

ON DEFINING A WESTERN EUROPEAN AUTOMOBILE INDUSTRY – PROBLEMS AND POTENTIALS

With 4 figures and 2 tables

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Zusammenfassung: Die westeuropäische Automobilindustrie – Probleme und Möglichkeiten

Angesichts des kritischen Wendepunktes, an dem sich die westeuropäische Automobilindustrie mit der geballten Herausforderung neuer Technologien, eines einheitlichen europäischen Marktes und der wachsenden japanischen Konkurrenz konfrontiert sieht, erscheint es notwendig, eine Bewertung der grundlegenden geographischen Strukturen dieses Industriesektors unter besonderer Berücksichtigung der Produktionsstandorte, der Beschäftigtenzahlen und der funktionalen Verflechtungen über die Ländergrenzen hinweg vorzunehmen. Die Standorte sowohl der Betriebe, die fertige Fahrzeuge produzieren, als auch die Standorte einer Stichprobe von Zulieferbetrieben zeigen im Vergleich mit der überaus starken Konzentration der japanischen Konkurrenz eine ausgesprochene räumliche Dispersion. Dennoch ist ein Kernraum in Nordwest-Europa erkennbar, der durch eine starke Verdichtung von Automobilfabriken und Zulieferbetrieben aller Art geprägt ist. Dieser Raum ist weitgehend identisch mit der Zone des größten Marktpotentials innerhalb der Europäischen Gemeinschaft. Das Kerngebiet der Automobilindustrie wird auch durch die Verteilung der Beschäftigten im Fahrzeugbau und in den Zulieferindustrien gekennzeichnet, deren Medianzentrum in Nordost-Frankreich liegt.

Im Rahmen dieser Arbeit wird weiterhin eine innere und äußere Peripherie-Zone der Automobilindustrie definiert und deren Anteil an den jüngeren Investitionen zur Steigerung der Produktionskapazität auf dem Fahrzeugsektor geprüft. Diese Streuung führt zu einem grundsätzlichen Standortkonflikt zwischen den Einsparungen bei den Arbeitskosten und der wachsenden räumlichen Distanz zu dem engen Netzwerk der Zulieferer. Die Techniken der „lean production“ fördern die Abhängigkeit der Zulieferbetriebe, und die jüngsten Investitionen der Japaner in Europa begünstigen Standorte mit besserer Erreichbarkeit.

Eine Analyse von Produktion und Absatz der sechs bedeutendsten Fahrzeughersteller in Europa zeigt, daß trotz wachsender Internationalisierung der Betriebsstandorte und der Herkunft der Bauteile von einer wirklichen funktionalen Integration der Unternehmen noch nicht gesprochen werden kann. Dabei hat sich ein Gegensatz entwickelt zwischen General Motors, Ford und Volkswagen auf der einen Seite, die große Fortschritte auf dem Weg zur Internationalisierung gemacht haben, sowie Peugeot-Citroën (PSA), Renault und Fiat auf der anderen Seite. In Anbetracht der instabilen ökonomischen Rahmenbedingungen der neunziger Jahre erscheinen weitere strukturelle und organisatorische Veränderungen unvermeidlich.

Introduction

The advent of the Single European Market in 1993 will be a major step towards creating a unified economic space in the European Community. Nevertheless the ultimate goal, which can be envisaged as the emergence of a set of functionally-integrated industries on a Community-wide basis, rather than a conglomeration of essentially national industries, is a long way off. This is an important consideration in the industrial future of western Europe, because the main global challenge to European manufacturing industry derives from two economically integrated and spatially coherent spaces, Japan and USA-Canada. Indeed following the recent North American free trade agreement, the latter countries will be joined by Mexico in 1994 (*Independent* 13-8-92).

Much progress has been made during the past two decades in the internationalization of automobile production within Europe, ironically led by the European offshoots of the United States-based transnational corporations (TNCs), Ford and General Motors (DICKEN 1992, BLOOMFIELD 1978). As GAEBE has pointed out, this development was mainly motivated by the search for scale economies and production cost reductions associated with an essentially Fordist production technology, emphasizing standardization of production and model ‘commonization’ (GAEBE 1991, p. 103). Recently the impetus for functional integration within the western European automobile industry has stemmed from increased Japanese competition in domestic and export markets, coupled with accumulating evidence of the superior quality and productivity standards of Japanese-made cars (WOMACK et al. 1990). An important accompaniment to this integration process has been the application by the major manufacturers of new production techniques, leading to a still-uncompleted restructuring of the automobile industry in western Europe (MAIR 1992, OBERHAUSER 1987).

The objective of the paper is to examine the geography of the automobile industry in western Europe at this critical juncture when it is facing intense competitive challenges. Western Europe is defined rather arbitrarily to include the European Community (EC)

together with Austria, Switzerland, and Scandinavia. This definition is therefore in broad contradistinction to eastern Europe, but also includes those countries which are likely to join the EC as full members in the near future. However it should not be interpreted as implying that the western European automobile industry has no connection with that of eastern Europe. It is rather an empirical definition, based upon the necessity of including the EC as an entity, because of its political significance in guiding the future course of the industry. Consequently where the term 'western Europe' is employed, this refers to the broad geographical area; where specific reference to the European Community is necessary, then 'EC' is used.

It is not intended to produce a substantive review of automobile production systems, since excellent recent surveys exist (GAEBE 1991, HILL 1989, SCHOENBERGER 1988, WOMACK et al. 1990). Instead the paper sets out to investigate the spatial distribution of the industry in terms of a number of variables – the loci of production, distribution of employment, and degree of market integration – across the entire area of western Europe, in so far as comparative data can be assembled. Perhaps surprisingly, there has been no attempt at such an overview since the studies by LAW and BLOOMFIELD in the 1970s (LAW 1974, BLOOMFIELD 1978). This return to the *actuality* of the industry's geography is essential, because we need to refine our understanding of its spatial structure in order to evaluate the impact of changes in technology, markets, and locational factors in investment decisions. As MAIR has stressed, the geographical structures of production are *themselves* a vital ingredient in determining the capacity of the western European automobile industry to adopt new technologies in its current round of restructuring (MAIR 1992). In particular, the probability of certain spatial outcomes arising from such changes cannot be predicted from events which have occurred in very different economic spaces, notably North America; this has rightly been criticized as 'technological determinism' (SCHOENBERGER 1988, p. 262).

