European Foundation for the Improvement of Living and Working Conditions

Trends and drivers of change in the European automotive industry: Mapping report

emcc european Monitoring Centre on Change

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Introduction

This report seeks to provide a general picture of the European automotive industry, covering all 25 EU Member States and the three candidate countries of Bulgaria, Romania and Turkey. It looks at the industry's strengths and weaknesses, and offers a brief analysis of the drivers of change and the resulting trends in work organisation, technology and employment. Various aspects of these trends and drivers will be picked up in the accompanying regional cluster and company case studies.

The geographical distribution of the main car assembly plants is shown on the map in the **Annex**[1]. A similar geography can be shown for the main engine and transmission plants, and for the plants of major suppliers. The map also indicates the scale and distribution of investment in EU Member States, particularly in the Czech Republic, Hungary, Poland, Slovakia and Slovenia, which joined the EU on 1 May 2004, and in the two candidate countries, Turkey and Romania.

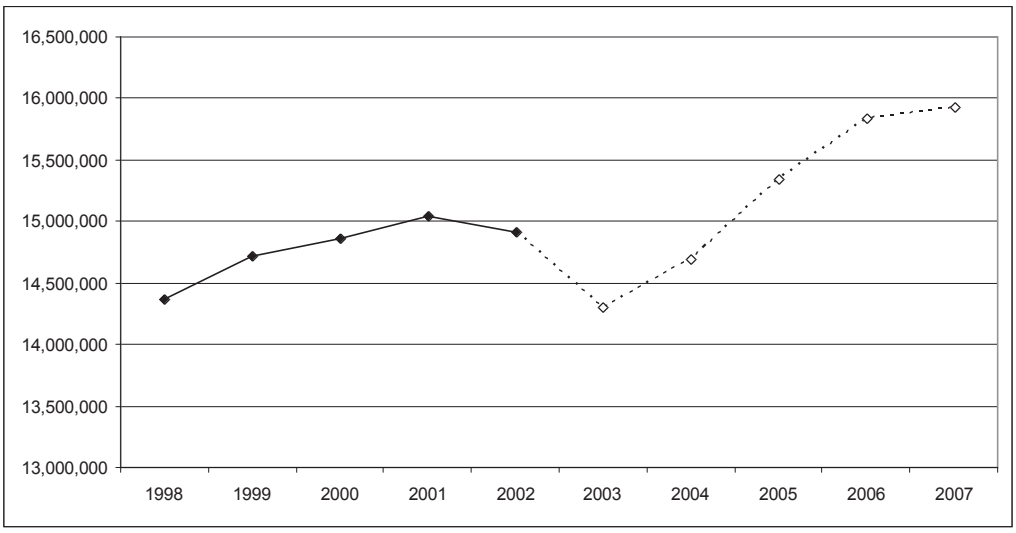
Present context [2]

Economic situation

Over the past five years, there has been a slowdown in economic output across the EU, and, while the forecasts are positive, modest growth of 2.0%-2.3% is expected in 2004.

Weak growth has led to reduced consumer and business confidence. Industrial production has decreased, including the production of durable consumer goods. Levels of private consumption have fluctuated during early 2003, following modest growth in the previous two years. This is partly due to poor labour market conditions, with EU unemployment rising during 2003. Economic indicators are weak in some major EU economies such as Germany, France, Italy and Spain. Only the United Kingdom (UK) has managed to resist these trends. Figure 1 shows the recent trends and forecasts.

Figure 1: *EU vehicle production and forecasts*



Source: *J.D. Power, LMC Forecasting.*

[1] This map is also available with interactive functions on the **emcc portal**, providing basic statistics for each country, such as production volume and employment in vehicle manufacturing and trade, as well as showing the model production at each site.

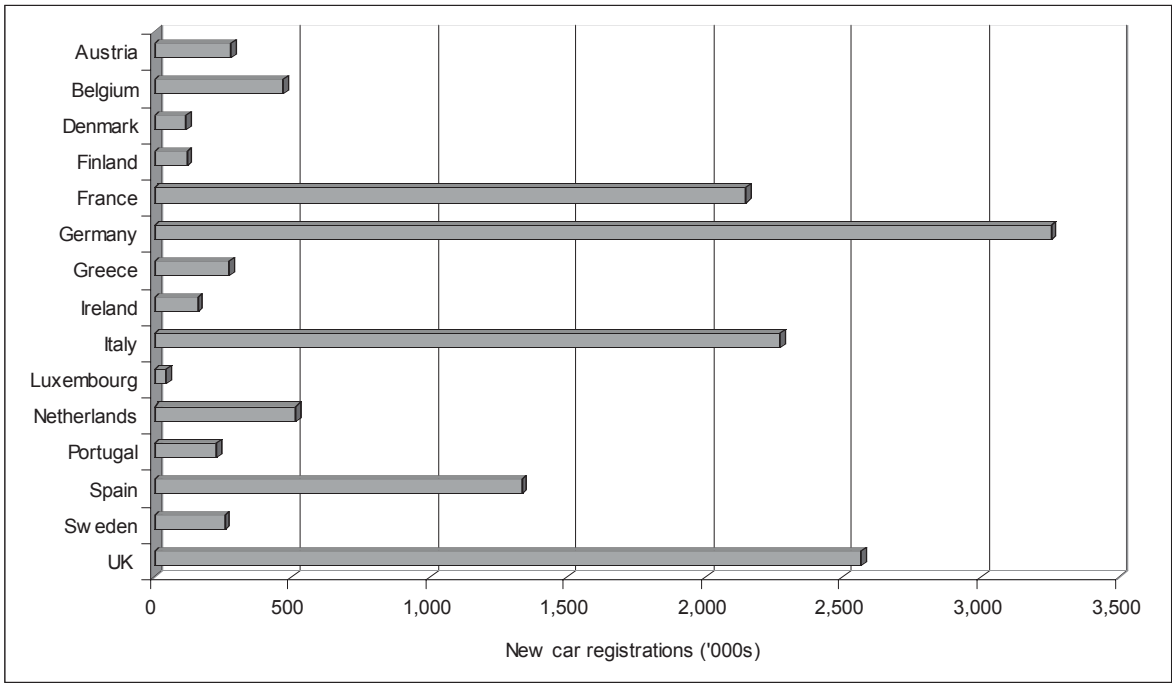
[2] Based on the *European Union Economic Report* established by the European automobile manufacturers association (*Association des Constructeurs Européens d'Automobile, ACEA*) in June 2003.

As can be seen, production fell in 2002, and will continue to fall in 2003 but, thereafter, may recover and achieve higher production levels.

Production

In 2002, global production of motor vehicles (passenger vehicles plus light and heavy trucks) was just over 59 million units. The main vehicle producing areas are Asia-Pacific, including Japan and Korea (19.3 million), western Europe (17.4 million) and North America (16.8 million). These areas are also the largest markets with sales figures in the same year of 14.2, 16.7 and 19.9 million respectively. The pattern of new car registrations in the EU15 is shown in Figure 2. The growing importance of production should also be noted in the Czech Republic, Hungary, Poland, Slovenia, Slovakia and Turkey. These are the main vehicle producing states in eastern Europe, with a production of 1.7 million cars in 2002 and sales of 1.2 million units.

Figure 2: *New car registrations in the EU in 2002*



Source: *VDA, Annual report of the automobile industry, 2003.*

The industry is organised globally, with production dominated by large firms and groupings. The largest 10 companies and groupings account for almost 83% of global car production, and the six major groups – General Motors, Ford, Toyota, DaimlerChrysler, Volkswagen and Renault-Nissan – account for two thirds of it.

