GLOBAL PRODUCTION NETWORKS IN EUROPE AND EAST ASIA: THE AUTOMOBILE COMPONENTS INDUSTRIES

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Introduction

The automobile components industries consist of a highly complex mélange of firms of very different sizes, types, and geographical extent, producing an enormous variety of products from the very simple to the exceptionally complex. It is estimated that purchasing of components 'accounts for between 50 and 70% of the cost price of an average car' (ABN-AMRO 2000: 11; Freyssenet and Lung 2000: 83). The 'shape' of the components industries is determined primarily by the strategies of their customers - the automobile assemblers - but not entirely so. It is also shaped by some of the more powerful components suppliers themselves, which have the capability, in turn, at least partly to influence the strategies of the auto assemblers. Indeed, although there are certain dominant trends in the relationships between assemblers and component manufacturers, the picture is by no means as straightforward as some of the literature tends to suggest. In addition, the state continues to play a significant role in these industries

The automobile industry as a whole has long been a focal interest of many countries in their drive for industrialization. This remains so today although, in Humphrey's (2000: 270) view it may be 'worth questioning whether efforts to promote the auto industry are worthwhile' from a national development viewpoint. The significance of the automobile industry lies in both its scale and its complexity in terms of its direct and indirect involvement across many other industries. Although perhaps up to 4 million people are employed in actually manufacturing automobiles a further 9-10 million are employed in supplier industries (Dicken 2003a: 355).

The purpose of this paper is to explore the structure and dynamics of global production networks in the automobile components industries drawing primarily, though not exclusively, on in-depth interviews with senior company executives and with 'non-firm institutions', including government agencies. The research design involved identifying a number of key firms in both the assembly and component sectors as 'focal' firms and interviewing them and some of their major suppliers. The aim was to explore, in as much depth as possible, their evolving production networks. Interviews were conducted with automobile assemblers and component manufacturers in Germany, the UK, Japan, South Korea, China, Singapore, Thailand, Czech Republic, Hungary, and Poland. In addition, a large volume of firm- and sector-specific materials was collected from both company and industry sources.

Together, these enable us to throw further light on the highly complex and dynamic processes of interaction and interdependence between firms in the industries and help to clarify some of the developmental implications for the countries and communities in which these industries are present (or being sought). The purpose of the research, therefore, was not to produce a comprehensive analysis of the global automobile components industries but, rather, to illuminate some of the processes involved in the current reconfiguration of production networks within the industries, particularly in Europe and East Asia.

The paper is organized into three major sections. First, we examine the relatively recent metamorphosis of the traditional automobile production process into the more complex production systems evident today, driven at least in part by market dynamics and by technological developments in automobile production. Second, we explore the nature of power relationships within these industries. The conventional wisdom is that power lies essentially with the automobile assemblers and that component manufacturers simply have to respond to pressures passed on to them by the assemblers. There is considerable truth in this but it is only part of the story. In addition, states, through their regulatory systems and practices continue to exert - albeit more in some cases than in others - a significant degree of power over the geographical and organizational configuration of these industries. Third, we look in some detail at how these processes are being worked out 'on the ground' in the two regions - Europe and East Asia - that constitute the geographical focus of this research project.

Metamorphosis of the automobile assembly and components industries

Figure 1 outlines the basic structure of the automobile production chain. As the archetypal assembly industry it continues to bring together an immense number and variety of materials and components drawn from a vast array of industries (the left hand section of Figure 1 shows only the major supplying industries). The central section of Figure 1 identifies the three major processes prior to assembly of the finished vehicle: the manufacture of bodies, of components, and of engines and transmissions. How the nature of, and the articulation between, these elements is changing is the focus of this and the following sections.

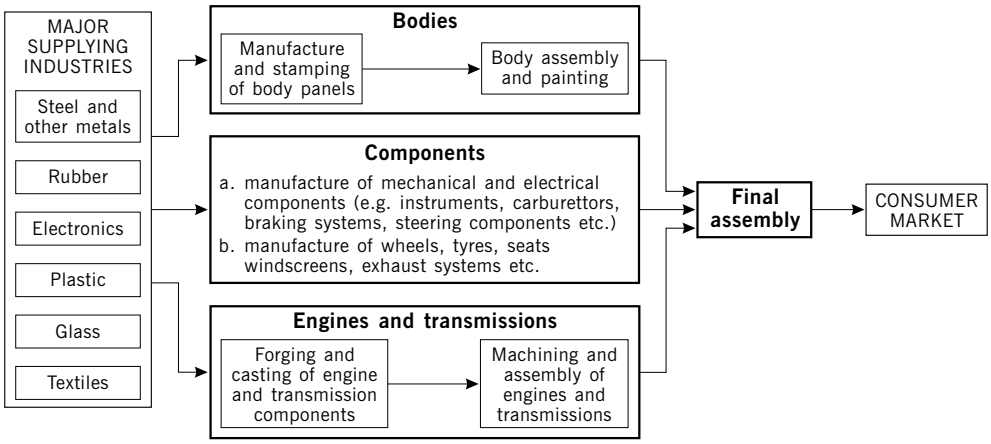

Figure 1: The basic automobile production chain

Source: Dicken (2003a) Figure 11.1

The method of manufacturing automobiles hardly changed at all in substance between 1913, when Henry Ford introduced the moving assembly line, and the early 1970s. Technologically, it was the mass-production system *par excellence,* characterized by a high degree of product standardization and production rigidity. Organizationally, it was characterized by a high degree of vertical integration within the major producers, especially the 'big three' United States firms which dominated the industry, together with a system of essentially arm's-length relationships with external components suppliers. Geographically, it was an industry of substantial global extent but a relatively low level of geographical integration. Most automobile plants were oriented to national or, in some cases, regional, markets, a structure greatly influenced by the long-standing protectionist regulatory policies of most national governments.

This relatively stable situation began to change dramatically in the early 1970s, primarily as a result of the emergence of highly efficient, and cost-competitive, Japanese automobile firms as world players. The changes largely triggered by this new competition transformed what had seemed to be a mature industry into one of volatility. What had appeared to be a mature industry, based on well-established technologies and organization of production, entered a phase of transformation (not unlike the situation in the early 20th century when a (literally) Fordist mass production system displaced craft-based production). The basis of this second transformation was claimed to be the displacement of mass production techniques by a system of *lean production*. As popularized by Womack, Jones and Roos (1990), this became the

much-hyped conventional wisdom (for some counter arguments see Williams et al 1992).

The essence of the lean production system as promulgated by Womack, Jones and Roos was that it 'combines the best features of both craft production and mass production – the ability to reduce costs per unit and dramatically improve quality while, at the same time, providing an even wider range of products and even more challenging work' (277). Whether or not one accepts the entire lean production argument, there is no doubt that many of its elements – and certainly much of its rhetoric – have been incorporated into the ways in which automobile production is organized. However, the extent and speed of adoption of many lean production elements has been extremely uneven between different automobile producers and there remains considerable variety in actual practice.

Two of the most important forces underlying the metamorphosis of the automobile assembly and components industries are, first, changing market conditions and demand for automobiles (and, therefore, for components) and, second, technological change.

