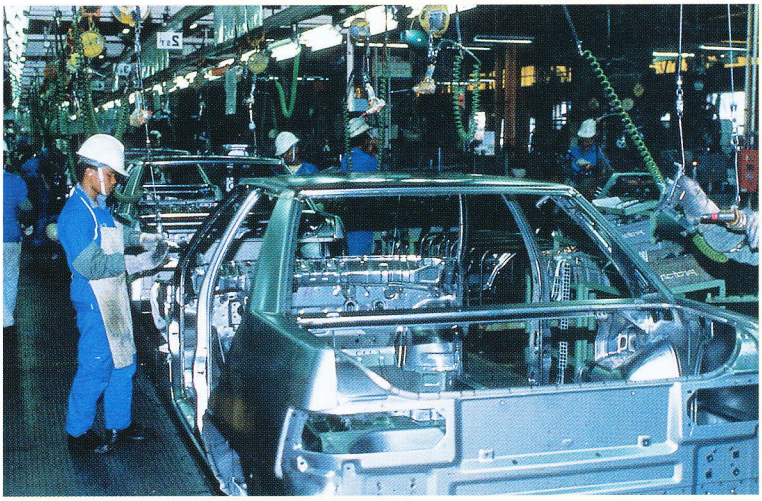


Figure 19.40
Car assembly (Proton)

and its encouragement, through tax incentives, for transnationals to locate there. The country's industrial strategy emphasised the development of high-value goods for the domestic market and export (e.g. cars) and the encouragement of high-tech industries (e.g. electronics – Figure 19.39b). In 1985, the government founded the Proton car company, initially in conjunction with Mitsubishi (Figure 19.40) and in 1995, the Perodua company, in partnership with Daihatsu.

During the 1980s and 1990s, industry was confined to specifically designed areas such as the new town of Shah Alam. This policy was good environmentally as only certain tracts of primary forest or farmland were used, but had the social disadvantage of concentrating jobs and development within a few core places (page 617 and Places 98). As firms newly locating in Shah Alam need not pay taxes for 10 years, then many of the world's better-known transnationals, together with Proton, located there.

The government had also, during the early 1990s, invested less money in industries that required large workforces and more in those where the emphasis was on technology. Its Technology Action Plan covered micro-electronics, biotechnology and information technology (Figure 19.41).

The Second Industrial Plan, which operated between 1996 and 2005, focused on the manufacturing sector and R&D (research and development), together with the integration of support industries. The plan concentrated on the production of electrical and electronic goods (including IT and multimedia), oleochemicals (from palm oil, timber and rubber), chemicals (petrochemicals and pharmaceuticals), transport equipment, machinery, and high-value textiles and clothing.

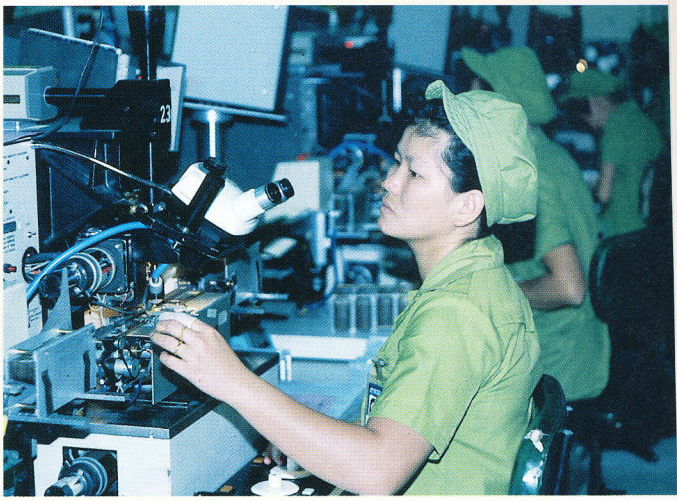


Figure 19.44
New high-tech industry, Penang

By the mid-2000s, an extensive road system linked Kuala Lumpur (the financial and commercial centre), Putrajaya (the new seat of government), Shah Alam (the industrial new town), Port Klang (the chief port) and Westport (with its new deepwater ocean terminal), Sepang (the new international airport) and Subang (the old airport now mainly used for domestic flights). The country had also completed a series of expensive 'prestige' projects including, in Kuala Lumpur, the twin Petronas Towers (1998), a three-line light rail transit system (LRT) and a 'linear city' (a 2 km long, 10 storey high structure comprising shopping malls, hotels, restaurants, apartments and offices).