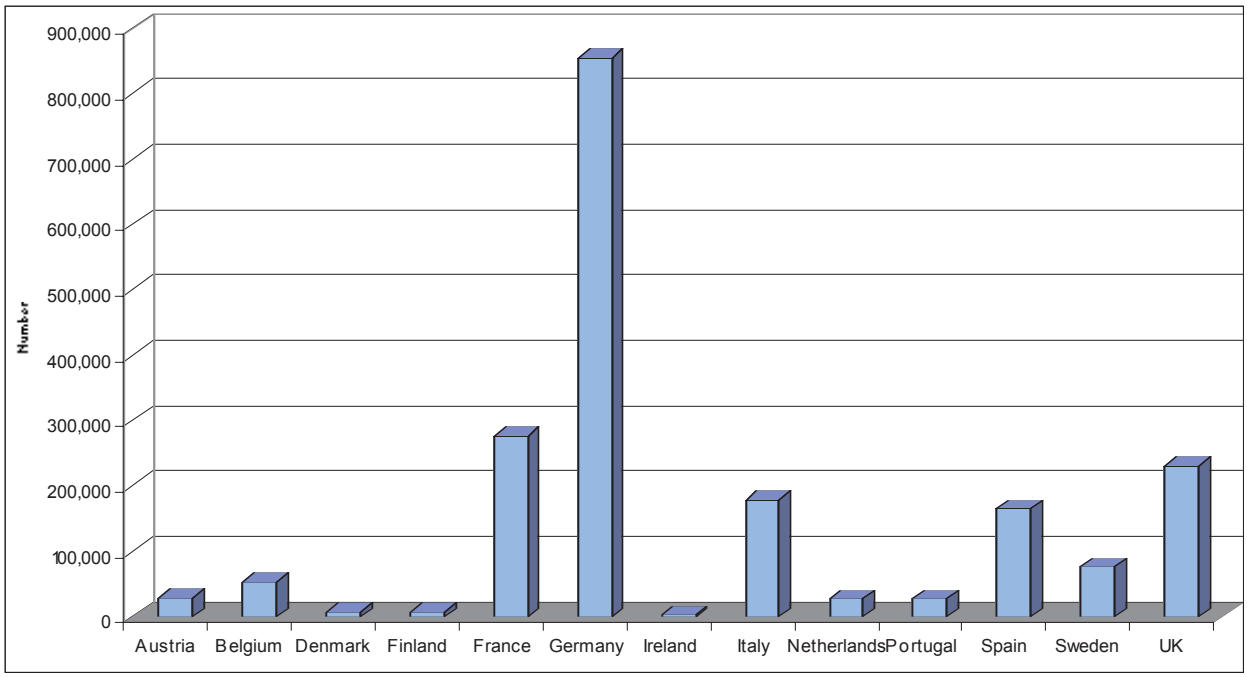
European market

The European market is highly competitive with about 40 manufacturers offering products. This is a greater number than in the other main markets. The automotive industry is a vital part of the European economy, making a positive contribution to the trade balance in 2002 of €30.9 billion with exports of €50.8 billion and imports at €28.9 billion (ACEA, 2003). The largest trade surplus is with the United States (US), totalling €3.7 billion in the first two months of 2003, and the largest deficit with Japan, amounting to €1.2 billion for the same period.

Employment situation

Employment is also significant. In western Europe (EU15) in 2002, there were 1.94 million people employed in the manufacture of motor vehicles and trailers, representing about 6% of all manufacturing employment. The breakdown of this figure across the EU15 is shown in Figure 3.

Figure 3: *Employment in motor vehicle manufacturing by Member State (EU15)*

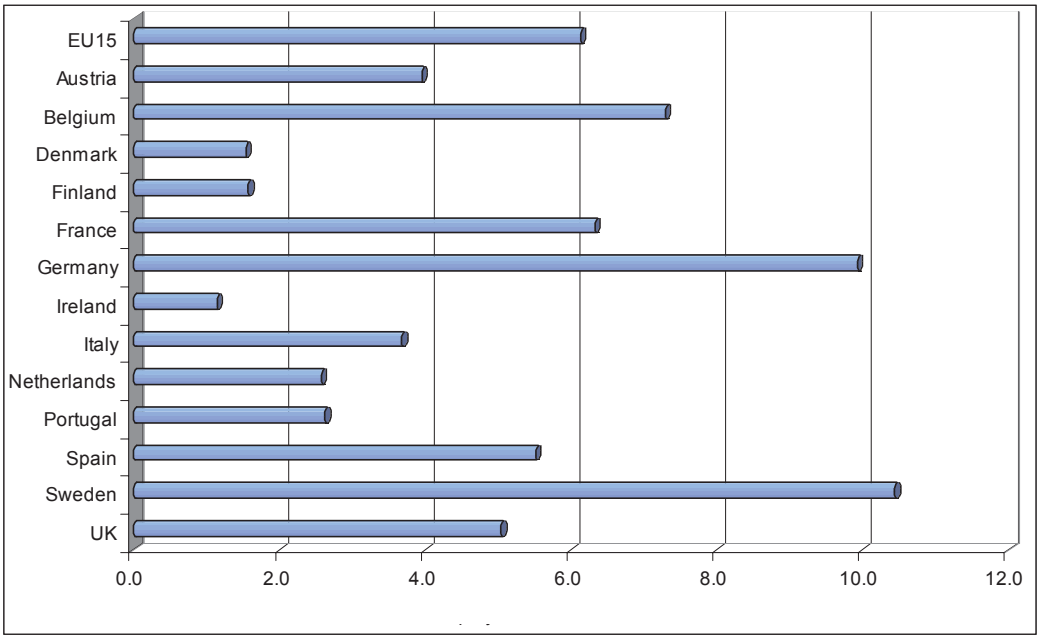


Source: *Eurostat Datashop.*

The largest number of people (856,000 or 44% of the EU15 total) were employed in Germany, followed by France (277,000 or 14%), the UK (231,000 or 12%), Italy (179,000 or 9.2%) and Spain (166,000 or 8.5%). These five account for 87.9% of employment in automotive manufacturing in the EU15. According to the 2002 figures from the International Labour Organisation (ILO), the total number of people employed in the EU25 is just under 2.2 million.

Figure 4 shows the number of people employed in motor vehicle manufacturing as a proportion of the manufacturing industry as a whole. The largest percentage is in Sweden, where the figure is just over 1 in 10. The next largest proportion is in Germany (9.9%), Belgium (7.3%) and France (6.3%). In Italy, Spain and the UK, the numbers employed in the sector are below the 6% average for the EU15.

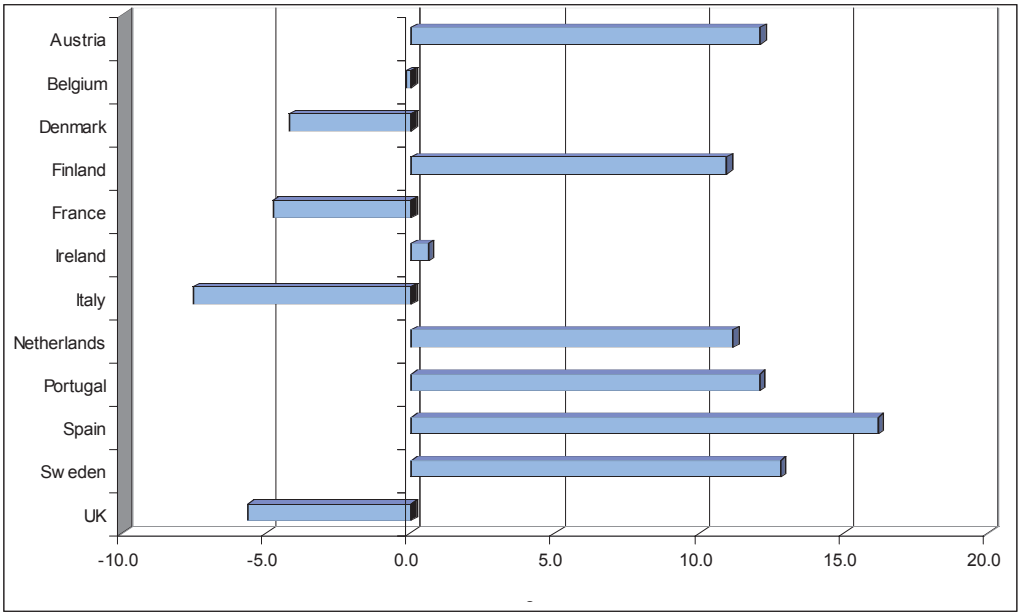
Figure 4: *% of manufacturing industry employed in vehicle manufacturing*



Source: *Eurostat Datashop.*

Figure 5 shows the changes that have taken place in manufacturing employment figures over the five-year period 1996-2000. Unfortunately, it does not include Germany as total figures and data are not available. In the 12 EU countries for which data are available, employment fell by 0.1% to 1.1 million people employed in the manufacturing industry. The largest increase was in Spain where employment levels rose by 16.2%. Employment also grew in Sweden (12.8%), Austria and Portugal (both 12.1%), the Netherlands (11.2%) and Finland (10.9%). Levels fell in three of the largest vehicle manufacturing countries: Italy (-7.5%), the UK (-5.6%) and France (-4.8%).