Background

CHAPMAN has recently emphasized the importance of undertaking industry-wide studies in economic geography, because different spatial trends may be operating within an industry at global, national or regional scales (CHAPMAN 1992). The present study falls into a scale intermediate between the global and the national. At the global scale the automobile in-

dustry is predominantly market-oriented, and western Europe constitutes one of three key centres of global production and consumption (DICKEN 1992). Within western Europe, however, earlier studies by LAW and BLOOMFIELD highlighted the importance of national territories in shaping the industry's geography, giving rise to a large number of automobile producers, each based within separate countries and producing cars dominantly for national markets, with the possibility of exports to colonial preference markets in the case of France and the UK. The expansion of this industry in the early post-war decades, when it constituted the archetype of a 'growth' industry, was also strongly influenced by national governments, each pursuing similar policy objectives of steering plants to regions with labour surpluses, either through agricultural over-dependence or the decline of heavy industries such as coal-mining. The expansion of indigenous companies was especially constrained within national frameworks; however, Ford had already begun to internationalize its investments in the 1960s, with the opening of the Genk plant in Belgium (LAW 1974). Ford's progress towards functional integration at an international scale in western Europe accelerated rapidly in the 1970s, when the Fiesta model was introduced (DICKEN 1992). This process was assisted by the enlargement of the EC to include the UK, Ireland and Denmark in 1973.

The 1980s have witnessed further changes in the environment of the automobile industry. These include a further enlargement of the EC to incorporate Greece, Spain and Portugal, increasing globalization of sales and production, radical innovations in technology, and the first Japanese investments in car production in Europe (JONES a. NORTH 1991). In a recent analysis of global automobile production systems, GAEBE has characterized the European production system as distinctively different from both North America and Japan (GAEBE 1991). The latter cores are strongly identified with the homogeneous adoption of Fordist and lean production models respectively, whereas the situation in Europe is more heterogeneous, since different strategies are pursued by the individual companies. The main *indigenous* companies are developing production systems which are either cost-orientated, in the case of Fiat, PSA, and Renault, or market-orientated in the case of VAG. These strategies have important implications for linkages, employment stability, and the strength of association with national territories. The European-based subsidiaries of the US-based TNCs, Ford and General Motors (GM), follow decentralization strategies which are similar to those adopted by their

parent companies. This involves a search for the lowest production costs, supported by complex logistics systems, and constant reference to the almost mythical 'world car' concept. Consequently the situation in western Europe is not only complex, but is evolving in different directions at once, and it is therefore important to develop a 'comparative' perspective on the industry's geography.

The introduction of new production technologies places a renewed emphasis on fundamental geographical properties such as distance and contiguity, and it will be instructive to measure the spatial dimensions of the western European automobile production system. The present spatial pattern is more complex than when 'national' systems predominated in the 1950s and 1960s, since it incorporates the impact of twenty-five years of locational evolution. The majority of changes have been additions to capacity, although there have been selective cutbacks, notably in the UK (LAW 1985). The expansion of capacity is still underway, and many car production plants are under construction in a variety of locations. But equally important in the long run are the modifications being made to existing capacity, and to relationships between automobile producers and their component and sub-assembly suppliers, as the influence of 'Just-in-Time' techniques becomes more apparent (LINGE 1991).

The distribution of production plants

Figs. 1 and 2 give a partial account of the spatial distribution of the western European automobile industry. First, they portray the complete distribution of car production plants (excluding some pure assembly plants in Belgium), and all dedicated multi-purpose vehicle (MPV) plants. This distribution is derived from information collected primarily from the business press, especially the *Financial Times*. As such, these data are not strictly contemporaneous, and allowance should be made for minor inaccuracies in the chronology of plant openings.

Secondly, a sample only of the thousands of component and sub-assembly plants is shown in the maps. The components industry is the basal layer of the pyramidal auto-production system, with a level of out-sourcing among European car producers ranging from 60%–70% (OECD 1992). In employment terms the independent components sector alone is almost as large as car production and assembly, accounting for 38% of EC motor vehicle and components employment (Commission of the European Communities (CEC)

1991). As a recent survey for the EC Commission (DG III) demonstrates, the EC components industry is highly fragmented, having over 3250 firms, of which two-thirds employ fewer than 100 employees (CEC 1991). It was therefore only feasible to represent this layer by means of a sample of the *independent* firms involved, and specialist component plants belonging to car assembly firms were excluded. Many approaches to the classification of auto components exist, including that adopted by the OECD, and that used by BERTRAM a. SCHAMP in their study of BMW, which is based upon the frequency of supply of the final assembly stage, ranging from virtually synchronous through hourly to daily and weekly (BERTRAM a. SCHAMP 1989, OECD 1992). The scheme adopted follows SHEARD, and is based on the hierarchical organisation of the auto-production system (SHEARD 1983). Attention is focused on the 'First tier' of suppliers, subdivided into the three major sub-groups of Mechanical components, Electrical components, and Body sub-assemblies. This procedure is itself open to criticism, in that it does not take into account the increasing trend towards the production of complete sub-assemblies, such as the production of complete dashboards and wiring harness packages (*Financial Times* 1992A). GLASMEIER a. McCLUSKEY's distinction between components which are primarily manufactured for initial vehicle assembly, or Original Equipment, and parts which feature equally prominently in the so-called After Market, such as batteries and exhaust systems, is also utilized (GLASMEIER a. McCLUSKEY 1989). The selection here focuses solely on the following Original Equipment components:

- a. Mechanical – axles, drive shafts, clutch assemblies.
- b. Electrical – starter motors, fuel pumps, electronic ignition systems.
- c. Body sub-assemblies – seat frames, wheels.

Names and addresses of component manufacturers were obtained from *Kompass Directories*, which presented information for all countries at the time of data collection in August 1991, with the exception of Austria, Portugal and east Germany (*Kompass* various dates). Although *Kompass* is one of the most important international directories, these data are not as robust as one would wish, and problems exist with their use, ranging from inevitable omissions to the lack of systematic information on plant size. Information on the operations of large firms, such as Bosch or Siemens, is also incomplete, because details are not given of the many branch plants involved. These deficiencies undoubtedly mean that the maps under-

represent the German components industry in particular (40% of EC output), and over-represent the Italian industry, with its proliferation of small firms (CEC 1991). Finally, some firms in the sample produced more than one selected component e. g. axles and clutches. In such cases the plant has been represented by *one* symbol only. There is also an inevitable degree of cartographic generalization in mapping plant locations at this small scale. This applies particularly to dense concentrations in regions such as the English Midlands.