Changing market dynamics in the automobile industry

Demand for automobiles has always been volatile and, like most major consumer products, subject to business cycle influences**.** However, it has become significantly more volatile – and more complex in its structure - in recent years. Three inter-related characteristics of the market for new automobiles are especially important:

- It is highly cyclical
- There are long-term (secular) changes in demand
- There are signs of increasing market segmentation and fragmentation

> In any of the Triad regions (Western Europe, Japan and the US) Original Equipment Manufacturers (OEMs) have been facing a mature market for the past 10 years, with stagnant demand, product proliferation and stiff price competition. The demand for new cars has been growing on average less than 1% a year during the past ten years and this trend is forecast to continue. This situation is particularly sensitive in the US market, where growth in the number of new cars sold has been virtually zero (Veloso 2000: 3)

Such slow growth in demand for automobiles in the mature markets reflects deeper *secular* or structural characteristics in these markets that limit future growth in car sales. In the mature automobile markets today some 85 per cent of total demand for automobiles is replacement demand, a much slower-growing market segment. Currently, therefore, there is around 30% overcapacity in Western Europe and 25% overcapacity in the United States– a massive problem for the producers. Stagnant growth in these mature markets has led to expectations that the most buoyant vehicle markets are now likely to be some of the emerging market economies, notably in East Asia and Eastern Europe. Significant growth in demand has indeed occurred in these regions but their vulnerability to financial shocks has dampened down some of these expectations. For example, the growth potential of East Asia's car markets, at least in the short- to medium-term, was seriously affected by the region's financial crisis of the late 1990s. This is still having an inhibiting effect on consumer demand in the region, despite the rapid growth of demand for automobiles in China.

Not only is the level of demand for automobile components highly variable and geographically uneven but also the nature of that demand is affected by the increasing segmentation of the automobile market and by the proliferation of model variants:

> the number of different vehicle models offered for sale in the US market alone doubled from 1980 to 1999, reaching 1050 different ones last year. In addition to the different models, there is also a myriad of features that can be added to each of the models, from power steering to power seats, or to cruise control, just to name a few. An increase in the number of models in the Triad, where demand is stagnant, and the smaller size of emerging markets, resulted in an important reduction in scale (Veloso 2000: 4).

Differences in the demographic structure of the market can have a significant impact. In North America, Western Europe and Japan the size of the older age groups is increasing rapidly. Such older groups create a demand for particular types of vehicle specification so that features that were once confined only to the luxury vehicle segment are now being increasingly fitted to volume cars. For example,

> adjustable lumbar pads are now available in volume produced cars, as are heating elements, driver seat cushion height and tilt adjustment … the 'greying' of the US and European driver population and accompanying increase in back pain is prompting seat manufacturers to incorporate orthopaedic features into car seats…Johnson Controls is exploring the use of

instrument displays with glare control and built-in voice recorders to remind drivers to take certain actions … its so-called HomeLink device … allows drivers to activate garage doors and home lighting and security systems (EIU 2000: 63)

Table 1: Differences in growth rates for individual automobile components (OE and AM), 1994-2005

	m units			m units	
Component	1994	1999	94/99%	2005	05/94%
Front passenger airbags	4.2	22.3	431	27.1	545
Electric motors (OE)	2007.3	3098.1	54	6350.2	216
Driver airbags	11.2	27.3	144	28.7	156
Front side airbags	0.0	14.7	-	39.5	-
CVT transmissions	0.0	0.7	-	2.4	-
HID headlights	0.0	2.7	-	10.0	-
Navigation systems	0.0	2.1	-	5.6	-
Air con systems	14.6	21.0	44	28.5	95
Auto transmissions	15.1	17.2	14	20.3	34
Disc brakes	86.3	94.5	10	112.2	30
Starter motors	101.6	110.4	9	123.1	21
Alternators	95.0	103.0	8	115.2	21
Batteries	129.7	140.9	9	157.6	21
Wiper blades	348.8	378.3	8	415.9	19
Shock absorbers	222.5	234.4	5	253.5	14
Air filters	275.0	289.0	5	304.1	10
Seatbelts	167.0	172.2	3	198.3	19
Manual transmissions	16.7	17.2	3	19.3	16
Exhaust systems	147.7	147.2	-0.3	149.8	1
Clutches	50.6	49.0	-3	50.0	-1
Drum brakes	47.0	42.7	-9	44.4	-5
Oil filters	446.5	420.6	-6	407.7	-10
Radiators	47.4	41.1	-13	42.5	-10
Sparking plugs	1261.7	1052.1	-17	845.5	-33

Source: based on EIU (2000) Table 9.1

These changes in demand for automobiles inevitably have a very significant impact on component suppliers. The global market for automobile components in the late 1990s was estimated to be around $520 billion (EIU 2000: 1). Of this total, $420 billion was in original equipment (OE) components and $100 billion in aftermarket (AM) sales. However, this ratio varies widely between different components and different manufacturers. For the Japanese firm, Denso, for example, around 50% of total sales is tothe aftermarket (*Company interview* 2002). The biggest problem arises in the OE sector because this is, obviously, most susceptible to the changing level of demand for new vehicles. In addition, each new model introduction results in a reduction of up to 30% in the number of components used (EIU 2000: 17). The market for automobile components, therefore, is immensely complex and volatile. Demand for some components, is growing much faster than for others, as Table 1 shows. For example, the EIU (2000: 65) identifies the following components regarded as likely to grow faster than the overall car market itself over the next few years:

- Adaptive cruise control (including radar and sensors/
- Keyless entry systems
- Air conditioning
- Cabin filters
- Fuel filters
- In-car navigation and entertainment systems
- Side airbags
- HID headlamps
- Seat comfort features
- Electronic braking systems
- Automatic transmissions

Accelerating technological change in the automobile industry

> Road vehicles will change more over the next 10 years than they have over the last 100 (ABN-AMRO, 2000:15)

Whether or not such a bold prediction is accurate, the fact is that substantial changes in the technology of automobile manufacture – in both product and process technologies - have been, and are, occurring. Such changes have immense implications for the automobile components industries. As a result, the components

manufacturers are spending increasingly large sums on research and development. It has been estimated that the component suppliers have doubled their expenditure on R & D over the past decade (from 3% to around 6% of sales) and are now spending more than the OEMs (ABN-AMRO 2000: 1, 8).

Perhaps the most important change, cutting across both product and process technologies, is the increasing use of electronics in automobiles. Electronics, in the form of automated design and manufacturing processes are now well established. Rather more recent has been the increasing importance of electronic components and systems as key building blocks in automobiles themselves.

> The modern car has become completely dependent on electronics for engine management, satellite navigation, suspension controls and a raft of other enhancements from memory seats to rain-activated windscreen wipers. The next big step in the integration of electronics in the vehicle is the connection of all computers on a 'vehicle intranet' which will provide a simple and flexible installation with a minimum of wiring…
>
> The total content of electronics in vehicles is difficult to ascertain…However, it is believed that electronics will continue to grow in all cars, accounting for more than 30% of a vehicle's value in the executive class to around 20% in 3-door hatchbacks (EIU 2000: 7).