Figure 5: *Changes in motor vehicle manufacturing employment from 1996-2000 (%)*



Source: *Eurostat Datashop.*

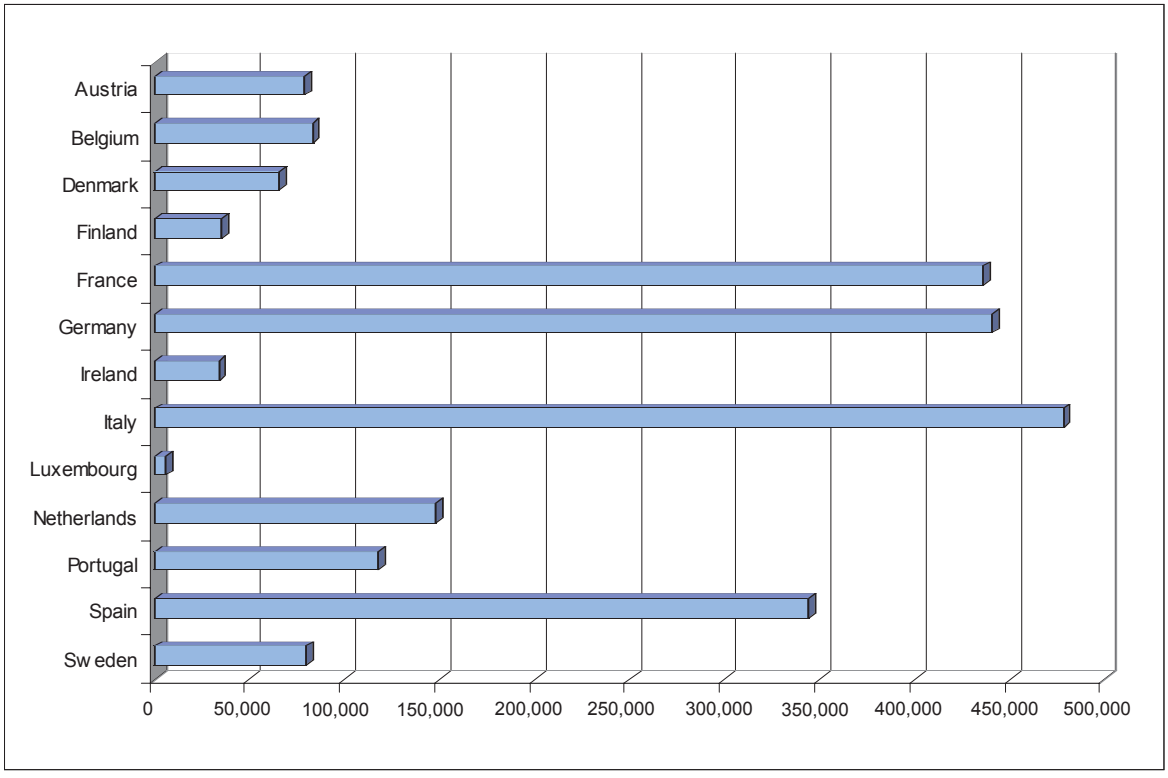
Figures for total employment in production, including component manufacture, are less easy to obtain. The members of the European Association of Automotive Suppliers (CLEPA) constitute a total employment of just over two million. They estimate that about three jobs among suppliers support each job in vehicle manufacturing - giving a figure of some 3 to 3.5 million (interview with Mr Bergner, Chief Executive of CLEPA). The overall trend is a decrease in direct employment in vehicle manufacturing and an increase among the major suppliers.

Figures are also available for the post-manufacturing ('downstream') side of the motor trade. This covers vehicle distribution, sales and repair, parts and fuel retail. In 2000, 2.9 million people were employed in the motor trade industry in the EU, excluding Greece and the UK (see Figure 6).

The European Council for Motor Trades and Repairs (CECRA) gives the following statistics, illustrating the scale of the downstream sector and its economic importance:

- 280,000 sales and repair enterprises, 2.2 million employees, €400 billion turnover;
- 110,000 fuel businesses, 440,000 employees and approx. €250 billion turnover.

Figure 6: *Numbers employed in the motor trade industry*



Source: *Eurostat, 'The motor trade in the EU', Statistics in Focus, 2002.*

Drivers of industry trends

Over the last decade, the industry has experienced major organisational change. In addition, there have been major changes to manufacturing and vehicle technology (see MacNeill *et al*, 2002). The main drivers are global competition, the growth of the supply industry, legislation and consumer demand.

Competition

Intense competition requires operations to be carried out with maximum efficiency. The key is large-scale production to reduce the value of fixed costs per vehicle. With increasingly sophisticated vehicles and rising investment costs, the optimum economic scale increases (Rees, 1999). Companies have sought to achieve economies by maximising volumes and standardising parts across their model ranges. The outcomes are investment in high capacity, an on-going trend towards mergers and acquisitions, and a rising number of cooperative ventures, for example, sharing research and development (R&D) costs (EUCAR, 2000).

Consolidation of car makers

Throughout its history, the automobile industry has undergone mergers and acquisitions (M&As). Recent M&As include the control of Chrysler (1998) and Mitsubishi (2000) by Daimler-Benz; the purchases of Jaguar (1989), Volvo (1999) and Land Rover (2000) by Ford; and of Seat (1986) and Skoda (1990) by Volkswagen, plus the alliance between Renault and Nissan (1999). Manufacturers have also used M&As to enter expanding markets such as Korea, for example Renault's purchase of Samsung (2000), General Motor's purchase of Daewoo (2003), and DaimlerChrysler's 20% stake in Hyundai. Some analysts predict that only six global producers will survive: two in Europe, two in Japan and two in the US. This prediction is fast becoming true in Japan and the US, but Europe still retains six major car and five major truck producers.

Cooperation

Not all consolidations have been successful (*Automotive News*, 3 November 2003). The best-known recent failure is probably the BMW purchase of Rover in 1994 that ended in 2000. The jury is still out on some others. For example, the share value of DaimlerChrysler is currently less than that of Daimler-Benz before the merger. Some, however, have been successful, such as the Seat and Skoda purchases by Volkswagen and the Renault-Nissan alliance. Alternative strategies, such as alliances on particular models or engines, are also emerging. Examples include the cooperation between Peugeot-Citroën and Toyota to build a new small car in Kolin in the Czech Republic; or that between General Motors and Fiat to share platforms and engine and transmission operations. Peugeot-Citroën is also working with Fiat on passenger vans, and with BMW on engines. It may be that a web of cooperative ventures will become a prevalent pattern for European car assemblers.

Overcapacity

Manufacturers plan capacity to achieve economies of scale. In western Europe, there is an estimated car capacity of 18.8 million (Rees, 1999) against production of 15.2 million in 2002. Companies are often over-confident in sales predictions. Fiat, Ford and General Motors' subsidiary Opel have all seen sales fall over the last few years. This has resulted in cutbacks including plant closures and almost 45,000 lay-offs or redundancies. General Motors has closed the Luton factory (UK) and reduced production at Antwerp (Belgium) and Bochum (Germany) with lay-offs totalling 20,000. Ford has closed five out of 11 European plants, ended car production at Dagenham (UK) and closed a shift at Genk (Belgium), resulting in 3,000 redundancies. Ford is now operating at above 90% capacity in Europe.

Optimism about new markets has led to investments in emerging markets, which have so far refused to materialise. For example, predictions of Brazilian annual production at 2.5 million vehicles and sales of 4 million units have not been realised, with an actual production of 1.5 million and sales of 1.6 million in 2002. Similar investments are being made in other markets, such as China and in the new EU Member States. The continued investment in capacity makes it more difficult for western Europe to export its surplus.