The Third Industrial Master Plan (IMP3) is to operate between 2006 and 2020. Its main objective is 'to achieve long-term global competitiveness through transformation and innovation of the manufacturing and service sectors'. The government has targeted:

- six non-resource based manufacturing industries – electrical and electronics, medical devices, textiles and apparel, machinery and equipment, metals and transport equipment
- six resource-based manufacturing industries – petrochemicals, pharmaceuticals, wood-based, rubber-based, oil palm based and food processing
- eight services sub-sectors – logistics, business and professional, ICT, distributive trade, construction, education and training, healthcare and tourism.

The plan was introduced with a predicted average economic growth of 6.3 per cent per annum (compare Figure 19.38) and, during that period, a threefold increase in trade – but that was before the global recession of 2008.

19 Case Study — Special Economic Zones and open coastal cities in China

Opening up to the outside world

In 1979 the Chinese government made several monumental decisions including replacing the commune system with the responsibility system, initially in farming (Places 63, page 468) and then in industry, together with the implementation of both the one-child policy (Case Study 13) and the 'open-door' policy which allowed trade with the outside world. The following year, China established five **Special Economic Zones (SEZs)** in Shenzhen, Zhuhai and Shantou in Guangdong Province, Xiamen in Fujian Province and the whole of Hainan island (Figure 19.42). According to the *China Business Handbook*, the SEZs: 'integrate science and industry with trade, and benefit from preferential policies and special economic managerial systems intended to facilitate exports. The SEZs also offer preferential conditions to foreign investors by granting them more favourable rates than in inland areas, and relaxing entry and exit procedures for business people. SEZs aim to attract foreign investment, to import advanced techniques, keep up to date with trends and activity in international markets, to expand export trade, to stimulate foreign exchange earnings, to facilitate participation in international economic and technological co-operation, and to provide a training ground for scientific and technological personnel specialising in international economics and trade'.

In 1984, China opened 14 coastal cities to overseas investment. These **open cities** (Figure 19.42), as they are known, were given the dual role of being 'windows' opening to the outside world and 'radiators' spreading economic development inland in an export-oriented economy. The economic and technological development zones that were set up within these open cities became such hotspots for overseas investment that in 1985 the state decided to expand the SEZs and open cities to form one continuous coastal belt. Five years later, several additional open cities were created along the Yangtze River, as far as Chongqing (Figure 21.24). When the Pudong New Zone was established in 1990 it meant that, with Pudong acting as the 'dragon's head' (reflecting the shape of the river), a chain of open cities extended up the Yangtze Valley.

Pudong

The development of Pudong, along with Shenzhen, must rank as the world's fastest-growing area, with huge commercial, industrial and residential zones together with a modern transport system (Case Study 15B and Figure 19.44). Since Pudong's development was first announced in 1990, when it was little more than an area of padi fields, it has been a **New Open Economic Development Zone**. It has emerged, in less than two decades, as China's financial and commercial hub, being home to the Shanghai World's Financial Centre and the Shanghai Stock Exchange as well as the Lujiazui Trade and Finance Zone, the Waigaoqiao Free Trade Zone, the Jinqiao Export Processing Zone and the Zhangjiang Hi-tech Park. Perhaps the most spectacular feature of Pudong's growth, at least to the visitor, be it for business or pleasure, is the skyline viewed across the river from Shanghai itself (Figure 19.43). In 1990 the Chinese saw Pudong as the engine pulling Shanghai into position as a major international economic, financial and trade centre – a vision that seems to have been fulfilled.