It is predicted that what has come to be termed 'telematics' will grow at a very high rate in the next few years:

> Telematics, an umbrella term for vehicle- and transport-related IT that is underpinned by technologies such as mobile telecommunications, satellite positioning systems and high performance computers, is being deployed or planned by carmakers worldwide…According to UBS Warburg, the securities house, the world market for automotive telematics is set to grow to $47.2bn a year by 2010, from $4.2bn last year…
>
> To date, the use of IT in cars has mostly involved embedded devices, from computer controlled fuel injection to ant-lock brake systems…New embedded systems will include anti-collision control, active noise reduction and electronic clutches…
>
> But the next generation of devices will appear above the dashboard. The ultimate goal is the development and adoption of an automotive operating system, a bundle of standards and software that will enable drivers to plug and play new gizmos to their hearts' content, and give car manufacturers and

> their partners several years' worth of applications to keep the industry moving forward (Vernon 2001: vii)

Apart from the increasing use of electronics, two other technological developments are especially significant, both of which are related to developments in the *architecture* of the vehicle (Pfaffmann and Stephan 2001:339). The first is the trend towards the reduction in the number of individual vehicle *platforms*. Although, as we saw earlier, the number of individual vehicle models has increased markedly, such diversity is being constructed on a much smaller number of different platforms. In other words, there is a much greater degree of commonality across the model ranges of individual producers. This allows a much greater degree of sharing of components across model ranges.

Table 2 illustrates this tendency in the case of Volkswagen. The VW group (which includes Audi, VW, SEAT, and Skoda) moved to just four basic vehicle platforms (down from 16 in the mid-1990s), all but one of which are shared across different models in specific segments.

Table 2: Vehicle platform types in the VW Group

		Vehicle type			
Market segment	**Platform**	**Audi**	**VW**	**SEAT**	**Skoda**
Luxury	1	A8			
Upper-level	2	A6			
Upper-middle-level	2	A4	Passat		
Traditional middle-level	3	A3	Bora Beatle Golf		Oktavia
Lower-middle-level	3				Toledo
Entry-level	4	A2	Polo Lupo	Cordoba Ibiza Arosa Marbella	Felicia

Source: based on Proff (2000) Figure 3

Similar trends are occurring in many of the other automobile manufacturers. For example, Fiat uses the same platform for its Palio, Siena, Strada and Minivan vehicles, GM uses the same platform for seven vehicles across its Buick, Chevrolet, Oldsmobile and Pontiac ranges (Veloso 2000: 7). Overall, GM is reducing its total number of platforms from 25 to 8; Nissan from 24 to 5; Toyota from 20 to 7 (Shimokawa 2000: 15; Freyssenet and Lung 2000: 86). In sum, during the 1990s, the number of combined platforms being used by the large European automobile

manufacturers fell from more than 70 to a little over 40 (ABN-AMRO 2000: 6). From a component manufacturer's point of view, the greater number of different models being built on a single platform the greater are the potential economies of scale for component production.

However, it now seems that VW is changing its strategy quite drastically as the influence of the relatively new CEO (formerly at BMW) takes effect.

> Mr Piech's 'platform strategy'…has been abandoned. This strategy – welcomed when set up - had two main problems. First, it hurt marketing as customers came to identify the downmarket Skodas and Seats with the more expensive Golf. Second, it led to periods of new model famine followed by feast…
>
> The platform strategy was directly to blame for the lack of new models because new vehicle launches had to be closely linked to the launch of a new platform (*Financial Times* 15 April 2003).

So far, at least, VW seems to be going against industry fashion. Certainly, from a component manufacturers point of view, the greater number of different models being built on a single platform the greater are the potential economies of scale

The second significant technological development, also linked to the vehicle architecture, is that of the *modularization* of certain components and the development of component *systems* (see Sturgeon 2003). A *module* is a group of components that are arranged close to each other within a vehicle and constitute a coherent unit. A component *system* is a group of components 'located throughout a vehicle that operate together to provide a specific vehicle function. Braking systems, electrical systems and steering systems are examples' (Delphi Automotive Systems, quoted by EIU, 2000:1). A modular and system-based architecture has become the norm:

> A *modular* product architecture is characterised by a relatively high *independence* of functional and physical units of the product. A high independence is given if components can be very easily de-coupled (or dis-connected) from each other. A prime activity carried out by OEMs in the early stages of the product development process is to develop a feasible product architecture. If the architecture is highly modular, the intersections between functions and components as well as among components are *clearly defined* (Pfaffmann and Stephan 2001: 339, original emphasis).

In fact, VW's alternative to the use of common platforms is, apparently, to be that of modules:

> A module, such as an axle or the electronic control system, will be used across many different vehicles but can be replaced independently of other modules. With a 12-year life cycle, updates will not be synchronised with the average seven-year life-span of a car model, meaning vehicle launches do not have to be bunched together close to a platform launch (*Financial Times* 15 April 2003)

The volatility of both market conditions and technology has transformed the manufacture of automobiles for both the vehicle assemblers and the component manufacturers. In particular, the power relationships between assemblers and suppliers are being reconfigured in ways that have implications not only for the firms themselves but also for the places in which production is carried out.

Re-configurations of power in the automobile assembly and components industries

The conventional view in most analyses of the automobile industry is that power lies predominantly and increasingly with the automobile assemblers – the original equipment manufacturers (OEMs) - and that component manufacturers simply have to respond to pressures passed on to them by the assemblers. There is, indeed, a good deal of truth in this view. Without doubt, reconfiguration of the relationships between assemblers and suppliers is taking place and power relationships are certainly not symmetrical. But component manufacturers, especially the very large firms and/or those with scarce proprietary technology, are by no means powerless. In addition, states, through their regulatory systems and practices, continue to exert - albeit more in some cases than in others - a significant degree of power over the geographical and organizational configuration of these industries. These complex power relationships are reflected in the various strategies being implemented by OEMs, component suppliers, and states in pursuit of their own competitive goals.

Concentration of OEMs in the automobile industry

At first sight, the history of the automobile industry would seem to be an inexorable progress towards increased concentration: the dominance of

production by a smaller and smaller number of firms. That was certainly the trend between the 1920s and the 1960s. In the early days of the automobile industry in North America and Western Europe there were scores of manufacturers each producing a limited range of automobiles for individual national markets. In 1920, for example, there were more than 80 automobile manufacturers operating in the United States, more than 150 in France, 40 in the United Kingdom and more than 30 in Italy. By the 1960s, following successive waves of consolidation both through merger and acquisition and also the closure of inefficient firms, around 50% of world automobile production was concentrated in just three firms: the US 'big three" (GM, Ford and Chrysler). But, as Kay (2003) has recently pointed out, the 3-firm concentration ratio in the industry has actually declined since then: to around 36%. In large part this has been because of the emergence, since the 1970s, of Japanese, German and, to a lesser extent, French automobile firms.

Despite the fall in the 3-firm concentration ratio, the global automobile industry is, without doubt, a strongly concentrated industry. The leading fifteen companies produce more than three-quarters of world vehicle output. The top four alone produce more than 40% of the world total. This is, by any measure, a strongly oligopolistic industry, characterized by high barriers to entry and typical oligopolistic strategies by the leading firms. In fact, the degree of industry concentration may well be increasing again. In the last five years, a new wave of cross-border mergers and acquisitions has occurred. The most significant, by far, was the acquisition of the American firm Chrysler by the German-owned Daimler-Benz in 1998. This $40.5bn deal was the third largest in the world between 1987 and 1999 and was widely seen as by far the most significant development in the automobile industry itself. In 1999, Ford acquired Volvo of Sweden for $6.5bn while the French company Renault acquired almost 40% of the equity in the Japanese firm, Nissan for $5.4 bn. In 2000, GM acquired a large stake in the dominant Italian company, Fiat; DaimlerChrysler acquired 34% of Mitsubishi Motors; and, in 2002, GM acquired the Korean assets of the bankrupt Daewoo. At the same time, some acquisitions unravelled, as in the case of BMW's short-lived ownership of the British company, Rover.