The maps

Fig. 1 graphically demonstrates the basis for MAIR's description of the western European automobile industry as a complex amalgam of regional production clusters on the one hand, and a wide dispersal of individual plants on the other, necessitating the development of pan-European linkages (MAIR 1992). An analysis of the locations of the 58 car or dedicated MPV plants (operational or under construction) in Fig. 1 emphasizes this point. They are dispersed within a far-flung quadrilateral linking Setubal (Portugal), Sunderland (UK), Malmo (Sweden), and Melfi (Italy), and whose longest axes extend from Sebutal to Malmo (2800 km), Setubal to Zwickau (2400 km), and Sunderland to Palermo (2300 km). This scatter of car plants indicates the extent to which the industry has become geographically dispersed within western Europe, and dependent on lengthy components supply-lines. Nevertheless, it is also possible to discern a duality in the pattern between a concentration in the older heartlands of car production and a peripheral scatter of more recent plants. This distribution has a basic continuity with the framework proposed by LAW in 1974: "The distribution of the industry in the immediate post-war period still largely reflected the locational pattern which had emerged during its early stages of development. In most countries there was a fairly distinctive pattern." (LAW 1974, p. 9).

Until the 1960s each major producing country tended to have distinctively *concentrated* production patterns, leading to the dominance of centres of car production in regions such as Greater Paris, the West Midlands, and Piedmont. Only in West Germany were the older production plants geographically dispersed between Stuttgart, Frankfurt, Cologne and Wolfsburg. Any interpretation of the subsequent development of the western European automobile production system into its present complexity has

therefore to take account of two major sets of factors, namely the role of changing production systems, and the importance of space.

Within western Europe the automobile industry has long been in the mature stage of the product life-cycle, and thus susceptible to downward cost pressures (CHAPMAN 1992, p. 49). These have created a strong impetus to decentralize plants to the 'cost-cutting peripheries', usually with State financial assistance (STORPER a. WALKER 1990). In recent years the adoption of lean production technology has created new requirements, and some observers have detected a reversal of previous decentralization trends in the North American automobile industry (MAIR, FLORIDA a. KENNEY 1988, WOMACK et al. 1990). These technologically-driven demands are creating conflicting locational pulls between the need to seek lower (peripheral) production costs on the one hand, and the need for increasing (central) technical inputs and closer inter-plant links implicit in JIT; the effects are already discernible in the European components sector (CEC 1991).

An analysis must also include the spatial dimension, which has tended to be neglected in recent years, since lean production particularly stresses the need for a closer relationship between assembly plants and component makers. Although some recent research indicates that the JIT principle might be capable of greater spatial flexibility than hitherto realized, the evidence provided by the recent influx of 20 component factories into the Munich-Dingolfing-Regensburg triangle, and by the clusters of component producers following GM and VAG into eastern Germany, reinforces the principle of close geographical ties, at least for those components which are needed on an hourly basis and are costly to transport and store (BERTRAM a. SCHAMP 1989, LINGE 1991, *Financial Times* 1992B).

The additional car production capacity constructed since the 1960s has been dominated by a shift to the "cost-cutting peripheries" of western Europe. The majority of new plants occur in more isolated locations, especially in underindustrialized regions, although inevitably exceptions can be found, such as Citroen's Aulnay plant in northern Paris. This shift to the periphery has proceeded in two broad phases; initially *national* peripheries benefited, as with the French industry to western France or the Nord-Pas de Calais region (OBERHAUSER 1987), or the Italian industry to the Mezzogiorno (AMIN 1985). At this time a number of CKD assembly plants were also set up in countries such as Belgium and Spain in order to circumvent high tariff barriers (DICKEN 1992). But by



Fig. 1: Distribution of car and components production plants (by type), ca. 1991
Verteilung der Automobilfabriken und Zulieferbetriebe (nach Typen) um 1991

the mid-1970s the movement took on an *international* dimension, with the beginnings of TNC interest in Spain, and this trend has since gathered pace.

The distribution of component plants also follows this broad phasing; LAW noted that component producers up to the early 1960s stuck closely to national territories, and were geared to the needs of national automobile production (LAW 1974, p. 6). This essentially national pattern of auto components purchasing is now breaking down, and a restructuring of the components industry across international divides is proceeding, led by giant firms such as Bosch, Valeo, and Magneti-Marelli (*Financial Times* 1992A).

Nevertheless the western European components industry still retains a national bias, especially where indigenous car assemblers are concerned; Fiat obtains 85% of its components from Italy, and Daimler-Benz 90% from Germany (CEC 1991). Fig. 1 therefore reveals distinctive regional clusters of component producers, particularly in the West Midlands, Greater Paris, and north-east Italy. Rather less-pronounced concentrations exist in Baden-Württemberg, western Bavaria and parts of North Rhine-Westphalia, although, as noted previously, the German industry is under-represented on the map.

An important feature of component manufacturing is the variable distribution of the various types of components. The production of mechanical components is based upon older skills in mechanical engineering and metal working, and plants in this category show a close association with the older centres of car production and/or engineering. These include the English Midlands, Greater Paris, the Sauerland in Germany, and Turin-Milan and Emilia in Italy. This category is less represented in outlying areas, though exceptions occur, as in Sweden or the Swiss Foreland, both having long-established metallurgical traditions; a scatter of plants in Germany reflects similar historical factors.

The distribution of mechanical components plants picks out the traditional heartlands of industrial activity in the major car-producing countries, but electrical components manufacture is a newer industry with 'lighter' characteristics, and responded to locational attractions in which low labour costs are prominent. While important concentrations do exist in some of the core regions of car production, especially Greater Paris and Turin, plants are generally widely distributed. Baden-Württemberg and South Germany have a mixture of mechanical and electrical plants, but the balance favours electrical components. Within France electrical component plants are widely-scattered, being well-represented in the

post-1950 decentralization of industry into the Paris Basin (AYDALOT 1984). In newer car producing countries, such as Spain, electrical component manufacture is also more prevalent than mechanical. Although not shown on Fig. 2, the degree of locational flexibility in this category is illustrated by Ford's selection of Cadiz for its new factory manufacturing engine management systems (DICKEN 1992).