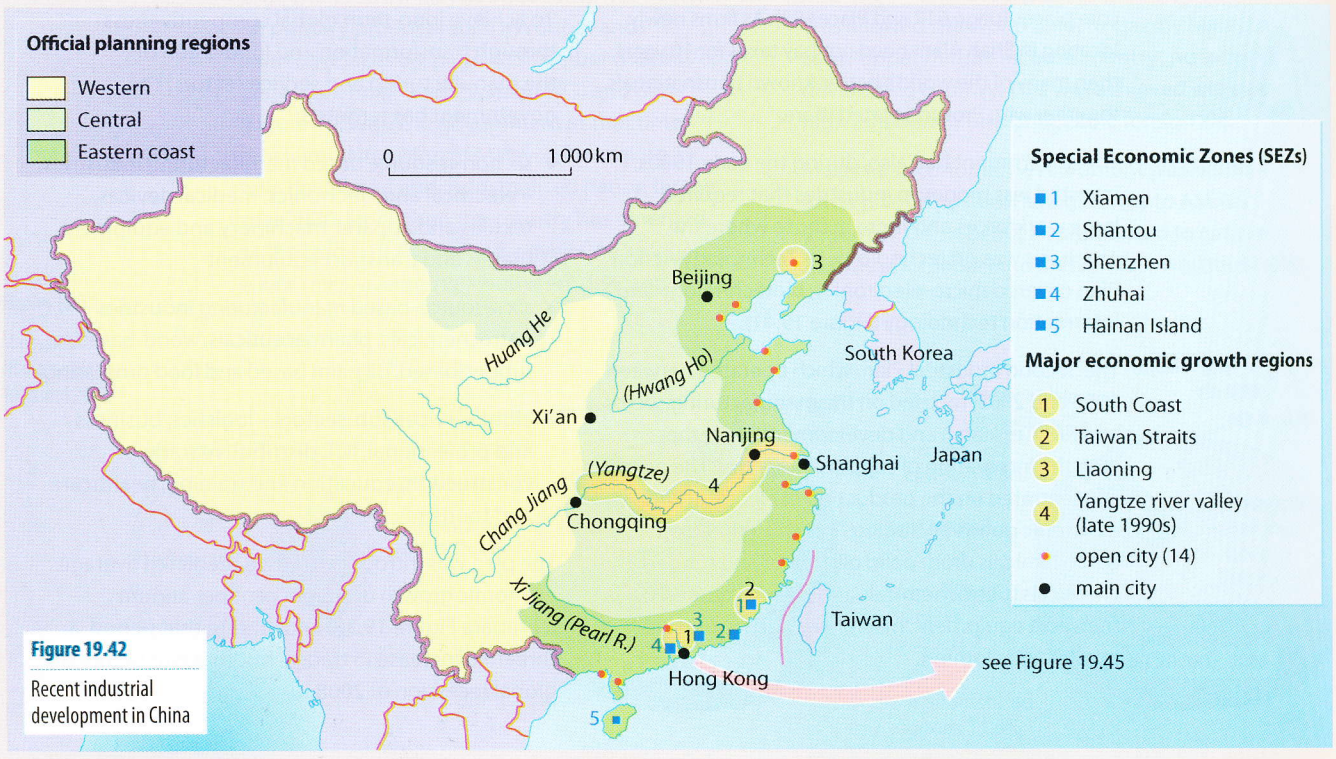


Figure 19.42 Recent industrial development in China

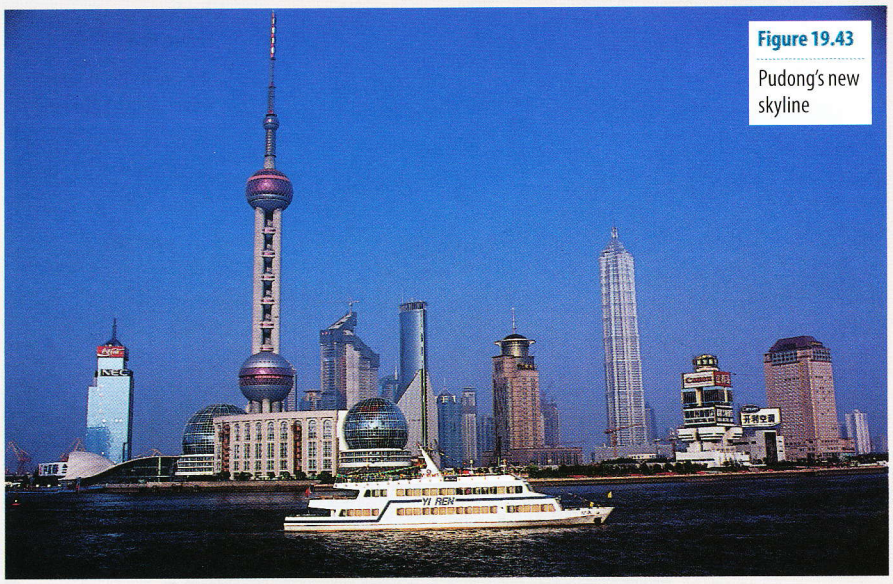


Figure 19.43 Pudong's new skyline

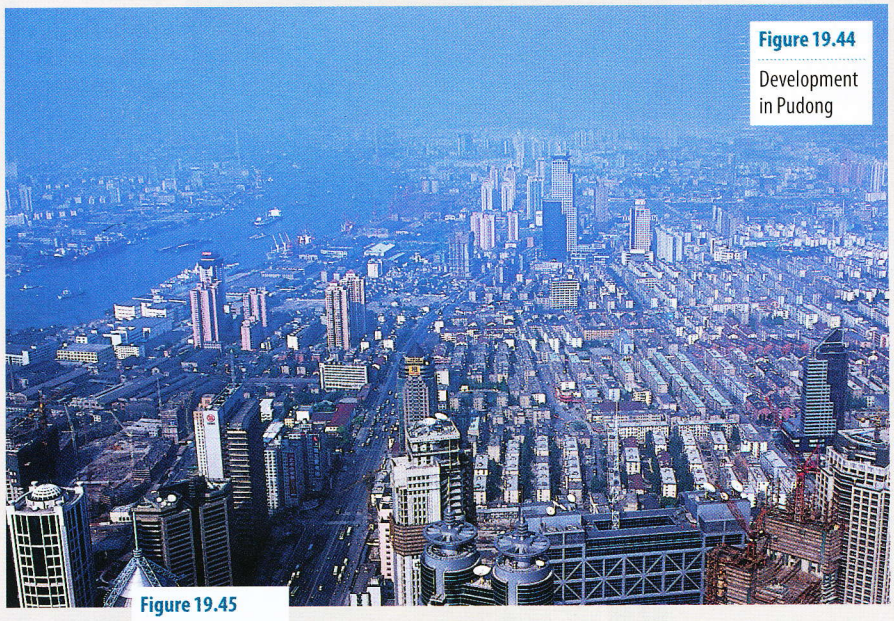


Figure 19.44 Development in Pudong

Figure 19.45 Shenzhen Special Economic Zone

Shenzhen

Before 1989, when it became a Special Economic Zone, Shenzhen was a group of small fishing villages surrounded by padi fields (Figure 19.47). It had a population of 20 000. By 1997, this population had risen to 3.8 million and by 2006 it was given as 8.46 million, making it the world's 27th largest city (Figure 19.48). The average age is under 30. The workforce can be divided into two polarised groups: those who have had a high level of education (20 per cent of China's PhDs are said to work here), and the majority, many of whom are migrants from surrounding rural provinces, with little education. Added to this are over 7000 daily commuters from Hong Kong.