However, mergers and acquisitions are not the only form of inter-firm relationship in the automobile industry. All the world's automobile manufacturers are also deeply embedded in *collaborative agreements* with other manufacturers.

Consequently, a veritable transnational spider's web of strategic alliances has developed, a web that stretches across the globe:

> In recent years, there have been about 100 new alliances in the automobile industry per year. The majority of these are manufacturing joint ventures…Around 80 per cent of the 1999 alliances (91 out of 115) were cross-border, indicating the high degree of globalization in this sector. International alliances in 1999 included 53 joint ventures, all of which (except one for marketing co-operation) were for assembly of vehicles or parts. US firms participated in 27 international alliances in 1999, followed by Germany (26), Japan (22), China (13), France (10) and Italy (8) (Kang and Sakai 2000: 24-25)

As a consequence of such mergers and acquisitions and the continuing proliferation of strategic collaborations between independent automobile firms, the organizational map of the automobile industry has changed dramatically (Figure 2). Apart from the recent mergers discussed above, Figure 2 shows some of the other significant groupings that have emerged in recent years, most notably the Volkswagen Group's acquisitions of the Czech firm Skoda and the Spanish firm SEAT, as well as the new equity relationship between GM and Fiat.

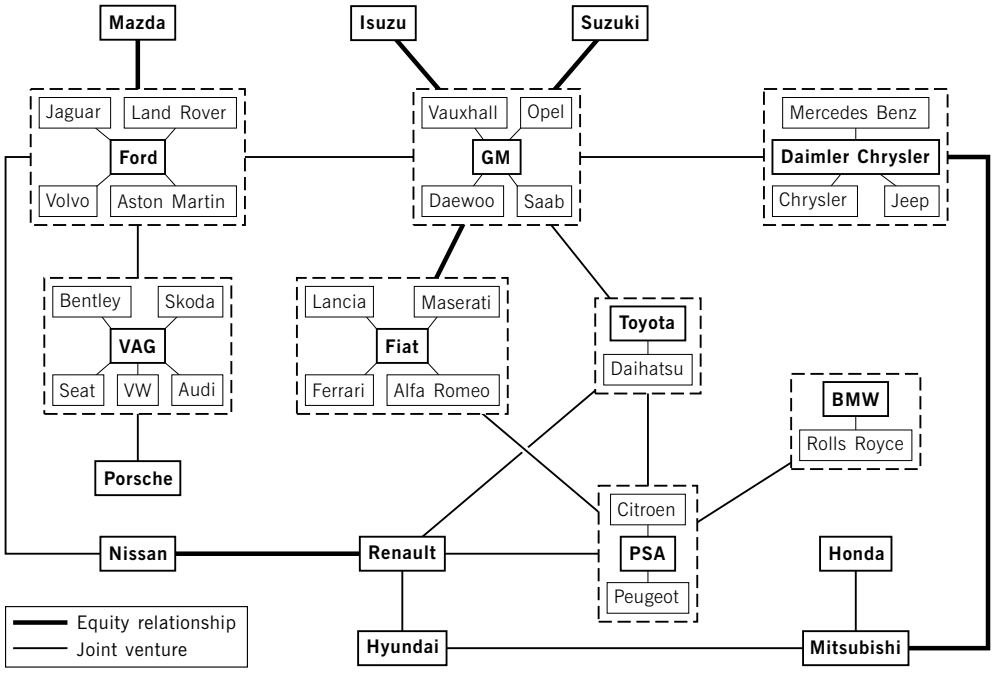

Figure 2: The organizational map of the automobile industry in 2000

Source: Dicken (2003a) Figure 11.8

Such consolidation amongst OEMs reflects the intensification of competition within the automobile industry in the face of the problematic demand and market conditions discussed above. Activities are being redistributed within firms' geographically extensive production networks in response to the fact that both the level and composition of demand for automobiles are highly uneven at a global scale. New productive capacity is mostly confined to those parts of the world – some of the emerging market economies – where there is the potential both for lower cost production and market growth. An inevitable corollary of consolidation is the rationalization and restructuring of operations. In the face of serious excess capacity in the industry, some plants are being closed, others are having their operations either scaled down or transformed. Automobile firms are adopting a broadly 'global' perspective to an increasing degree.

However, it would be misleading to conceive of all (or even most) automobile producers as adopting pure global strategies. Despite some common features, there remains substantial variation in strategies between individual automobile firms, at least some of which derives from their geographical origin. In fact, although it is certainly true that many firms are attempting to standardize their platform strategies globally or to use more complex modules and systems, in reality it is a strategy most evident at the *regional* scales of North America, Europe, and East Asia in particular. Hence it would seem to be more accurate to think in terms of strategies of *regionalization* rather than globalization. Again, however, variety rather than uniformity would seem to be the norm in the industry.

Changing relationships between OEMs and suppliers

Production of materials and components for the automobile industry in the past has taken various forms. The dominant US firms, GM and Ford, developed a very high level of in-house component production as part of their highly vertically-integrated production systems. At the other extreme, a great deal of materials and components purchasing in the industry was on an arms'-length basis from independent suppliers. The Korean firm, Daewoo, outsourced 85-90% of the total cost of the vehicle. Its purchasing policy was to let 'suppliers manufacture all parts except for the parts that constitute the external appearance of the car, such as …[body]…panels and the parts that directly influence the performance of a car, such as the engine' (*Company interview* 2002). Arms'-length purchasing, based primarily

on price, was also used by the more integrated producers (like GM and Ford) for those components not produced in-house. In between these two extremes, the major Japanese producers, notably Toyota, developed a very tight relationship with closely-linked, independent or quasi-independent, component firms located in close geographical proximity to their assembly plants. The existence of the *keiretsu* system in Japan greatly facilitated such an arrangement.

In virtually all cases, however, the roles of the OEM and the supplier were distinctive and functionally separate: the OEM placed an order for a component based on its own design and engineering specifications and component suppliers had to meet those specifications at an agreed price. This was the standard subcontracting system common in many industries. Increasingly, at least among non-Japanese automobile firms, price became the determining influence. OEMs ranged increasingly widely to find lower-cost components; relationships between OEMs and suppliers were often 'distant' in terms of both location and working functions. The close geographical proximity between customer and supplier, that had been a feature of the early years of the automobile industry in both North America and Europe, began to break down as technological developments in transportation and communication made longer-distance transactions possible. The increased geographical distance between the assemblers and their suppliers made it necessary for the assemblers to hold huge inventories of components at their assembly sites. In this way, the possibility of the assembly line being disrupted by a temporary shortage of components (or by faulty batches) was reduced. This was, to use Schonberger's (1982) term, a 'just-in-case' system.