The production of body sub-assemblies, represented by wheels and seat frames, should reveal a tendency to locate nearer to the car producing plants, since the output is bulkier and costlier to transport (SHEARD 1983). This category is the least satisfactory to map, because there is a high degree of internalized production by the automobile producers. Some clusters, including Greater Paris, northern Italy or Campania, relate to this model, but isolated car assembly plants in western France and Spain are not accompanied by obvious component suppliers in this category, while producers of these components in Germany are well-scattered. In the latter, however, automobile assembly plants are also dispersed.

Fig. 2 simplifies the pattern of car and component production. On to this simplified pattern have been superimposed contours of the *peripherality index* derived by KEEBLE and his co-workers for the EC (CEC 1988). Details of the methodology used are given in the original source (p. 12-16), but essentially the higher the index value, the greater is the accessibility to the peak market potential, a vital consideration for a consumer-oriented industry such as automobile production. A majority of both car and component plants falls within, or just beyond (e. g. Wolfsburg), the 126 isoline, which delimits the zone of high market accessibility and market potential. In a real sense, therefore, this zone corresponds with the operational heart of the western European motor industry, containing an immense concentration of car production and components plants, as well as the research and development centres of all major car manufacturers except Fiat. It accords reasonably with the cruder definition advanced by JONES a. NORTH in 1991, which referred to the 'Paris-Wolfsburg-Munich triangle' (JONES a. NORTH 1991).

The bulk of the remainder of the automobile industry lies within the zone of 'intermediate' accessibility (74 to 126 isolines), including both the newly-developing industry in the 'New Länder' of Germany, and the many plants in the post-war boom region of Bavaria. In a broadly similar relationship to the core are the car plants of Britain's industrial periphery, Merseyside and the North East. Rather different is the considerable concentration in north-

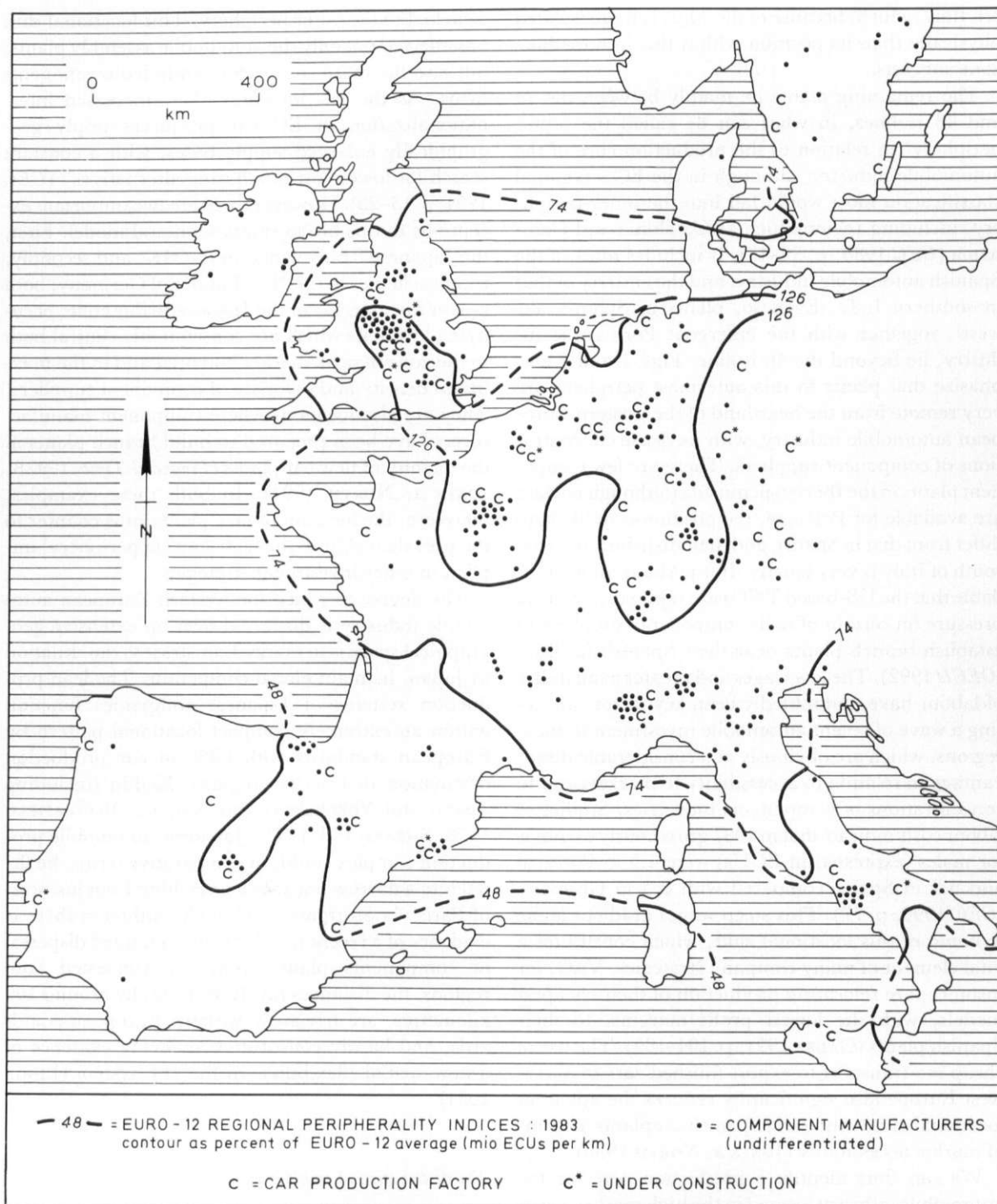


Fig. 2: Distribution of car and components plants (undifferentiated) and regional periphery indices for EURO-12
Verteilung der Automobilfabriken und Zulieferbetriebe sowie Kennziffern der regionalen Peripherie in der Europäischen Gemeinschaft

ern Italy, which, because of the Alps, is more isolated physically than its position within this intermediate zone suggests.