The capacity issue has a strong influence on industry economics as vehicle prices are calculated on forecast capacities and reduced capacity means higher unit costs. Vehicle makers, therefore, often attempt a balancing act where a proportion of the excess is discounted heavily through the dealerships. Another outlet is through cut-price deals to the hire and leasing industry.

However, the picture is complex. Excess capacity in some plants is mirrored by shortages elsewhere. Volvo, another part of Ford, is expanding production in its Ghent plant (Belgium) and taking on 800 additional workers. Others suffer from capacity shortages when sales are high. Peugeot-Citroën, for example, on the basis of two shifts, is operating at 117%. Another success story, BMW's Mini production (UK), is running at maximum for the plant. Also, some spare capacity is necessary – as shown by Volkswagen's ability to shift Polo production from Bratislava in the Czech Republic to Spain when sales of the Touareg SUV (sports utility vehicle) exceeded forecasts.

Lean manufacturing

In Europe, the drive for efficiency was, originally, thought best addressed through automation. However, at the time (1980s), the reliability and accuracy of robots was insufficient to meet the challenge of matching Japanese quality. To face this challenge successfully, the best approach consisted of a better work organisation and the adoption of the Japanese model of 'lean manufacturing' (Womack *et al*, 1990). This seeks to reduce waste through the best possible utilisation of resources including:

- human resources – through better work organisation, teamwork, flexibility and devolved responsibility;
- capital investment – by maximising machine and factory utilisation, and reducing 'dead' resources tied up in stock by means of a 'just-in-time' delivery system;
- factory space – by organising production based on a logical flow of materials;
- materials – by ensuring high 'right first time' quality and minimising waste.

The system of just-in-time parts delivery has transformed the organisation of the supply industry. Logistics and material movement has become a skill in itself with the growth of firms that specialise in the field, and that are increasingly taking over functions previously undertaken by car manufacturers, such as the delivery of components to the production line. Secondly, the efficient use of human resources has seen the integration of quality control and maintenance into the assembly process. This has meant the removal of a number of separate job functions and the introduction of flexible working. Efficiency gains have enabled a reduction in the time to produce a car from 37 hours in 1990 to around 24 hours today (Nelissen, 2002).

The supply industry

Another major development has been the restructuring of the supply industry and the growth of major 'mega-suppliers'. As outlined above, the supply industry is a major employer. The 'lean' paradigm has brought about major changes in working practices and organisation at all levels.

Outsourcing

As car makers seek to cut costs, they outsource more and more to the supply industry. This externalises a proportion of fixed (overheads) and variable (materials) costs, and shares the risk for new developments. Outsourcing also allows greater economies of specialisation and scale, since suppliers are more experienced in certain functions and can supply several carmakers. Some manufacturers have sold off their in-house component companies in order to concentrate resources and raise funds (General Motors and Ford's two component arms became Delphi and Visteon, respectively).

Vehicle manufacturers have also devolved responsibility for logistics and stock control. They try to deal directly with a few large suppliers who purchase individual parts from the large base of small sub-assembly and single component suppliers (Volpato, 2002). For maximum efficiency, the whole supply system needs to be lean. Each company in the

value chain is required to organise logistics to buy, make and sell components 'just in time', and to minimise costs through flexible working and the elimination of waste. This has had the following effects:

- a rapid growth in value of the supply industry from €530 billion in the late 1980s to well over €1,000 billion today and the growth of large 'mega suppliers';
- a very high technological base among the large suppliers; in this, Europe has a strong lead;
- up to 60% of the value of a new car coming from suppliers;
- pressure to reduce costs on the network of small and medium-sized enterprises (SMEs) that make up the lower links in the supply chain – many of which have gone out of business;
- outsourcing of design and engineering functions, leading to growth in companies which offer high value-added services. Examples include Pinin Farina, Bertone (Italy), Mayflower, Prodrive, Ricardo (UK) and AVL (Austria); again, Europe has a strong lead in this area.

Consolidation of suppliers

The above process as well as the logic of scale has led to major consolidations in the supply industry. The top 10 suppliers with ownership and annual sales are: 1. Delphi (US, €30 bn); 2. Bosch (Europe, €22.4 bn); 3. Visteon (US, €17 bn); 4. Denso (Japan, €18 bn); 5. Lear (US, €14.4 bn); 6. Johnson Controls (US, €16 bn); 7. Magna (Canada, €14.3 bn); 8. Aisin Seiki (Japan, €12.6 bn); 9. Faurecia (Europe, €11.8 bn); 10. TRW (US, €11.6 bn) (*Automotive News*, June 2003). These data illustrate the dominance of the large corporations in the US. Although four out of the next five in a 'top 15' are European-owned, and are high value and successful firms, the scale of the US corporations poses a potential threat to European ownership in the future.

Under cost pressure from the automakers, the trend of supplier consolidation is likely to go further. PricewaterhouseCoopers predicts a reduction in tier-one suppliers to 30 by 2010 and major reductions in numbers at the second tier and lower: a forecast reduction from 10,000 tier-two suppliers to less than 1,000. The effects have already been felt, with global job losses in the last two years at Delphi (17,000), Dana (21,000) and Lear (6,500). Consolidation has led to increasing specialisation (Jürgens, 2003). There are now few global suppliers of certain modules such as seats, safety systems, lighting and steering.

Modules and systems

Suppliers have taken increasing responsibility, particularly in areas such as electronics. An outcome has been for whole modules or systems to be pre-assembled by the suppliers and delivered (just in time and just in sequence) to the car factories (Chanaron, 2001). This makes assembly quicker and more convenient for the carmakers, and transfers responsibility for quality and logistics to the suppliers. European manufacturers have gone further in the move to modularisation than their US or Japanese counterparts. However, most are cautious about over-dependence on mega suppliers (Jürgens, 2002).

In many cases, module/systems suppliers have set up close to the assembly plants, for example, on supplier parks (Jürgens, 2002). The ultimate modular assembly developments are the Volkswagen (VW) Resende plant in Brazil, the Skoda Octavia plant in Bratislava (Slovakia) and the Smart Car plant at Hambach in France. Here the module suppliers have been integrated directly into the production process. For the suppliers, a module or system supply gives additional added value and a greater stake in innovation. The car makers benefit from cost savings but lose competence; jobs are also lost through 'hollowing out'. This is a potential threat and some companies resist too much outsourcing, notably Mercedes and Toyota.

Modular assembly is operated globally but with local production as far as possible. Logistics are costly and difficult – especially with road and rail bottlenecks in Europe. As modules become more complex, the local aspect of production becomes essential. It is unlikely, therefore, that there will ever be a wholesale transfer of production to low cost locations. However, as outlined below, there will be growing pressure on the small lower tier suppliers.