The essence of the system that came to be called 'lean production' necessitated a very different set of customer-supplier relationships in the automobile industry. In particular, it demanded much closer functional relationships between OEMs and their suppliers, with design and production of components and systems of components being carried out in very close consultation. Longer-term relationships became more desirable whilst, at the same time, development and delivery cycles became shorter leading to the need for very frequent delivery of components 'just-in-time'. Such changes have been worked out in different ways by different firms in different places. However, some broad general tendencies are clear.

First, among those OEMs that had a considerable amount of in-house component production there has been a strong move towards 'de-verticalization' or

increased outsourcing. This has taken a number of forms. Both GM and Ford, for example, have formally spun-off their former in-house component divisions into free-standing, independently-owned companies – Delphi and Visteon respectively - that have to compete for business with their former owners. For example, in the case of Visteon's relationship with Ford,

> Our relationship currently is only a business relationship, which means that we are one of their suppliers. We are the biggest suppliers but… we to go through their competitive bidding process and they will return and tell us whether we have the lowest price or the best quality etc. So we are just one of their suppliers (*Company interview* 2001).

In all US and European OEMs, the proportion of components that is outsourced has increased dramatically. For example, PSA increased its outsourcing from 45% of the car's value in 1985 to 70% in 1997; Renault's outsourcing increased from 50% to 65% over the same period and was estimated at 80% in 2000 (Veloso: 2000: Figure 5). However,

> the degree of outsourcing varies widely, based on each producer's definition of what is core and should therefore be kept in-house…the degree of acceptance also differs from one OEM to another. While outsourcing may be considered a norm in the auto industry, some carmakers may be tempted, from time to time, to source some components back in-house. This 'insourcing' policy may be based on fair 'make or buy' analysis (providing that they have kept in-house capabilities) or be justified by the need to maintain sufficient workload in specific areas (ABN-AMRO 2000: 3)

VW, for example, is starting once again to manufacture its own seats in its Eastern European operations, partly because the seat manufacturing segment has become so highly concentrated and the number of potential suppliers so much reduced (*Company interview* 2001).

It is a mistake, therefore, to see a unidirectional and irreversible trend towards increased outsourcing across the board. Not only do firms need to identify and retain their major core competences but also they must constantly monitor the situation:

> we…critically ask ourselves time and again which new areas we have to do in-house, but also which areas eventually to source out. We'll never do windscreen wiper motors, or adjustment motors. It is even a question of whether we should get fit for the development of roofs for convertibles, these are areas where you say "no". But there are considerations, to do components

> for aggregates for example, which are very important in-house (*OEM Company interview* 2001).

This potential for returning to 'in-sourcing' by OEMs causes problems for component suppliers:

> Some of the OEMs do their own production in-house. Plus, some of the Japanese are now forming sort of branches of what we do. There is a cycle, you find the OEMs suddenly are making this kind of stuff. They put it all out only to draw back in and produce in-house. For this reason, we have to keep a close eye on what they are doing (*Supplier company interview* 2002)

This tension between out-sourcing and in-sourcing is also related to the timescale of contracts negotiated by OEMs with their suppliers. The current conventional wisdom is that, at least as far as Tier 1 suppliers are concerned, short-term contracts are being replaced by longer- term contracts for components. But the actual empirical evidence is mixed. While there are undoubtedly many cases where long-term contracts prevail – often for the life of the specific model – there are many others where short-term contracts still exist:

> Sometimes the customer wants a long-term contract, another one wants to have short-term contracts. Our interest is in having long-term contracts, which helps us to better plan our capacities. The customers don't really like that, they do more and more short-term, one-year contracts again (*Supplier company interview* 2002).

This kind of practice can be found throughout the supply network as suppliers themselves put pressure on their suppliers:

> We must have the freedom of changing suppliers whenever it is required. We have very high cost specialists, we need to meet our cost targets as well. So if a supplier become expensive we need to find an alternative source, so we do not make any long-term commitments with suppliers, we try not to do that (*Supplier company interview* 2001).

Our evidence therefore suggests that generalized statements about long-term relationships based on cosy ideals of trust need to be treated with some caution. As one supplier observed:

> There's no loyalty. The only loyalty is the cost, they can give you all the spiel but…(*Supplier company interview* 2002)

In some cases, the key variable appears to be the nationality of the OEM. A Korean components supplier observed that

> Korean automakers' orders are stable…Foreign companies are much more picky…in the case of the transaction with Daewoo, customization and lock-in due to long-term relations are the most important…When we transact with foreign customers, the most important factor is price (*Supplier company interview* 2002).

However, it does not inevitably follow that all firms from the same country have identical relationships with their suppliers. For example, one European supplier doing business with both Toyota and Nissan observed that

> Toyota was a lot more difficult than Nissan…Jaguar and Nissan are probably more similar that Nissan and Toyota who are completely different. A lot of it is down to the individuals but also the way the individuals are influenced by the culture (*Supplier company interview* 2001).

Increased outsourcing by OEMs undoubtedly increases opportunities for component suppliers. However, this is tempered by the clear and increasing preference by OEMs to work with a *smaller number of suppliers*, at least for certain key components and to transfer greater responsibility for aspects of design and engineering to such preferred suppliers. The extent of the reduction by OEMs in their number of suppliers is striking. The OEMs' Suppliers Association (OESA) has estimated that whereas in 1990 there were some 30,000 suppliers in North America, this number had fallen to 10,000 by the year 2000 and predicted a further decline to between 3,000 and 4,000 by the year 2010 (*Financial Times* 4 March 2003*).* 'Ford's '2000' strategy envisaged reducing its total number of component suppliers in North America by more than 50% over ten years; from more than 2000 to less than 1000. Of that 1000, a mere 180 companies will be awarded around two-thirds of the orders. Prior to its takeover by Daimler Benz, Chrysler was planning to reduce its number of main suppliers from 1500 to fewer than 150. Amongst European firms, PSA has reduced its suppliers from 900 to less than 500; BMW from 1400 to 600. In turn, the major component suppliers themselves are reducing the number of their suppliers. Visteon, for example, recently announced that 'it would, in future, do business with only two or three companies in "each segment" of business for the next five years' (*Financial Times* 4 March 2003).

As we noted earlier, the tendency is for each new model to utilise a smaller number of individual components and for more components to be shared across

common vehicle platforms. This is tending not only to reduce the number of components but also to contribute towards reducing further the number of suppliers.

> The introduction of new models traditionally provides the best opportunity to make a quantum leap in terms of streamlining the supplier base. With higher standardization and fewer individual parts, the total number of suppliers involved in a new car can be significantly reduced from one generation to the next. More importantly, the number of direct suppliers can be cut by 30% to 50%, thus making life easier for the OEMs' purchasing department. As an example, 200 suppliers were involved in the launch of the new [Renault] Clio, against 300 for its predecessor; the reduction was even sharper for the Volvo S80, which required only 150 suppliers versus 500 for the S90 (ABN-AMRO 2000: 9).

New roles for suppliers in the automobile industry

Not only is the number of direct suppliers being progressively reduced but also the precise roles played by suppliers are changing. The supply system is becoming more *functionally segmented*. In place of the myriad of specialist raw materials and component suppliers, four major segments seem to be evolving: raw materials suppliers, component specialists; standardizers, and integrators (Figure 3). Each of these has a rather different focus, market presence, and critical capabilities. The raw material and component specialist segments are, of course, by no means new. What is new is the emergence of other categories of supplier, notably the standardizers and the integrators, both of which have significantly greater design and manufacturing responsibilities and have a different kind of relationship both with their OEM customers and also with their own suppliers. This latter characteristics is especially significant in the case of the integrators.