The remaining plants lie mainly between the 74 and 48 isolines, in what can be called the 'outer periphery' in relation to the production core of the automobile industry, although in the EC's regional classification most would fall into the inner-periphery, including regions such as Catalonia and Campania (CEC 1988, p. 39-47). It includes most of the Spanish automobile industry, and the entirety of that in southern Italy. Even so, plants in Spain's 'far west', together with the emergent Portuguese industry, lie beyond the 48 isoline. Figs. 1 and 2 emphasize that plants in this outermost periphery are very remote from the heartland of the western European automobile industry, with its dense concentrations of component suppliers. There are few component plants in the Iberian peninsula (although no data are available for Portugal, the position is unlikely to differ from that in Spain), and their distribution in the south of Italy is very patchy. It is perhaps understandable that the US-based TNCs are reputedly exerting pressure on certain of their components suppliers to establish branch plants near their Spanish facilities (OECD 1992). The low wages and greater availability of labour have undoubtedly been key factors attracting a wave of recent automobile investment to these regions, which are obviously at a considerable disadvantage in relation to accessibility to markets and to concentrations of components industries. Studies of labour costs indicate that in 1987 gross hourly earnings for males (expressed in ECUs) were 1.5 in Portugal and 5.2 in Spain, compared with 8.5 in Germany (CEC 1990, p. 77). This steep wages gradient is the dynamo of this locational shift, which constitutes a vital element of many company strategies. VAG, for instance, are relocating production of their cheapest models, with the lowest profit margins, to their Spanish plants (GAEBE 1991, p. 104-105). The use of cheap sea transport to export finished cars to north-west Europe also significantly reduces the apparent locational disadvantage of Spanish car plants in terms of market accessibility (JONES a. NORTH 1990).

We can thus identify a production core for the automobile industry located in the high market accessibility zone; an inner periphery located in the intermediate accessibility zone, and an outer periphery located beyond the 74 isoline. A broad relationship exists between these zones and the chronology of the industry's expansion. The inner periphery attracted the bulk of new investments in the 1960s and early 1970s, whereas attention since the late 1970s has

switched to the outer periphery. This locational shift has affected not only the automobile assembly plants, but also the more conservative-minded components firms. As the EC indicates, "... increased internationalization of EC car producers imply geographically enlarged supply bases, with a constant search for lower cost purchasing alternatives" (CEC 1991, p. 13-23). However there are two important exceptions to this broad spatio-temporal model. First, the Japanese 'transplants' in the UK, and secondly, recent schemes in the New Länder of Germany; both are on the margins of the *high accessibility* zone, occupying locations which are consequently central both to the zone of peak market potential and to the maximum density and diversity of component suppliers. They are also locations where component manufacturers have been prepared to build branch plants in the vicinity of new car plants (*Financial Times* 1992B, JONES a. NORTH 1991). In both these examples, therefore, the location of new plants runs counter to the prevalent shift to the 'cost-cutting periphery' implicit in other investment strategies.

The degree to which the western European automobile industry is dispersed over an extensive geographical space is in marked contrast to the situation in Japan, its main global competitor. The lean production systems of Japanese companies function within an extremely compact locational pattern by European standards with 80% of car production origination in just two regions, Keihin (including Tokyo and Yokohama) and Nagoya (BLOOMFIELD 1978, SHEARD 1983). The Japanese automobile production complex could, in comparative terms, be fitted into a narrow linear belt stretching from just west of Paris via Stuttgart to Munich. Although there is evidence of a recent trend towards a limited dispersal of components plants from the congested core regions, the distances involved, typically around 100 kilometres, are trivial by western European standards, and hardly constitute convincing evidence of a new spatial 'flexibility' in the JIT system (LINGE 1991).

The distribution of employment

The data used in Figs. 3 and 4 were obtained from *Eurostats Regional Statistics* and refer to male and female employment (wage and salary earners) in NACE*) 35 Manufacturers of Motor Vehicles and

*) Nomenclature Générale des Activités Economiques dans les Communautés Européennes