Shenzhen was chosen as an SEZ due to its coastal location for trade, its deep natural harbours, its proximity to the financial and commercial centre of Hong Kong (then still a British colony and with which it has a similar culture), its plentiful supply of labour (which is adaptable but cheaper than in other Asian NICs) and its low land values (rents are half those in Hong Kong). It has benefited from financial incentives offered by the Chinese government and from over US$30 billion invested by overseas TNCs for the building of factories and in forming joint ventures. The SEZ comprises four of the seven districts (397 km^2) that make up Shenzhen (Figure 19.45). Nanshan (164 km^2), with its Science and Technology Park, is the focus for high-tech industries and foreign companies. Futian (78 km^2) is the trading centre and includes the Stock Exchange and the municipal government building. Luohu (79 km^2) is the financial and commercial centre with the new People's Bank of China. Yantian (76 km^2) is the centre for logistics as well as being China's second biggest and the world's fourth largest deepwater container terminal.

Since its inception, Shenzhen has focused on selective industries which include computer software, IT, microelectronics and components, video and audio products and electro-mechanical integration. More recently, new industries, such as pharmaceuticals, medical equipment and biotechnology, have grown rapidly. At present, electronics and telecoms equipment is the largest industry with, for example, over 100 million handsets for mobile phones being manufactured in 2007. There are over 200 R&D

Special Economic Zones and open coastal cities in China

organisations within the SEZ, many having strong links with inland universities. TNCs located here include Sanyo, Hitachi, Matsushita (all Japanese), IBM (American), Siemens (German) and Great Wall (China) together with, from the retail sector, over 5000 companies producing goods for Wal-Mart (Figure 19.46). Shenzhen has the largest manufacturing base in the world as well as being a powerhouse in the economy of China – and all in less than 20 years! But success rarely comes without its problems and Shenzhen has these in the form of an unreliable electricity supply, insufficient clean water, difficult disposal of waste and uneasy labour relations.

Figure 19.46
Wal-Mart's Shenzhen base

Figure 19.47
Shenzhen (1999) – this was all farmland in 1980

Wal-Mart is the world's largest retailer by far. In 2004, the company had 4900 stores worldwide and its 1.6 million sales assistants sold goods to some 138 million customers. But where do the products it sells come from? For many of the non-perishable consumer goods on the store shelves, such as toys, clothes and electronics, the answer is increasingly likely to be China. In 2004, Wal-Mart sourced US$18 billion worth of goods from China, representing 3 per cent of that country's exports. The huge sourcing operation is run from Wal-Mart's overseas procurement office located in Shenzhen in the southern Guangdong province, from which the retailer has established ongoing supply relations with over 5000 local companies. Individual companies can do huge amounts of business with Wal-Mart. Guangdong's Yili Electronics Group, for example, started supplying hi-fi systems in 1995, and now supplies Wal-Mart with over US$200 million worth of goods each year, accounting for half its sales.

Wal-Mart sources its goods from China because labour costs there are just 4 per cent of those in the USA. This means that a product can be manufactured in China, packaged, shipped around the world, sold to American or European consumers and still return a decent profit for both manufacturer and then retailer [page 643].

Adapted from *Economic Geography* (Blackwell, 2007)