	Raw material supplier	Component specialist	Standardiser	Integrator
Focus	A company that supplies raw materials to the OEM or their suppliers	A company that designs and manufactures a component tailored to a platform or vehicle	A company that sets the standard on a global basis for a specific component or system	A company that designs and assembles a whole module or system for a car
Market presence	• Local • Regional • Global	• Global for 1st tier • Regional or local for 2nd, 3rd tiers	• Global	• Global
Critical capabilities	• Material science • Process engineering	• Research, design and process engineering • Manufacturing capabilities in varied technologies • Brand image	• Research, design and engineering • Assembly and supply chain management capabilities	• Product design and engineering Assembly and supply chain management capabilities
Types of components or systems	• Steel blanks • Aluminium ingots • Polymer pellets	• Stampings • Injection moulding • Engine components	• Tyres • ABS • Elect. control unit	• Interiors • Doors • Chassis

Figure 3: Major segmentation of supplier roles in the automobile industry

Source: based on Veloso (2000): Figure 8

A major characteristic of the kinds of development shown in Figure 3 is that there has been a substantial transfer of design and, especially, of engineering functions from the OEMs to key suppliers and a much closer degree of collaboration between OEMs and these suppliers. At the same time, the OEMs themselves are beginning to move away from some of their traditional roles:

> 'The carmakers are moving in the direction of being a virtual marketer and designer of vehicles. The actual engineering of them is moving to the supplier base. If you are a supplier with a commodity product down the chain, you are in trouble,' says John Cunningham, managing partner of the global automotive practice at Accenture, the consultancy. 'If you can create more value added, you are all right' (Grant 2003)

As a consequence of these changing roles and responsibilities of suppliers and their relationships with the OEMs the overall supply chain of the automobile industry is being transformed. Figure 4 shows one possible trajectory. The relatively simple tiered hierarchy that has developed in recent years is metamorphosing into a structure in which the connection between Tier 1 suppliers and the OEMs is being mediated by a new layer of module and system integrators – what some analysts term a 'Tier 0.5' to signify its closer relationship with the OEMs. The precise configuration of the

future is still far from clear and may well contain more variety than this picture suggests. But there is no doubt that a significant reconfiguration of the automobile production network is taking place, with potentially massive repercussions for both the firms and communities involved. However, it is important to be aware that not every component firm can be unequivocally allocated to a specific tier for all their operations. A given supplier may be a Tier 1 supplier in one context and a Tier 2 supplier in another context.

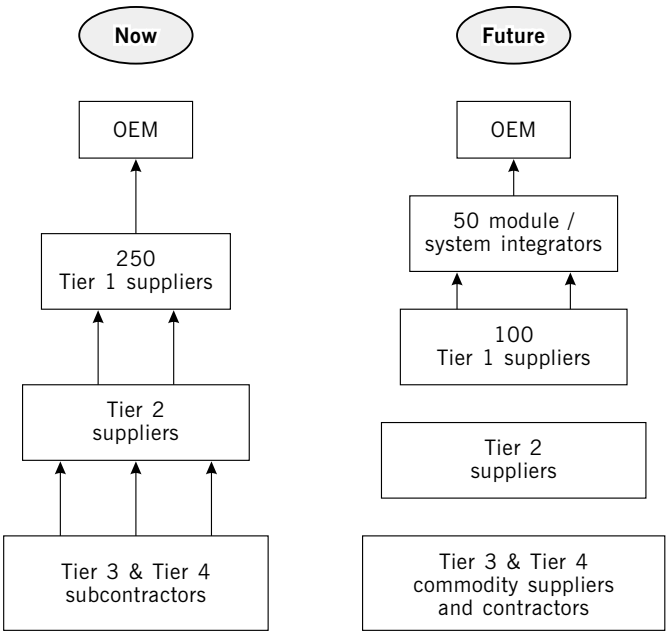

Figure 4: Transformation of relationships within the automobile supply network

Source: based on ABN-AMRO (2000): 10

Where does the power lie in automobile production networks?

Pressures from OEMs

During the past three decades, OEMs have been transforming the ways in which they design and build vehicles. Such changes, as we have seen, impinge directly on suppliers of materials and components. Where, then, does power lie in automobile production networks? There is no doubt that the OEMs are able to exert very substantial power over most of their suppliers. Fundamentally, OEMs choose their suppliers according to their own criteria whereas it is more difficult for suppliers to choose their customers. The major choice criteria exercised by the OEMs are: price, quality, and timeliness of delivery. In all three areas there is abundant evidence of

OEMs being able to exert enormous pressure and, in the process, to shift between suppliers where their performance falls short of requirements.

Demands by OEMs for continuous price reductions from their suppliers, year-on-year, have become the norm in the automobile industry. As one leading supplier observed:

> We are driven by price demands…If you are not competitive on price you aren't going to get anywhere (*Supplier company interview* 2002).

Examples of price pressures include: Toyota's demand for a 25% cost reduction over three years and Ford's requirement of a price reduction of between 5 and 7% per year (Veloso 2000: 12). Skoda expects annual reductions of 2% per year from their suppliers. Such price pressures are, in turn, passed on to the major suppliers' own suppliers and so on throughout the production network to the smallest commodity suppliers. This year, for example, Visteon requires a 6% reduction in prices from its suppliers of the injection moulding plastics used in such modules as dashboards and instrument panels (*Financial Times* 4 March 2003). In addition, such reduced prices have to go hand-in-hand with improvements in quality and reliability. It is quite common for the length and even the value of a supply contract to be explicitly linked to such price and quality improvements by suppliers. Quality is conventionally measured using the international standard for the industry, QS9000, together with measures of reliability (rejection rates of so many parts per million – currently 200ppm is regarded as the relevant standard).

Timeliness of delivery of components has become a central concern of the OEMs and is expressed through heavy pressure on suppliers to shorten lead-times – the gap between the placing of an order and its delivery – and to deliver on a just-in-time schedule. As a result,

> the pressure for fast response is widespread throughout the supply chain. World class response is associated to a lead-time on the order of a day. Expectation of on-time delivery is between 98.5% and 100%, depending on the responsibility of the supplier (Veloso 2000: 43)

Hence, logistics considerations have come to be seen as increasingly crucial although, as a leading German automobile manufacturer pointed out to us,

> logistics costs are the most hidden and underestimated costs in production. Under globalization, of course, they gain importance. As a rule of thumb, if you look at the value added of a car, about one-third of it is attributed to

> logistics costs, with suppliers, materials suppliers, and so on and so forth. And for that, the customer doesn't pay a single Deutschmark. So we are well advised to reduce these costs. If I see the eagerness with which we try to save a minute of production time here and there, and how much we have neglected the issue of logistics costs, then there is a wide area… (*OEM Company interview* 2001).

These pricing, quality and time-to-delivery criteria imposed by OEMs are closely tied to two other kinds of pressure exerted by OEMs on suppliers. The first is the strong trend, discussed earlier, for the use of a smaller number of preferred suppliers. This, in turn, is changing the whole structure of relationships within the automobile supply network as Figure 4 indicates.