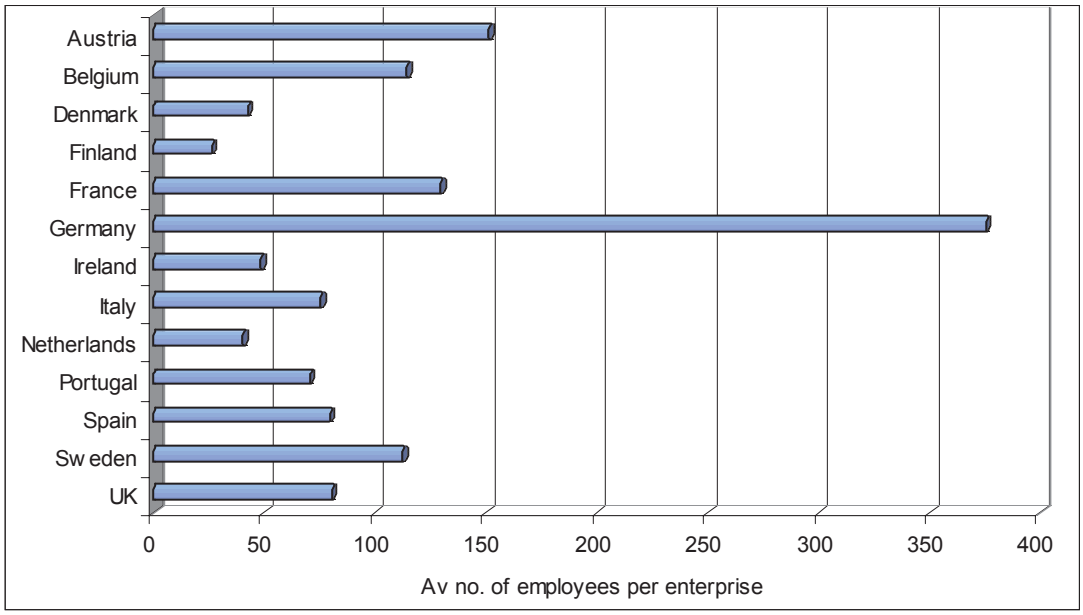
Smaller, 'lower tier' suppliers

Observing the above trends could lead to the conclusion that large suppliers would follow the same trend and outsource to sub-suppliers. To some extent, this has happened but large suppliers have been reluctant to lose innovation and technological competences. They also tend to view as inadequate the abilities of many of the lower tier companies in terms of quality, cost and delivery (QCD). Thus many training programmes have been set up to assist sub-suppliers to improve QCD. Examples in the UK are the **Accelerate Programme** and **SMMT Industry Forum**.

The biggest squeeze on suppliers has been in the lower size band among producers of single components. It has been difficult for these companies to find the resources to innovate, and they lack the scale to address the high volume requirements of standardisation. Figure 7 illustrates the average size of the supply base companies. As can be seen, with the exception of Germany, enterprises tend to be small. This makes them particularly vulnerable to low cost competition from outside western Europe and, in the long run, outside Europe. The small and medium sector is faced with three choices:

- to innovate and add value to the product;
- to consolidate or cooperate, in order to reduce fixed costs and achieve larger scale;
- to diversify so as not to be so dependent on the auto industry.

Figure 7: *Average size of workplace, 2002*



Source: *Eurostat Datashop.*

In a number of European regions, public policy has sought to support both the local supply base, by encouraging clustering, and the external economies of cooperation. These policies follow the ideas of Porter (1990), and Cooke and Morgan (1998).

eCommerce

eCommerce is accelerating the above trends and has become an essential tool for purchasing transactions and for sharing computer-aided designs (CAD). General Motors, Ford, DaimlerChrysler, Renault-Nissan and Peugeot-Citroën launched their online procurement company, Covisint, at the height of the dotcom boom. This was seen as a way to conduct auctions for parts, organise a global purchasing network and return a profit. However, the results have been less than expected and suppliers have resisted putting sensitive information online. Nevertheless, the system, and other similar ventures, remains as an information channel and a facility enabling co-design of parts.

The use of eCommerce puts additional pressure on the lower tier suppliers. Rapid responses are required, as are high levels of expertise. Training, and finding the time and resources to train, is a significant obstacle that threatens many small companies.

Legislation

European legislation is a major driver of the industry. Emissions and recycling legislation have a strong impact both on vehicle technologies and construction.

Environmental legislation

The EU emissions standards are compulsory in all EU Member States. The current Euro IV standard must be reached by 2006. It covers emissions of CO2, N2O, and hydrocarbon particulates for both diesel and petrol engines. Sulphur emissions are not covered but are addressed through the introduction of low sulphur fuels, which will be mandatory by 2005. CO2 is not covered either but is subject to a voluntary agreement which commits automobile manufacturers to reduce CO2 emissions by means of improved vehicle technology. This requires more efficient vehicles and lower weights, and also the development of market-oriented measures such as improvements in the level of consumer information.

Recycling legislation

The second main area addressed by law is recycling and the End-of-Life Vehicle Directive (or ELV Directive). Member States must set legislation increasing re-use, recycling and other forms of recovery of 'end-of-life vehicles' (ELVs) and components, and phase out certain hazardous substances by 2007. About 25% of each ELV currently goes into landfills; the target is to reduce this to below 5% by 2015. A further requirement is 'free-take-back' of ELVs, which enables owners to take their vehicles to an authorised treatment facility at no cost to themselves.

It is expected that the costs of compliance will be significant. Analysts estimate the regulations of the ELV Directive might result in an additional €20 to €150 per vehicle (Martin and Raes, 2002, p. 1). A particular issue for manufacturers is the responsibility for achieving recycling and recovery targets. This will require partnering with downstream operators. As a result, a number of consortia have been set up, for example, by Fiat in the Turin area. A second line of approach is through re-manufacture of parts – probably more for the after-market than new vehicles.

De-pollution/dismantling/shredding will require greater control and monitoring requirements, such as certificates of destruction and authorisations of treatment. Existing experiences in the Netherlands, Germany and France demonstrate that increased professional regulations are likely to drive some players out of business, resulting in consolidation. This is of particular concern to small and medium-sized enterprises in the industry.

Consumer demand

The third driver of change is the consumer. There is a growing demand for more choice. Volume production may become similar to that for premium cars, with a greater number of vehicles being made to order on the basis of a multi-option choice, i.e. 'batches of one'. Online vehicle purchase will accelerate this trend. At the same time, the market for niche

vehicles is growing, i.e. more variation of body shape and styling. This has led to a variety of body shapes being constructed on standard platforms. Examples include the Renault Scenic, Fiat Multipla, the Opel VX220, and the VW Beetle and Audi TT. Furthermore, there is an increased awareness of occupant and pedestrian safety, and tests of the New Car Assessment Programme (NCAP) have become the accepted standard in Europe. European consumers also look for greater fuel economy, exemplified by the growing popularity of diesel power units in Europe. This may not be the case in the US or Japan.

Another trend has been a move 'up-market' in specifications and the inclusion of more on-board electronics and telecommunications systems. Through increased specification, carmakers can extract higher margins. Nevertheless, sales patterns have been significantly affected. Volume producers, such as Ford and Opel, have marketed models that overlap the price bands of premium producers. In this context, consumers have often opted for the prestige marques. Hence, sales of vehicles such as the Ford Mondeo and Opel Vectra have suffered. In 2002, the Mercedes C-Class and BMW 3-series sales exceeded those of the Mondeo and Vectra.

Technology

All of these issues have significantly impacted on both vehicle and manufacturing technology (UK Department of Trade and Industry, 2002; MacNeill *et al*, 2002).

Car makers seek to take advantage of sophisticated technology to:

- address the competitive pressure and to meet increased customer expectations on quality and cost;
- add value to their vehicles to offset the squeeze on costs and profit margins. For example, the electronics content of a passenger car averages about 30% of its sale value. Meanwhile the value of the mechanical parts decreases;
- meet the demands of environmental legislation;
- address consumer demands for increased safety and sophistication.

In terms of the vehicle, the major change is likely to be a continued move to more electronics and telematics, and a shifting value base from mechanical to electrical/electronic parts. A possible change is the move to a 42-volt electrical system, which would save energy and could enable engine downsizing. A 42-volt system would also enable safety improvements with the integration of electrically controlled steering, braking, ABS and suspension to provide driver assistance.

There will be continued development of electric, hybrid and fuel cell drives, especially for city cars and fleet vehicles. However, the internal combustion engine will continue to dominate in the foreseeable future. Further refinements will produce improvements to the efficiency of both diesel and petrol engines. A major interest is in alternative synthetic fuels that are made from biomass which would be more or less CO_2 neutral. They could also have wide-reaching consequences for the European agricultural environment.

There will be a revolution in vehicle telematics affecting both the 'in-vehicle' experience and mobility. The industry, along with planners and policymakers, is concerned about the waste of energy and knock-on costs to business (plus inconvenience and irritation) caused by traffic congestion. Features likely to be introduced include more sophisticated route guidance, inter-model route planning, lane guidance and proximity radars for speed control and warning systems. Europe, with a lead in communication technologies, is in a strong position. In-car entertainment systems may also take off, though the market has been slow to date.

The pressure to reduce emissions and fuel consumption is driving vehicle weight reductions through material changes such as increased use of aluminium, magnesium plastics and composites. Changes in the use of materials will also facilitate cheaper modes of assembly, enhanced occupant and pedestrian safety, and recycling.