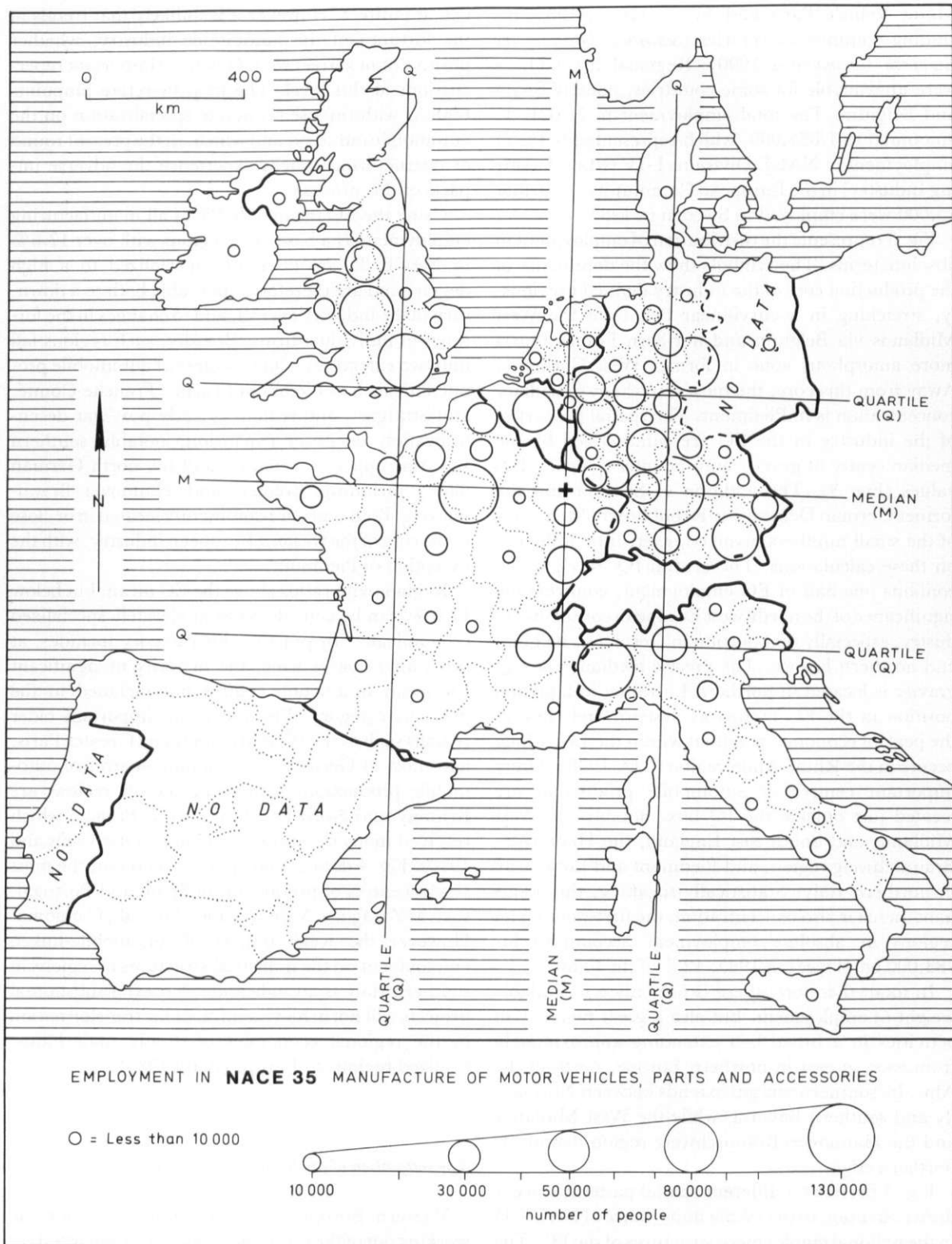


Fig. 3: Absolute distribution of employment in NACE 35 (motor vehicles, parts and accessories), 1985
 Absolute Verteilung der Beschäftigten in NACE 35 (Produktionszweige Fahrzeugbau, Ersatzteile und Zubehör) 1985

Motor Vehicle Parts and Accessories in 1985, including commercial vehicles (*Statistical Office of the European Communities* 1990). Regional breakdowns were unavailable for some countries, notably Spain and Belgium. The total employment in NACE 35 amounted to 1,864,000, which represented 6.3% of employment in NACE Divisions I-IV (Manufacturing Industry) in the European Community. A further 75,000 were employed in Sweden in 1985.

Fig. 3 represents the distribution of employment in absolute terms. The symbols show the dominance of the production core of the industry defined previously, stretching in a curvilinear belt from the West Midlands via Belgium and northern France into a more amorphous zone in former West Germany. Away from this core, the most important subsidiary concentration is in Piedmont. The spatial properties of the industry in the EC are summarized by the median centre of gravity and the inter-quartile (IQ) values (Fig. 3). The addition of Sweden and the former German Democratic Republic would, in view of the small numbers involved, exert little influence on these calculations. The central IQ 'box', which contains one-half of EC employment, confirms the significance of the north-west European core of the industry, especially that portion in Germany, Belgium and northern France. The precise median centre of gravity is located in northern Lorraine, in a pivotal position in the EC motorway system, and close to the peak of economic potential within the EC, which occurs in the Rhine-Main region (*CEC* 1988). Many important centres of automobile production are located just outside the IQ box, notably the West Midlands and South-east England, the Hannover-Braunschweig region, and Piedmont and Lombardy in northern Italy. Statistically-speaking, the dominant theme is also concentration, the first-ranking *ten* regions in absolute employment accounting for 783,000 employees in 1985, 42% of the total.

In total, therefore, there is not only a formidable weight of employment, but also a great diversity of activities in a broad belt extending approximately from west to east in northern Europe, north of the Alps. Its southern margin extends between Normandy and southern Bavaria, while the West Midlands and the Hannover-Braunschweig region delimit its northern edge.

Fig. 4 presents a different spatial pattern, since it draws attention to the *relative* importance of NACE 35 in the regional employment structures of the EC. The regional divisions used in Fig. 3 are rather coarse, and must not be equated with labour market areas, so that the implications for regional economies are to some

extent indirect. However it is unlikely that trends in the fortunes of the automobile industry, whether positive or negative, would not have important repercussions at this level. The map therefore pinpoints regions with intense economic specialization on the automobile industry, and which, in the present round of restructuring, might experience the adverse impacts of this process.

Using the EC mean of 6.3% of all manufacturing employment as a base, any regions with over 12.6% in NACE 35 are obviously specialized to a high degree, and are therefore vulnerable both to a downturn in the industry overall, and to changes in the fortunes of individual firms. Broadly, such regions fall into two categories - 'old' centres of automobile production, such as Piedmont (Turin), Franche-Comté, and Stuttgart, and regions of early post-war decentralization or rapid expansion, notably southern Bavaria, upper Normandy, and the north German plain, including Bremen and Hannover-Braunschweig. Both types are dominantly located in or close to the core of the western European industry, with the exception of Piedmont.

Regions with ratios above the EC mean, but below 12.6%, can be considered as moderately specialized economically. In practice this category includes, at this rather coarse scale, the majority of significant European production centres not included in the previous category. Prominent are important older regions such as the West Midlands and Greater Paris, and most of Germany's remaining centres of automobile production. Among the newer regions are Brittany and Nord-Pas de Calais in France, which received many decentralized plants in the 1960s and 1970s. Fig. 4 does not adequately represent the most recent centres of production in Spain and Portugal, such as Zaragoza, Valencia and above all, Catalonia. However the weak impact of automobile-linked employment on the industrial structures of regions in southern Italy is an indication that even substantial projects will not achieve a miraculous transformation in the regional economies of deeply underindustrialized regions in Europe (*AMIN* 1985).

The integration of production and markets

Western Europe is an important arena for the working out of the accelerating globalization trends in the 1980s (*DICKEN* 1992). The western European automobile industry invites us to ask whether it is still a set of national industries, or a set of industrial cor-