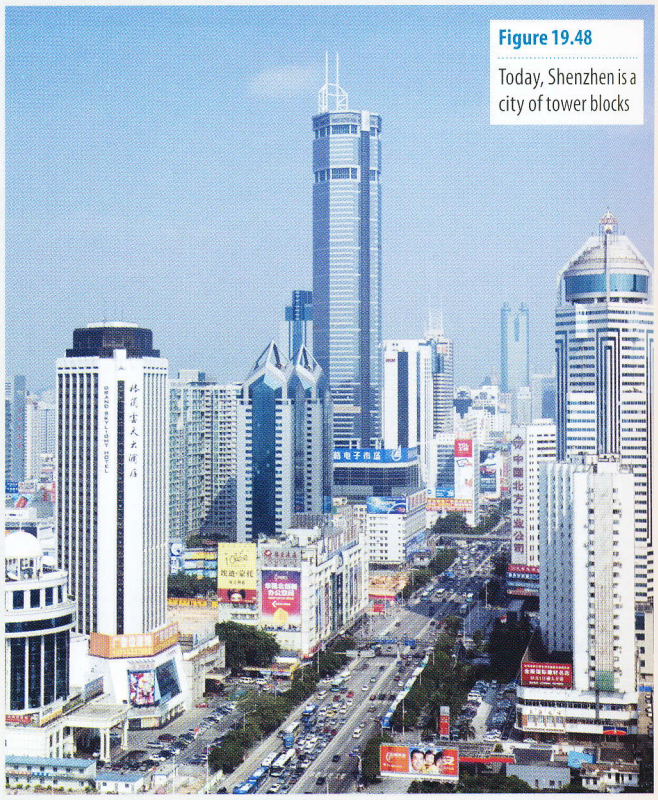


Figure 19.48
Today, Shenzhen is a city of tower blocks

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Questions & Activities

Activities

1 **a** **i** What is 'manufacturing industry'? *(1 mark)*

ii 'With the shift from an industrial to a post-industrial society it is sometimes unrealistic to try to draw clear boundaries between "manufacturing" and "services".'

Explain the problems that led to this statement. *(2 marks)*

iii Explain why the proportion of the UK's population in secondary employment has fallen so sharply in recent years. *(6 marks)*

b The number of people employed in manufacturing has not fallen evenly across the country.

i Name an area where a loss of manufacturing jobs has caused a serious local unemployment problem. *(1 mark)*

ii Explain what caused the loss of manufacturing jobs in that area. *(3 marks)*

iii Describe a strategy that has been used to create new employment opportunities in that area. Assess the success of the strategy. *(6 marks)*

c The gender structure of the workforce in the UK has changed rapidly since 1960. Describe and account for the changes. *(6 marks)*

2 **a** **i** What are 'high-tech industries'? *(2 marks)*

ii It has been noted that firms involved in high-tech industries often have two quite distinct parts to their operations. These are:

- research and development
- mass manufacturing.

Suggest why these two separate parts of the industry often locate in different places. *(3 marks)*

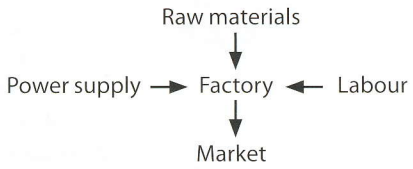
b **i** Name **one** area where a concentration of research and development centres for high-tech industry has developed. *(1 mark)*

ii Explain why the area you named in **i** is attractive to this industry. *(9 marks)*

c **i** Name **one** area where mass production for the high-tech industry has developed quite separately from research and development. *(1 mark)*

ii Explain why the area you named in **c i** is attractive to this industry. *(9 marks)*

3 **a** Study the diagram below. It shows some of the factors that influence the location of manufacturing industry.



Give **one** example of an industry where the most important factor influencing its location is:

i raw materials

ii power supply

iii labour supply

iv access to market.

For each example you have given, explain why that factor is so important. *(12 marks)*

b **i** What is meant by:

- footloose industry?
- greenfield site?

ii Name an example of a footloose manufacturing industry that has located on a greenfield site. Suggest why that site was a suitable location for that industry. *(5 marks)*

c **i** What is 'inward investment'? *(1 mark)*

ii Choose an example of a factory that has been built by a foreign-based company investing in the UK. Suggest why that company chose to invest in the UK, and why that particular location was suitable for its investment. *(7 marks)*