Europe leads in new vehicle technology and in communications, but Japan and the US lead in electronics and software. New players, such as Microsoft, could threaten the *status quo*.

The truck industry

The truck industry can be divided into transporter vans, light trucks and heavy trucks. The first operates in much the same way as the car industry with the same drivers towards high volume production and a squeeze on costs.

However, the heavy truck segment operates differently. Firstly, volumes are much lower. For example, Volvo, the largest supplier of heavy trucks to the European market, manufactured just 160,800 trucks in 2002 – in nine locations and with 20,000 direct employees in the truck division. However, each vehicle represents very high value. In addition, large trucks are made on a fixed chassis rather than a platform. This lends itself to modular assembly far more than does car-making. Hence, in some markets there is a tradition of the purchasers specifying engines or other major parts other than from the truck manufacturer. This is particularly the case in the US market.

The trend to consolidation is just as apparent. For example, Volvo has acquired Renault's truck business, plus the US Mack company. It also holds 20% of Mitsubishi's truck and bus division. Mercedes, the world's largest truck and bus manufacturer, owns the US truck makers Freightliner and Sterling, and has strong alliances in other markets. Future consolidations are likely.

The market for trucks and buses is different from that for passenger cars. Whereas about 85% of the car market is in Asia-Pacific, Western Europe and Japan, these regions account for only 50% of the market for heavy trucks and buses (Rees, 1999). Truck and bus sales are not dependent on private consumption but are an essential means of communication and trade throughout the world. For example, Brazil, which has failed to match car sale expectations, is the world's largest bus market. The opening up of other markets such as central and eastern Europe, Russia, China and India thus represent real opportunities for truck and bus makers.

Europe possesses a strong advantage in the truck industry, much more so than in car or component manufacture. Mercedes is the world's largest truck and bus manufacturer and, together with Volvo, Scania, Iveco and MAN, the European industry occupies a dominant position. However, as Rees (1999) points out, companies from developing countries may emerge as major players. Hence, European manufacturers are forming alliances, such as Mercedes with the Indian company Telco.

Retail and services

The sales and distribution sector is set to experience considerable change. Currently, distribution and sales account for up to 25% of the cost of a new car. It is said by some to be the only part of the supply chain that is not yet 'lean'.

The 'three-day car'

There is likely to be a major drive to reduce the delivery time to customers following their original order. This will provide a better service to the car buyer while significantly affecting costs. Car production takes one to two days, transport to the dealer eight days on average; yet it takes weeks or even months for the customer to obtain delivery. In theory, the customer could get a new car, manufactured to order, and with his/her own particular specification in just

three days: one to order, one to make and one to deliver. Of course, this is a theoretical ideal. However, a time of one week could be feasible from anywhere in Europe, with an online ordering system and a flexible 'upstream' supply chain to the vehicle manufacturer. Increased customisation to buyers' specifications could also be a way for manufacturers to extract higher margins.

This would also save costs. Reduced delivery time would be a major squeeze on inventory. Significant cuts in the overall pipeline could see inventory costs reduced from around €1,000 per vehicle to less than €100, based on a statement by Ford's CEO, Nick Scheele, in 2000.

Any such move will put considerable pressure on the distributors and retailers.

The new block exemption

The new block exemption regulation (NBE) governing how vehicle manufacturers distribute their products in Europe took effect on 1 October 2003. The aim of the Commission regulation is to promote competition and a better deal for consumers. It separates new car sales, repair and parts supply, and gives more autonomy to dealers and repairers.

For new cars, the manufacturer can choose an exclusive system (where the dealer is given an exclusive territory) or a selective system (where the dealer is restricted to selling the vehicle to an end user or another dealer in the network – although there is liberalisation regarding seeking customers throughout the EU). All but one manufacturer (Suzuki) have chosen the latter with particular quality and display criteria. It is unlikely that the multi-brand outlets once foreseen will emerge. The new system has encouraged vehicle manufacturers to rationalise their distribution networks. A 12% reduction in franchised dealer numbers was seen in 2002 (*Automotive News*, November 2003). Low margins on sales, and ever-present cost competition, have meant dealers need to increase the number of sales per site; hence, a cut in numbers follows.

The NBE itself will also lead to reductions in the number of franchises through consolidation. It allows dealers to sell franchises within the network and, after 2005, dealers can open additional sites, both without the need for the manufacturer's agreement. These changes will benefit the larger dealerships and lead to major consolidation. This is very significant as, in most Member States, the average dealership is a small business with a single franchise and these are now vulnerable. The exception is the UK where there are already large multi-outlet dealerships.

Consolidation may have a significant effect on jobs. There may also be a long-term shift in employment patterns, with fewer jobs in traditional dealer networks but increasing numbers in retailing formats. It is predicted that online purchasing by consumers will grow – perhaps to more than 50% of sales in the next few years. Internet intermediaries, however, must have a permanent sales point. Fiat, for example, has developed online selling in Brazil with computer 'plug-ins' enabling 360° viewing, option and colour changes, plus online finance.

The NBE also separates the contracts which vehicle manufacturers sign for new car sales, repair and parts supply. Sales and service can therefore be separated. Most franchises will retain both businesses. However, there is an opportunity for independent authorised repair centres and for new players at non high street locations. This is especially so as vehicle manufacturers must make technical information and training available.

Regarding spare parts, the NBE has potentially far reaching consequences. Authorised dealers currently account for over 40% of all repairs, and 80% in cars that are less than four years old. Car makers supply most of the spares used. They make about 20% of these themselves and buy in, and sell on, the rest from suppliers. The NBE will enable repairers to buy parts directly from an authorised parts producer (the same producer that made the original part in many cases). Consequently, suppliers and repairers can extract higher margins – and the car maker less.

Impact of enlargement

The accession of the new Member States, and the opening of markets, has led to investment in central and eastern Europe and Turkey. Since the fall of communism, western auto manufacturers have invested €20 billion in the Czech Republic, Poland and Slovakia alone. The map in the **Annex**[3] illustrates the locations of the plants. As well as new markets, these Member States offer lower labour costs, the availability of a skilled workforce, incentives and 'green-field' labour relations. The opening of new assembly plants has been followed by new suppliers' plants, often in close proximity to supplier parks. The significant transfer of the industry from Europe's industrial heartlands to central and eastern European countries has raised some concern. Table 1 reflects the major increase in production in the main vehicle-producing new Member States and candidate countries.

However, decentralisation from the industrial centre is not new (Lung, 2002). In the past, the industry has spread to more peripheral areas such as the south of Italy and the Iberian peninsula.

Table 1: *Change in vehicle production in new Member States and candidate countries (1990-2002)*

	Cars 1990	Trucks 1990	TOTAL	Cars 2002	Trucks 2002	TOTAL	CHANGE %
Czech Republic	187,773	28,587	216,360	454,400	5,800	460,200	112.70%
Hungary		9,003	9,003	134,600	3,300	137,900	1431.71%
Poland	283,890	51,604	335,494	309,900	39,400	349,300	4.12%
Romania	90,000	11,400	101,400	70,300	14,100	84,400	-16.77%
Slovakia				235,700	200	235,900	
Slovenia				106,000		106,000	
Turkey	175,561	33,489	209,050	197,750	142,367	340,117	62.70%
Total	737,224	134,083	871,307	1,508,650	205,167	1,713,817	96.69%

Yet, as Lung observes, the attractiveness of Europe's industrial heartlands continues to draw new investment (Mercedes A-class, the MCC Smart and the Toyota Yaris). As Table 2 shows, the investment in central and eastern Europe has not necessarily weakened the base of production in the traditional industrial areas.

[3] This map is also available with interactive functions providing basic statistics for each country, such as production volume and employment in vehicle manufacturing and trade, as well as showing the model production at each site.