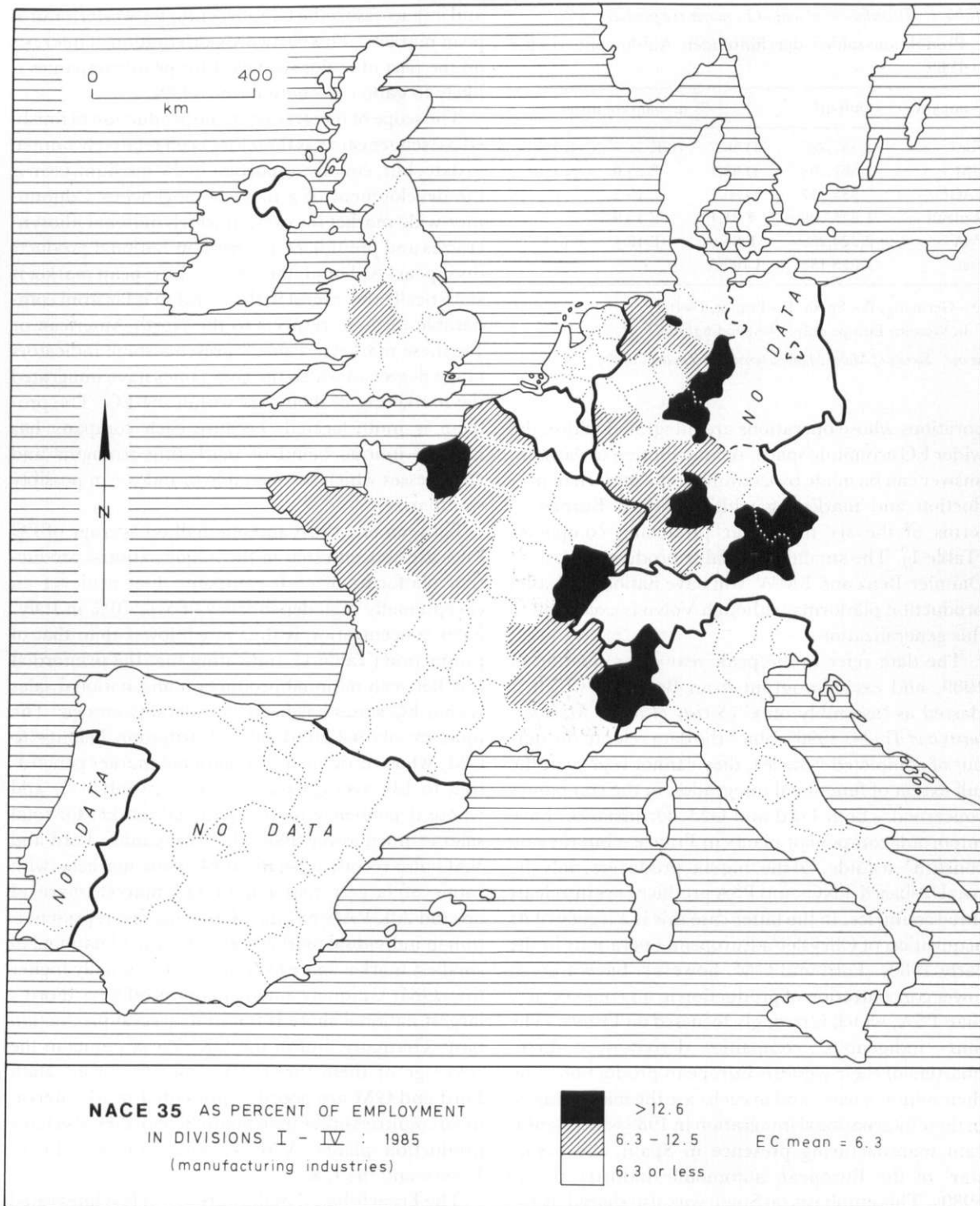


Fig. 4: Relative distribution of employment in NACE 35, 1985
 Relative Verteilung der Beschäftigten in NACE 35, 1985

Table 1: Distribution of output by major car producers 1989

Produktionszahlen der führenden Automobilhersteller 1989

Company	Output ¹⁾	% in main countries		
Ford	1,357,986	D 46.7	UK 31.7	E 21.6
GM	1,567,393	D 63.1	E 23.0	UK 13.3
VAG ²⁾	2,335,137	D 80.7	E 19.3	-
Renault	1,721,000	F 84.1	E 15.9	-
PSA	2,320,266	F 84.9	E 10.4	UK 4.7
Fiat	1,955,132	I 100.0	-	-

D = Germany, E = Spain, F = France, I = Italy

¹⁾ in Western Europe only; ²⁾ including SEATSource: *Society of Motor Manufacturers and Traders* (1990)

porations whose operations are integrated within the wider EC economic space. A contribution towards an answer can be made by examining the pattern of production and marketing within western Europe in terms of the six major car producing companies (Table 1). The smaller, specialist producers, such as Daimler-Benz and BMW, still have nationally-based production platforms, although Volvo is exception to this generalization.

The data refer to the peak year of production in 1989, and exclude output from Belgium, which is classed as 'assembly only' (*Society of Motor Manufacturers and Traders* 1990). Since the data refer to the output of completed vehicles, they cannot represent the full extent of functional integration in the companies concerned – both Ford and GM, for instance, have important component plants in France – but they do constitute a guide. Of the 'big six' producers, only the two US-based TNCs and PSA produce cars in at least three countries; in the latter case this is a legacy of its acquisition of Chrysler's European operations in the early 1980s. Ford and GM, however, have a much lower concentration of production in any one country than PSA, which is strongly focussed on France. The four 'indigenous' companies derive over three-quarters of their western European production from their national base, and in each case the main element in their international integration in 1989 was a significant manufacturing presence in Spain, the 'rising star' of the European automobile industry in the 1980s. This emphasis on Spain was also shared by the US-based TNCs. Fiat has the most national of all production platforms, and has acquired almost the totality of Italian production during the 1980s. It should be noted, however, that eastern Europe plays a major role in Fiat's European operations, and agreements exist with FSM in Poland to produce the 126 model,

and its successor, the Cinquecento, for western European markets. This eastwards-orientation of interests on the part of major western European companies is likely to gather strength in the 1990s.

The scope of integration in the production of finished passenger cars has therefore been relatively limited to date, but, equally important in the medium-term is the development of a more homogeneous Community-wide market for cars, in which national idiosyncracies and prejudices against non-national products disappear. Although the western European market is statistically the largest in the world, it is far from comparable in these respects to the North American or Japanese markets. Table 2 presents some indicators of the degree to which the companies have integrated the marketing of their cars within the EC. The problem is multi-faceted, because each company has its own unique blend of marketing strengths and weaknesses which no one table or index can possibly summarize.

Between one-third and one-half on average of EC sales are concentrated in the major national production platforms of each company; Fiat achieves an exceptionally high dependency of over 70% in Italy. Sales concentration is thus much lower than that of production (Table 1), indicating that the primordial link between national production and national sales within EC states has been considerably eroded. The most evenly-balanced sales distribution belongs to GM, whose ratio of largest national market penetration to EC average market share is only 1.5, and whose dependency on one national market for total sales is much lower than other companies. Ford and VAG also record substantial EC-wide markets, with ratios of largest national to EC market share of around 2.0. VAG has the more balanced representation in individual markets, and its ratio of national to smallest market share (4.8) is only marginally higher than GM. Uniquely among major producers, Ford's largest national share is not in its largest production base, Germany, but in the UK. Weak points in the coverage of these three companies do occur. Both Ford and GM are poorly represented in Mediterranean countries other than Spain, where they also have production plants. VAG's weaker markets lie in France and the UK.