The second, related, pressure on suppliers is for them to follow the locational decisions of the OEMs. As the OEMs have increasingly globalized – or at least regionalized – their manufacturing operations suppliers have come under intense pressure to follow their major customers. Such pressures at least partly result from the tendency for OEMs often to prefer to work with their established suppliers rather than to create links with new suppliers in new geographical areas. In particular,

> now that suppliers are increasingly involved in design, the implication of standardization is that the same suppliers should 'follow' the assembler to the various emerging markets in which assemblers are setting up operations. Ideally, the assemblers want more or less identical parts delivered to any part of the world. One way of achieving this is to make parts centrally and ship them to various locations around the world….However, importing parts is frequently expensive and logistically complex…For the assembler, the best option for a locally-produced part is to use a follow source. This should guarantee that the component will be identical to that used in other markets. Further, the follow source will be responsible for ensuring that the rest of the supply chain meets the assembler's standards…When the globally preferred supplier is unable or unwilling to establish a local production facility, the assembler's second preference is to use another of its global suppliers – either making the part under license from the globally preferred suppliers or providing its own design…The least preferred option is for a local company to produce the part, either under license or using its own design (Humphrey 2000: 252)

The prevalence of 'follow sourcing' was borne out in many of our interviews with component suppliers. As one leading Tier 1 supplier asserted:

> We have a strategy that says we will reconfigure our higher labour plants into JIT assembly plants. And we will set up our manufacturing facilities wherever the OEMs are setting up theirs (*Supplier company interview* 2002).

This strategy has become increasingly oriented towards the emerging markets and may involve the closure or downsizing of established plants in the mature car markets. As the same supplier observed:

> Quite clearly, our goal is ultimately to develop manufacturing plants in lower wage cost countries. We will develop a supply base around those. In simple terms, the route we are taking at the moment is that we take a UK assembly and a UK supply base and the first thing we move is the assembly, then we need to develop the infrastructure around the new locations (*Supplier company interview* 2002).

The pressure on suppliers to follow the assemblers to new geographical areas is a significant example of OEM power. It involves, as a rule, suppliers locating sufficiently close to the OEM assembly plant to be able to deliver on the schedule defined by the assembler. Depending upon the local transportation infrastructure, this can vary quite considerably. In some cases, assemblers are setting up supplier parks adjacent to their assembly plant. A revolutionary – and as yet not too highly developed practice – is to embed the production of components directly into the actual assembly lines themselves. VW, GM and Ford are all currently experimenting with such systems at their new plants in Brazil (Dicken 2003: 367-368; Veloso 2000: 12). Within Europe, VW is also implementing an integrated supply system at its Skoda subsidiary in the Czech Republic. There, some twenty suppliers work directly on site fitting, for example, seats and cockpits assembled on a parallel production line. The workers engaged in these processes are employed by the supplier companies and not by Skoda (*Company interview* 2002).

Supplier responses

One clear response to these OEM-generated pressures is *consolidation* within the supplier network, a parallel development to the consolidations among the OEMs discussed earlier. Mergers and acquisitions are strategies aimed either at increasing strength through the bringing together of firms with complementary assets and

advantages or at reducing competition. Both motives are apparent in the automobile components industries as firms attempt to offset the power of the OEMs.

Although the fragmented nature of the automobile components industries makes it difficult to measure their overall degree of concentration, it is clear that concentration has been increasing markedly and continues to do so. As with the OEMs, there has been a wave of mergers and acquisitions as component firms strive to increase their market power vis-à-vis both the OEMs and other component suppliers. Virtually all the major component suppliers we interviewed had been involved in merger and acquisition activity over recent years. The shape of firms such as GKN, TRW, Siemens VDO has been transformed by such processes of corporate growth. Although such mergers and acquisitions have greatly increased the size, diversity and, therefore, the relative power of these companies they also create major problems of reconciling long-established practices and relationships of the firms involved. Such adjustment problems are invariably exacerbated where the merger involves firms of different nationalities.

Table 3 summarizes the pattern of mergers and acquisitions that occurred in just one year, 1999. In total, there were 123 M&As amongst automobile suppliers in that year. 34% of these deals were between firms in the same country and, of these, Germany and Spain were especially prominent. But the most striking feature of the cross-border mergers and acquisitions is the prominent position of US acquirers. US firms were responsible for 38% of cross-border deals in the automobile components industries in 1999. UK and German automobile firms were especially important targets for US acquirers.

The overall result of such waves of mergers and acquisitions has been the emergence of a core group of global components firms (Table 4). At the world scale, more than half of the top 13, including the top two, are US firms, three are Japanese, including the fourth largest in the world, Denso, one is German (Bosch), and one is French (Valeo). The left-hand side of Table 4 shows the ranking of the leading European components firms. Apart from Bosch, European components firms are significantly smaller than the leading US firms.

Table 3 Acquisitions in the automobile supplier industry, 1999

Country of acquirer

(Number of acquisitions)

Country of acquired company	**No.**	**Same country**	**USA**	**Germany**	**Other Europe**	**Japan**
Germany	26	14	8		4	
United Kingdom	24	6	15	1	1	1
France	15	2	4		9	
Spain	14	10	2		2	
Japan	12	4	4	3	1	
Italy	9	2	4	1	1	1
South Korea	8	-	5	1	1	
Sweden	6	4			2	
Poland	3		2	1		
China	2		1			1
Belgium	1		1			
Czech Republic	1				1	
Malaysia	1				1	
Netherlands	1		1			
Total	123	42	47	7	23	3
% column	100	34	38	6	19	2

Source: calculated from data compiled by PriceCooperWaterhouse

Table 4 The leading automobile component suppliers, 1999

World			*European*		
Company	**HQ**	**Sales $bn**	**Company**	**HQ**	**Sales $bn**
Delphi	USA	27.3	Bosch	Germany	15.6
Visteon	USA	18.5	Valeo	France	7.7
Bosch	Germany	15.6	Atecs		7.5
Denso	Japan	12.6	Thyssen	Germany	5.7
Lear	USA	12.4	ZF Group		4.5
Johnson	USA	11.1	Faurecia		4.3
TRW	USA	11.0	Magneti Marelli	Italy	4.1
Dana	USA	10.1	GKN	UK	3.9
Magna	Canada	9.0	Autoliv		3.8
Valeo	France	7.7	Freudenberg	Germany	3.8
Arvin	USA	7.6	Siemens	Germany	3.6
Aisin	Japan	7.5			
Yazaki	Japan	6.4			

Source: based on ABN-AMRO (2000): 12-13

Although it is clear that suppliers often have little choice other than to succumb to the pressures exerted by the OEMs it is not invariably the case. The increase in outsourcing by OEMs, including such major developments as the hiving off of Delphi and Visteon by GM and Ford respectively, presents potential opportunities for supplier firms with the appropriate expertise and innovative strength. The shift of responsibilities for aspects of component, module, and system design and engineering from assemblers to suppliers presents huge opportunities. The key, of course, lies in developing proprietary technologies not possessed by others.