Table 2: *Opening and closing of assembly plants in Europe*

Year	Closure	Opening
1991	Renault, Valladolid 1 (Spain) Saab, Malmö (Sweden)	Eurostar, Steyr (Austria)
1992	Renault, Billancourt (France) Lancia, Desio (Italy) Lancia, Chivasso (Italy) Innocenti, Lambrate (Italy)	Opel, Eisenach (Germany) Mercedes, Rastatt (Germany) Honda, Swindon (UK) Toyota, Burnaston (UK) Suzuki, Esztergom (Hungary)
1993	Volvo, Uddevalla (Sweden)	Seat, Martorell (Spain) Volkswagen, Bratislava (Slovakia)
1994	Volvo, Kalmar (Sweden)	Sevelnord, Hordain (France) AutoEuropa, Palmela (Portugal) Volkswagen, Mosel (Germany) Fiat, Melfi (Italy)
1995		NedCar, Born (Netherlands) Ford, Plonsk (Poland)
1996	Seat, Barcelona (Spain) Chausson, Creil (France)	Autonova, Uddevalla (Sweden)
1997	Renault, Vilvorde (Belgium)	MCC Smart, Hambach (France)
1998	Renault, Setubal (Portugal)	Opel, Gliwice (Poland) Audi, Györ (Hungary)
1999	Opel, Szengotthard (Hungary)	
2000	Ford, Azambuja (Portugal) Ford, Plonsk (Poland) Foden, Sandbach (UK)	
2001	General Motors, Luton (UK) Fiat, Rivalta (Italy)	Ford (Turkey) Toyota, Valenciennes (France)
2002	Ford, Dagenham (UK)	Volkswagen, Dresden (Germany) Porsche, Leipzig (Germany)
2005		BMW, Leipzig (Germany) Peugeot-Citroën–Toyota (Czech Republic)

Source: *Lung, 2002*

A threat to lower tier suppliers

As discussed above, western European production continues to increase and notable new investment has been made in western Europe. Investment by the major suppliers has followed as the modular method of production demands proximity. Most of the new assembly plants are for the manufacture of small, lower cost vehicles designed for entry to the new markets. Table 3 shows the sales figures in 2002 for some of the new EU Member States and candidate countries, demonstrating their importance as markets in their own right.

Table 3: *Sales in new EU Member States and candidate countries in 2002 (in '000 units)*

	Cars	Trucks	Combined
Czech Republic	148	19	167
Hungary	173	33	206
Poland	398	27	425
Romania	89	22	111
Slovakia	65	10	75
Slovenia	53	6	59
Turkey	66	52	118
Total	992	169	1161

However, the EU15 Member States still had a negative trade balance in vehicles with these same countries in 2002 and 2003, as shown in Table 4. Primarily, these plants use parts assembled locally but manufactured in western Europe. Finished cars are then imported back (Allen, 2001). In the short term, this implies a loss to the traditional areas and a growing capacity in the new Member States. The table also illustrates the considerable volatility of the market.

Table 4: *Trade balance in motor vehicles 2002 and 2003*

	Imports ('000 euro)		Exports ('000 euro)		Balance ('000 euro)	
	2002	2003	2002	2003	2002	2003
EU15*	**4,608,920**	**5,124,400**	**9,972,902**	**10,208,737**	**5,363,982**	**5,084,338**
New EU Member States and candidate countries, of which:	**1,533,527**	**1,720,309**	**921,502**	**1,381,410**	**-612,026**	**-338,900**
Poland	239,287	243,189	312,369	432,589	73,081	189,400
Slovenia	158,647	146,015	83,731	111,566	-74,916	-34,449
Czech Republic	381,046	363,139	169,322	200,005	-211,723	-163,134
Slovakia	311,038	484,907	45,652	74,761	-265,386	-410,146
Hungary	245,486	199,260	172,035	259,875	-73,451	60,615
Romania	283	401	69,128	75,160	68,845	74,758
Turkey	197,740	283,398	69,265	227,454	-128,476	-55,944

Notes: *Overall positive balance of trade in motor vehicles with the rest of the world. These figures incorporate those for the new EU Member States and candidate countries shown in the remainder of the table and summarised in the second line.*

In the long term, the main threat to the traditional manufacturing areas is probably not the loss of car making nor of sophisticated systems from the major suppliers, but of the manufacture of simple components. Parts such as metal or plastic can be produced more cheaply away from the traditional industrial centres and transported relatively easily to where they are assembled into modules or systems to go to final vehicle assembly. The company cases and cluster studies, particularly the one on the West Midlands in the UK, reveal how unprepared many small and medium-sized companies in the sector are to face the challenge of competing less on price and more on value and quality. The threat to these companies also comes from outside the EU. Considerable investment has been made in other emerging markets. A prime example is China where companies, including Volkswagen, Peugeot-Citroën, BMW and DaimlerChrysler, are involved in major joint ventures with local manufacturers. These often involve local content agreements. In the medium to long term, it is likely that a significant proportion of commodity parts and those involving labour intensive operations

will be imported from these markets. A good example is the wiring loom that weaves through the vehicle, which is labour intensive to make: it is now entirely made in low-cost locations.

Employment trends

In all developed countries, the number of manufacturing jobs is declining. This is primarily because of efficiency gains rather than transfer to low-cost locations, though that does play a part. In the short term, the main threat is the sluggishness of the European economy. Although the positive trade balance indicates outlets, fall in demand leads to overcapacity. If downward trends continue, there will be reduced shift patterns and lay-offs though not necessarily plant closures. The extra production capacity in the new Member States and candidate countries exacerbates the situation but will be essential if the upward forecast is realised.

The motor industry is among the better-paid business sectors. The average wage in this sector within the EU in 2000 was €34,310 per year, but with considerable variation. Workers in Portugal received the lowest wage per year (€11,800) while those in Germany the highest (€41,000). Among the other major producing countries, workers in the UK had higher wages per year (€36,900) than those in France, Spain and Italy. Wages in the automotive industry are significantly higher than in other manufacturing sectors: 26% higher on average in 2000. In Germany, Spain, the UK and Portugal, they were 15% higher than in the manufacturing industry as a whole (Portugal 31%). In Finland, Ireland and the Netherlands, however, wages were lower than in other manufacturing industries.

In some places, industrial relations are still poor. A number of well-publicised instances in UK and Belgian factories, for example, illustrate this. Improvements are possible on both sides. The traditional stronghold of industrial trade unions in the sector faces major challenges with the growing tendency of automotive firms to become transnational companies. Such companies make decisions about investment and location regardless of national borders, and put at risk the unions' capacity to represent workers and regulate the employment relationship (see EIRO, December 2003).

Skills and recruitment

The industry has mainly blue-collar employment with about 90% in this category. It is also largely male-dominated. However, the skills base is changing as vehicles become more sophisticated and demands for quality become more stringent. Lean manufacturing has flattened out employment structures and given production workers more responsibility. In addition, the increasing sophistication of vehicles and production requires new skills, for example in fitting and testing electronic components, in tending robots or analysing process control statistics. All major companies have on-going training programmes. In general, the large companies do not experience major recruitment problems, and often have the pick of the workforce in each area. However, a number of particular skills shortages are apparent, particularly in the design and development of electronics and in the software to integrate different systems. Skills shortages do pose a problem for the smaller companies in the supply chain. These businesses find recruitment difficult and, with lean production, have little spare capacity to engage in training programmes.

Flexibility

The industry thinks globally but operates locally, while trying to maintain flexibility. There is no social dialogue within the industry in Europe, nor industry- or company-wide agreements. Bargaining is at plant level except in Germany where there is a two-tier system of national and plant level bargaining. The key, as far as the industry is concerned, is flexibility. To a large extent, this is more important than wage costs; for example, BMW chose Leipzig for its 3-series production over lower cost locations. Vehicle manufacturers and major suppliers also tend to operate competitions to decide which plant gets a new model or order. The European Works Council (EWC) Directive, which was adopted in September 1994, gives rights of consultation through work councils in every company employing more than 1000 employees in the EU. This provides a platform to discuss changes but levels of horizontal inter-plant solidarity tend to be low. Instead, there

is a vertical solidarity as both management and workforce will vigorously promote their plant to the parent company. This joint recognition of competitiveness is, to a large extent, overcoming the traditional, adversarial, industrial relations between management and workers.