The French-based majors are much less integrated in marketing terms. Renault has a particularly polarized pattern in which, apart from France and Belgium, its only significant national penetration is in Mediterranean countries. One-third of Renault's EC sales are in Spain, Portugal and Italy, but under 15% in the affluent markets of Germany, UK and the

Table 2: European Community: new car registrations 1989

Europäische Gemeinschaft: Neuzulassungen von Kraftfahrzeugen 1989

Company	All EC registrations		National market ¹⁾		Market ratios	
	No. 000s	% of total market	% of EC sales	% of total market	A	B
Ford	1,488	12.1	41.9	27.1	8.2	2.2
GM	1,346	11.0	34.0	16.2	4.3	1.5
VAG ²⁾	1,848	15.0	43.3	28.3	4.8	1.8
Renault	1,350	11.0	49.0	29.1	19.4	2.7
PSA	1,628	13.2	45.8	32.8	8.6	2.5
Fiat	1,923	15.6	70.2	57.2	17.5	3.7

A = ratio of national market share to smallest market share in EC;

B = ratio of national market share to EC average market share

¹⁾ country of largest market share for Ford, GM; country of largest production for VAG; ²⁾ including SEATSource: calculated from *Society of Motor Manufacturers and Traders* (1990)

Netherlands. This is a major cause for concern in the long-term future of Renault as a major producer. PSA's statistical spread is similar, though less extreme. Its diffusion into EC markets is stronger (an 8.6 ratio compared with Renault's 19.4), and it enjoys a reasonable presence in the affluent but also very competitive markets of northern Europe. The most vulnerable marketing position belongs to Fiat and its associated companies, which have found it difficult to break out from an over-dependence on the domestic market and low-income Mediterranean countries such as Greece and Portugal. Thus only 15% of Fiat's total EC sales occur in Germany, UK, and the Benelux, although these countries account for over half of annual new car registrations in the EC.

The emergence of a homogeneous European market is therefore some distance away, even for the big six producers. Progress among individual companies has also been uneven, with the US-based TNCs and VAG making the most rapid strides towards the goal of achieving an even market penetration. This goal is of course an ideal - total uniformity in market distributions can never be expected since the models produced by individual companies do not overlap perfectly, and are unlikely to do so in the future. GM, for example, do not make an equivalent car to the Fiat Panda, let alone the tiny Cinquecento. But the opening up of the EC market to increasing competition in the 1990s places a premium on the diversification of sales into all corners of the *total* European market, including not only the EC, but also EFTA countries, and, as their economies strengthen, the countries of eastern Europe as well. In the final analysis volume sales are vital for the maintenance of scale economies, and long-term market share is therefore a critical

variable. In 1989 Japanese firms had already taken almost 11% of the combined EC and EFTA market, even in highly contrived market circumstances. This market share was equivalent to the total output of one of the six major western European producers, and demonstrates the size of the competitive challenge ahead. Arguably the most vulnerable companies in this most consumer-centred of industries will be found among those who cannot integrate their markets at an international level within Europe.

Conclusion

The paper has posed some basic questions, and has attempted to answer these within the limits of the available data and information.

First, it is possible to identify and define a core region within western Europe which is also *de facto* the productive heartland of the entire European automobile production system. This core region forms a broad, loose-knit but nevertheless recognizable belt running west-east across north-west Europe from the English Midlands to southern Bavaria. It contains over half of the EC's employment in the motor vehicle and components industry. With few exceptions it contains all the significant HQ and R&D establishments of the automobile producers, and it has the densest network of specialist component and sub-system plants. In view of the increasingly close economic and technical links between automobile producers and a diminishing but select band of major component suppliers implicit in the adoption of so-called lean production technology, this core region

will surely assume an even greater significance in the short- and medium-term, particularly as only a small proportion of component manufacture faces intense logistical pressures to locate in the close proximity of assembly plants (BERTRAM a. SCHAMP 1989). Further research is undoubtedly necessary to monitor the implications of the changing spatial relationships between assemblers and suppliers, but with all automobile producers aiming to reach the Japanese level of about 80% for bought-in components, the creation and maintenance of good quality operational linkages of all kinds will be vital.

Secondly, in comparison with Japan, the spatial configuration of the western European industry is characterized by very wide dispersion. This can be linked with the political fragmentation of the European space, and the continued importance of nation states in creating sharp discontinuities in labour markets, economic policies and cultural conditions. MAIR (1992) has stressed that space itself conditions the adoption of new techniques such as JIT, and there is unlikely to be a replication of a North American-style production re-centralisation, which CHAPMAN links with the locational requirements of new flexible production systems (CHAPMAN 1992, p. 63). Within western Europe the position is more complex, since there has been a substantial recent shift of both automobile and selected component plants to a geographically-extensive, low-cost periphery. Until 1990 this periphery was coterminous with the Mediterranean countries, particularly Spain, Portugal, and southern Italy. Since 1990 increasing attention has been given to the new eastern European periphery, especially in Poland, Hungary, and former Czechoslovakia, where labour costs are even lower by western European standards, and where lean production practices can be built into the new plants from the outset (*Financial Times* 1992A). However some investment trends run counter to this shift to the new peripheries of Europe, particularly the UK transplants of Nissan, Toyota, and Honda, which are either within or very close to the core region; in these cases JIT accessibility is coupled with low labour costs and the cultural familiarity of the English language. Arguably a similar package of advantages surrounds the new east German plants of VAG and GM. Even VAG's gradual absorption of the Czechoslovakian firm, Skoda, can be interpreted as an extension of the German auto production system – after all, the distance from Wolfsburg to Skoda's main Mlada Boleslav plant is less than from Wolfsburg to other centres of German car production, such as Munich, or Stuttgart!

Finally, the nation states continue to be of relevance in understanding the uneven progress made by the various producers in integrating their production and marketing. The link between nationally-based production and sales patterns has been broken, but in the process a gap has emerged between individual companies. Ford, GM, and VAG have made huge strides towards a European-wide presence, whereas PSA, Renault and Fiat remain more nationally-based and regionally-confined. Excess production capacity undoubtedly exists in western Europe, and intensified Japanese-based competition can be anticipated, so that further organizational changes, production restructuring, and plant rationalization will be inevitable. In this connection the increasing organizational ties between Renault and Volvo, and the MPV joint venture between VAG and Ford in Portugal, are but two contemporary indicators of an ongoing process in which the automobile industry is becoming less national and more European.

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