Exam practice: basic structured questions

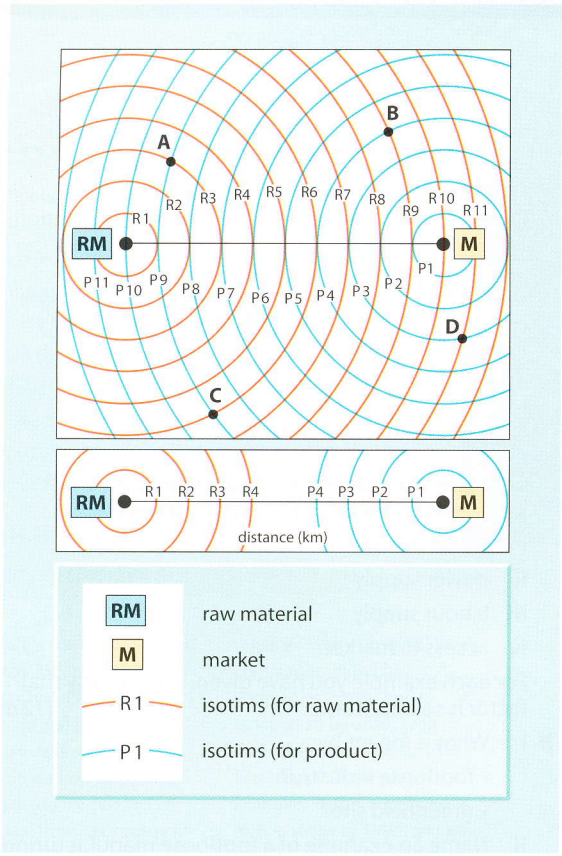
4 **a** **i** Name a region in the UK that has suffered unemployment as a result of the decline of its traditional manufacturing industry. *(1 mark)*

ii Explain why the traditional industry developed in that area and then declined. *(8 marks)*

iii Describe the other social and economic problems that are found in that area as a result of the unemployment that followed the decline of the traditional industry. *(6 marks)*

b The government has developed several policies to try to attract new industry into regions that have suffered the loss of their traditional industry.

Choose any such government initiative, and describe how it has affected any one area. Assess how successful the initiative has been in attracting new industry. *(10 marks)*



Site	Total transport costs if the raw material is pure	Total transport costs if the raw material is gross and loses 50% of its weight during manufacture
A		
B		
C		
D		

Figure 19.49

5 **a** In the Weber model of industrial location, what is the 'least cost location'? Explain why it is important. *(3 marks)*

b Show, with the aid of diagrams, how the least cost location in Weber's locational triangle may be:

i near to the raw material

ii near to the market

iii midway between the raw material and the market. *(6 marks)*

c Study Figure 19.49, which shows an area with one raw material and one market. Assume two different situations:

X – the raw material is pure

Y – the raw material loses 50 per cent of its weight during manufacture.

i Complete a copy of the table above to show the total transport costs (in tonne km) for an industry located at each of the sites A – D. *(4 marks)*

ii For each situation, X and Y, describe the least cost location.

Give reasons for your answer. *(6 marks)*

d How useful is Weber's model to an understanding of modern industrial location? Justify your answer. *(6 marks)*

6 **a** **i** Describe **three** differences between the formal and the informal economic sectors in economically less developed countries. *(6 marks)*

ii Explain why *jua kali* workshops are very important in Kenya's economy. *(6 marks)*

iii 'If governments wish to encourage development that will benefit the poorer sections of the population, one of the most important actions they can take is to reduce the rules and regulations which hinder the development of the informal economy.'

Suggest why this is seen to be important. *(4 marks)*

b Discuss the advantages and disadvantages for less economically developed countries of investment by transnational companies. You should make specific references to one or more countries that you have studied. *(9 marks)*

7 **a** In Myrdal's model of industrial location he referred to 'cumulative causation' which is also sometimes called 'the multiplier effect'. What does this term mean? *(4 marks)*

b With reference to the industrialisation of **either** South Wales in the late 19th and early 20th centuries **or** any other region with which you are familiar, explain how cumulative causation helped to cause the development of industry. *(10 marks)*

c Myrdal realised that as some areas industrialise this may cause a 'backwash effect' on other regions in the country. He named the areas that were affected 'the periphery'. Explain:

i the 'backwash effect' *(3 marks)*

ii the 'periphery' of a country or region. *(3 marks)*

d Name an area which could be regarded as part of the economic periphery in a country or region that you have studied.