Fluctuations in the market, and difficulties in forecasting, mean that changes and shifts in production capacity are inevitable. To achieve flexibility, there is increasing use of flexible contracts and use of temporary or agency staff. The former are employed on a short-term basis (e.g. for two years), though often with the prospect of achieving permanent contracts. The latter are workers employed by outside agencies. The agency employer is responsible for meeting the requirements of employment legislation. From the receiving company's viewpoint, agency workers allow a flexibility that full-time employment would not. For example, agency workers can be used over the summer period to end the annual shutdown. As might be expected, the pay rates are less. This is not to say that there are very large numbers of this category. Agency and temporary workers are a minority. The downside of lower training, motivation and commitment to quality is likely to ensure that this remains the case.

The Working Time Directive

The Directive was adopted in November 1993 and aims to protect workers against the adverse effects of excessive hours, inadequate rest or disruptive working patterns. However, the Directive allows for flexibility when there is a need for continuity of production or where there are surges of activity. In addition, derogations are allowed through collective agreements, provided that workers are afforded equivalent periods of rest. In the case of the maximum working week of 48 hours on average, derogations allow the average to be calculated over six months or over 12 months by agreement. This has enabled some manufacturers to negotiate contracts based on annual hours and align production schedules with demand. Manufacturers operate differently at different plants, according to the principle of local bargaining, but most operate the system somewhere. Agreements share the common principle of exchanging extra hours worked for time off later. There are likely to be more such flexibility deals in the future.

Upstream and downstream changes

Outsourcing also puts pressure on the supply industry to be lean. Efficiency gains have led to job losses in many cases, particularly in the small and medium size firm. However, outsourcing also leads to transfer of employment into the supply industry. This can lead to a reduction in wage levels and working conditions if the trend goes beyond the major supply companies. A particular concern is around non-production jobs, such as logistics, in the factory. Outsourcing these to logistics specialists saves money but often results in lower wage rates and a lessening of security.

The new block exemption regulation threatens an important reorganisation and potential loss of jobs in the retail and distribution sector due to major consolidation. The squeeze will come from two directions. Firstly, vehicles have become much more reliable. Hence, service intervals are further apart and fewer components need to be replaced. Secondly, as vehicles become more sophisticated, additional skills, for example in electronics, are required. Individual retailers and repair shops are likely to experience considerable difficulties in recruiting the skills they will need.

SWOT analysis

Taking account of all these trends, it is possible to consider an analysis of the strengths, weaknesses, opportunities and threats (SWOT) of the European automotive industry in comparison to its main competitors. Some 'SWOTs' are common to all carmakers. In addition, the effects of some changes are not yet clear, for example, the new block exemption (NBE) for retail and repair.

STRENGTHS	WEAKNESSES
• Competitive market and demanding consumers – which drives innovation. • Strong lead in many future automotive technologies and in infrastructure communication technologies. • Innovative and well-engineered products. • Strong lead in the expanding 'knowledge intensive services' sector. • Strong presence in the premium and high performance sectors which generate innovation and are highly profitable. • Presence in all world markets and a strong presence in emerging ones. • Lead in the truck and bus industry. • Strong and independent supply base. • Supportive public policy framework.	• Continued difficulty in matching the Japanese companies on quality – this threatens market share. • Less consumer-oriented than the US industry. • A number of (relatively) smaller scale companies, especially among the supply industry – vulnerable to take-over. • Relative failure to enter the US market because of lack of appropriate products – except in the premium segment. • Industry has, mostly, been a follower rather than a leader of major trends, e.g., on lean manufacture. • Poor industrial relations in some plants and a lack of flexibility in some traditional working practices.
OPPORTUNITIES	**THREATS**
• Potential to gain a lead in new vehicle technologies. • Potential to gain a lead in 'traffic management' technologies. • Very strong presence in the emerging Chinese market. • Future economies of scale and innovation through cooperative ventures. • Increased demand for trucks and buses from developing world. • Potential to develop a customer-oriented retail system linked to the upstream component supply. • Export of high value services – design and engineering. • Export of re-cycling expertise. • Potential to gain external economies via strategic networks. • Potential to work more closely with the supply industry and the retail sector to provide more consumer orientation and take a market lead.	• Some companies are in a weak position financially and lose market share. • Take-overs could threaten technology lead, especially in the supply industry. • Outsourcing strategy may lead to a loss of core competences, especially compared to Japanese manufacturers. • New players such as Japanese or US electronics or software companies could threaten the technological lead. • Capacity in new markets may be under-utilised, exacerbating capacity issue in Europe. • Lack of brand loyalty among European consumers. • Smaller suppliers, lower in the supply chain, threatened with competition from low cost locations. • Difficulties in recruiting the skills needed for the future, especially in the smaller supply companies.

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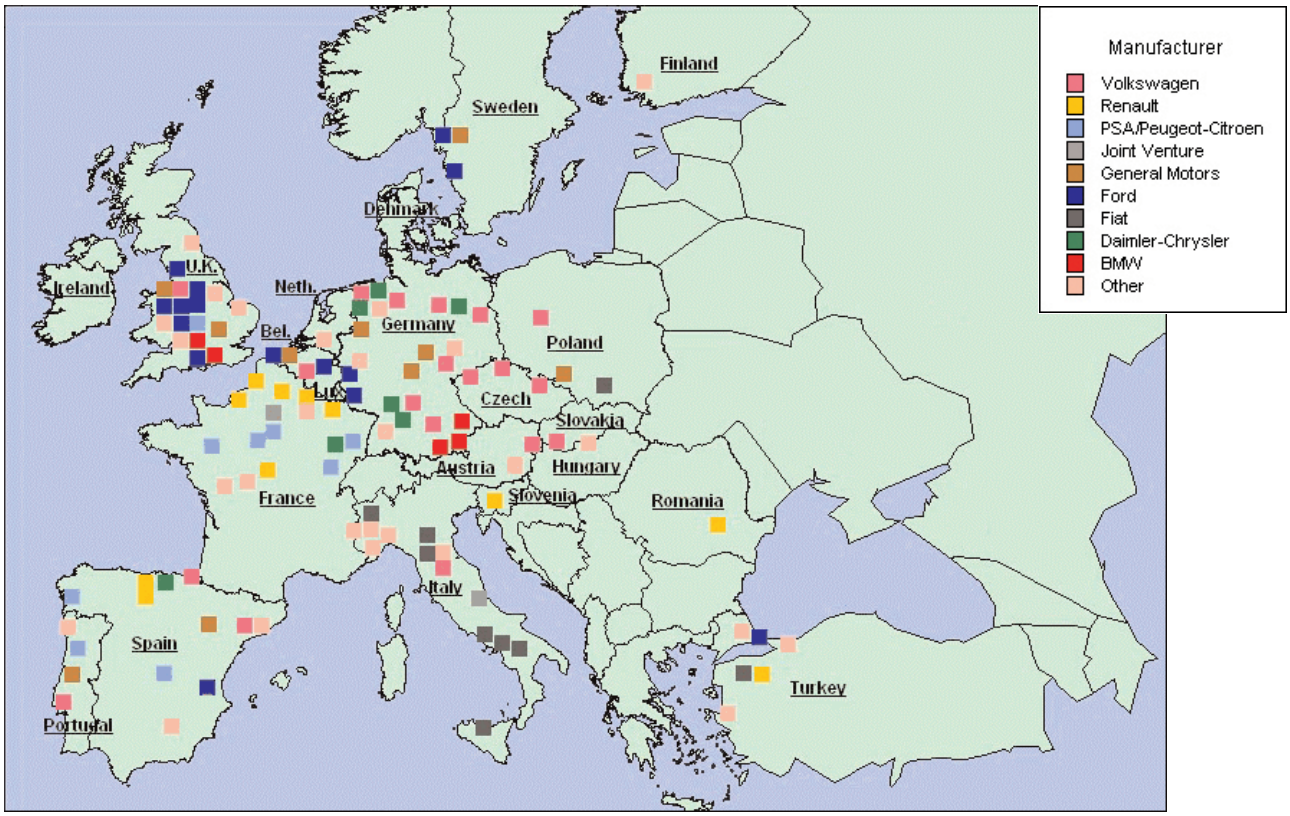
Annex

Distribution of vehicle assembly plants in European countries



This map is also available as an interactive map providing basic statistics for each country and showing the model production at each car manufacturer's site on the **emcc portal** at **www.emcc.eurofound.eu.int/automotivemap**