Describe the features that make this area part of the economic periphery. *(5 marks)*

Exam practice: structured questions

8 **a** Discuss the problems that have been caused by a high concentration of employment in a small number of industries in the UK. *(10 marks)*

b Explain how one or more government initiatives have been used to try to broaden the base of employment. *(15 marks)*

9 Study Figure 19.50.

a Referring to Figure 19.50 and your own knowledge, explain why India has become a major centre of automobile manufacture. *(10 marks)*

b Discuss the extent to which the recent growth of India's manufacturing and service economy have depended on investment by transnational corporations (TNCs). *(15 marks)*

The market for cars in India is growing so quickly that it seems likely that it will overtake China's sales totals soon. Sales of passenger cars increased by 12.17% to 1.5 million in the year to March 2008.

India's car industry is concentrated in the region around Pune, Maharashtra. Plans are that the Pune region will employ 25,000 people in car making in two years.

Volkswagen, General Motors, Tata Motors, Mercedes-Benz, Fiat and Peugeot already have plants there and the local Development Corporation is in discussions with four or five other major international companies seeking land for new factories. The cost of building a factory here is cheaper than almost anywhere else in the world.

But huge savings are made on manpower – with manual workers in India paid about £1.30 a day. As a result, major car makers are considering using their India plants for export, both for finished cars and components. GM has said it wants to make India an export hub for small and mid-sized cars destined to be sold in other emerging markets and Hyundai plans to make India the sole production centre for its new I20 model, even though it will not be sold domestically.

Figure 19.50

10 Study Figure 19.51. It shows details of solar cookers, an example of appropriate technology.

a Describe the solar cookers shown here and explain why they are good examples of appropriate technology for use in developing countries of Africa and Asia. *(10 marks)*

b With reference to one or more examples, explain how appropriate technology can be used to improve the quality of housing in developing countries. *(15 marks)*

11 **a** Describe the main features of Myrdal's theory of cumulative causation. *(10 marks)*

b With reference to a named peripheral region in a country outside the UK:

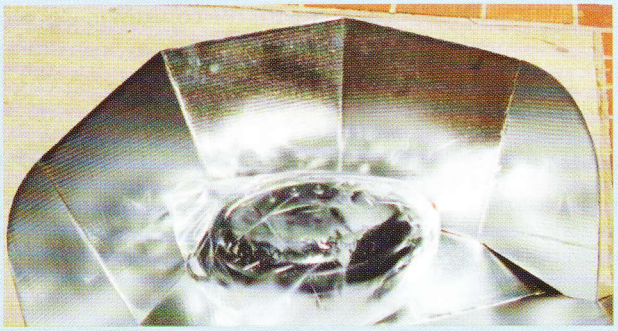
i explain the problems that have been caused by its peripheral position *(5 marks)*

ii describe one scheme that has been tried in an attempt to overcome these problems, and evaluate its success. *(10 marks)*

Figure 19.51
Solar cookers

Box cookers
Box cookers cook at moderate to high temperatures and often accommodate multiple pots. Worldwide, they are the most widespread. There are several hundred thousand in India alone.

Curved concentrator cookers
Curved concentrator cookers cook fast at high temperatures, but require frequent adjustment and supervision for safe operation. Several hundred thousand exist, mainly in China.



Panel cookers
Panel cookers are simple and relatively inexpensive to buy or produce. Solar Cookers International's 'CooKit' is the most widely used combination cooker.

Exam practice: essays

12 Changes in technology during the past 30 years have had a major effect on industrial location throughout the world.

Describe the major changes. Explain why they have taken place and how they have affected the location of industry. *(25 marks)*

13 Assess the importance of transnational corporations in the development of the global pattern of industrialisation in the late 20th and early 21st centuries. You should refer to their effect in both more and less economically developed countries. *(25 marks)*

14 Account for the development of the 'tiger economies' of South-east Asia and discuss the extent to which they can be seen as models for the development of the economies of other developing countries. *(25 marks)*