The extent to which the leading automobile components firms have developed such capabilities on a global scale can be seen in four examples: Bosch, Denso, GKN, and TRW. Robert Bosch, the German company headquartered in Stuttgart, is the world's third largest automobile components manufacturer (see Table 5). The automotive equipment division is one of four business sectors, with a product portfolio encompassing engines and transmissions; braking and steering systems; electronic systems. It accounts for more than 60% of the company's total sales. Bosch

is a highly research-intensive company, spending 7.6% of its annual sales on R & D. The automotive division operates around 140 manufacturing plants and 75 development and applications facilities located in 28 countries (Figure 5). It employs more than 140,000 people, 42% of which are located within Germany itself and a further 23% in Europe. Outside Europe, the Americas account for 17% and Asia (including India) for 16% of total employment. Bosch has managed to sustain a comparatively high degree of power and freedom from assemblers' demands. Bosch's international growth has been based less on a 'following the assembler' principle than on itself building a global network in which aftermarket sales are very important. In some product areas, assemblers have no choice other than to use Bosch as a supplier, as in the case of diesel fuel injection systems.

Figure 5 The geographical distribution of Bosch's automotive components operations

Source: Company information

The second example, the Japanese company Denso, is the world's fourth largest automotive components manufacturer. Denso was originally a subsidiary of Toyota but became independent in 1949, although it is still 23% owned by Toyota. Initially called Nippondenso it changed its name to Denso in 1996. Like Bosch, it has a broad portfolio of automotive products; in Denso's case within the categories of thermal systems, powertrain control systems, electronic systems, and electric systems. Its total employment of around 70,000 is spread across 25 countries (Figure 6), with two-thirds concentrated in East Asia (55% of which is in Japan). Elsewhere, Denso's employment is spread fairly evenly between North America, Europe, and India (each with 9-11% of the total). Denso's position as one of the world's leading component suppliers, especially of air conditioning systems, gives it considerable bargaining power with OEMs (in addition to the fact that it still retains an important link with Toyota.

Figure 6 The geographical distribution of Denso's automotive components operations

Source: Company information

TRW, the third example, and the seventh largest automotive component manufacturer in the world, is a US company that has grown especially aggressively through merger and acquisition (its name derives from the merger in the 1960s

between Thompson Products Inc. and the Ramo-Wooldridge Corporation in California). Since then, the company has absorbed a number of domestic and foreign companies, most notably, in recent years, Lucas Varity in 1996 (itself an earlier merger of the British company Lucas and US company Varity). Through such mergers, TRW has developed a broad product range, notably in: vehicle control and braking systems; steering and suspension systems; safety systems and electronics; engine components (especially valves); and body control systems. TRW operates more than 150 production facilities in 23 countries (Figure 7). Unlike Bosch and Denso, TRW has a less domestically-oriented profile: only 40% of its total employment of almost 64,000 is located in North America. The bulk of TRW's operations are in Europe (51% of total employment) with only 4% in Asia.

Figure 7 The geographical distribution of TRW's automotive components operations

Source: Company information

Bosch, Denso, and TRW are all strongly diversified automotive component manufacturers. The fourth case, the British company GKN, is much more specialized. Indeed, its strength lies in the fact that it has 41% of the world market for constant velocity joints (CVJs). GKN's Automotive Driveline Division (ADD) contributes around half of the company's sales and profits (its other divisions are aerospace and industrial services. Much of ADD's growth has been through merger and acquisition. Its 20,000 employees are spread over roughly 45 manufacturing plants, primarily in Europe, East Asia and North America (Figure 8). GKN dominates the world market for driveshafts. Its main competitors are not so much other tier 1 suppliers as the in-house operations of the major assemblers (although it is significant that GKN recently took over the in-house driveshaft production for both Nissan in Japan and GM/Opel in Germany). Hence, GKN either licenses its technology to assemblers (thus retaining profit) or sells its products to them (e.g supplying all of Toyota's driveshaft needs).

Figure 8 The geographical distribution of GKN's automotive components operations

Source: Company information

GKN, therefore, is able to retain a considerable degree of negotiating and strategic power. It makes us of this power to balance the assemblers' locational

demands with its own structural goals.. GKN decides where it wishes to expand and upgrade production facilities by selectively shifting forging technology and capacity to selected locations around the world, notably in East Asia. Further down the chain, GKN exercises considerable buying power over its steel suppliers (the main input for driveshafts) through its demands for very high-quality, specialized steel. GKN is one of the biggest customers of such products.

Of course, even these leading global automobile components firms are relatively tiny compared with the automobile OEMs. For example, whereas Bosch employs 140,000 workers, VW employs 306,000 and Gm employs almost 400,000. Nevertheless, there is little doubt that the major automobile suppliers – the core group of firms at the top of the hierarchy – do have very considerable power. Such component firms invariably sell their proprietary products to most, if not all, the leading OEMs and are, therefore, not locked into any one relationship. In some cases, there may be only two or suppliers of a particular component so OEMs do not have a lot of choice. The examples of Bosch, Denso, TRW and GKN show that although OEMs do indeed have the power to shape these suppliers' locational strategies the major suppliers themselves have sufficient power, through their specific expertise, to leave the assemblers little alternative to using them as sources for key systems.

It is also important to point out that the relative bargaining power of and OEM and its major suppliers is unlikely to remain constant over time. The recent problems of Daewoo provide an example. One of its leading suppliers explained how its relative bargaining power vis-à-vis Daewoo changed:

> We have had long-term relations with Daewoo Motors. Daewoo Motors was flexible in price negotiations so we enjoyed transacting with it. Especially in recent years, when Daewoo Motors suffered from the financial crisis, we had relatively more bargaining power so we could transact with Daewoo Motors at a higher price (*Supplier company interview* 2002).

Hence, the relationship between such firms and the OEMs is more one of symbiosis than of simple OEM dominance.

> The dominant issue for most suppliers seems to be the conquest of key positions in the supply pyramid. However, if it is important for them to obtain a Tier 1 status, it is equally important to control critical components (with distinctive technological features) that can enable strong negotiating positions and preserve direct relationships with the OEMs. In the long run, we believe

that profitability will be more dependent on innovation capability and technological leadership than mere position in the supply chain.
As a consequence, two major groups of potential winners will emerge in the components industry:

- Large groups that meet all the requirements needed to act as Tier 1 suppliers, i.e. diversified technological expertise, cost competitiveness, research and logistics capabilities, financial strength and international exposure.
- Component makers offering unique technologies that are critical to the car's performance (e.g. Siemens and Bosch in direct injection systems for diesel cars, or Bosch in electronic stability programs (ABN-AMRO 2000: 9-10).

Such firms possess power comparable with that of the major assemblers who are increasingly dependent upon them. In that regard, it is a mistake to picture the power relationships within the automobile industry as being totally dominated by the OEMs. At the same time, however, those firms that do not possess, or cannot develop, such technological strengths are in an increasingly vulnerable position. Producers of 'commodity' components (such as windscreen wiper blades, for example) are in a weak position because the barriers to entry in such segments are far lower. Margins are very thin anyway and are continuously being eroded by OEM pressures. In other words, the automobile components industry is becoming increasingly polarized; the map of power relationships is far more complex than is often claimed.

The role of the state

So far, we have been concerned only with firms and the power relationships between them. But we must also take into account the continuing, albeit changing, role of the state. In some circumstances in particular, the state continues to exert power and influence over decisions taken by OEMs and suppliers. Indeed, throughout the history of the automobile industry the state has played a key role, notably in two key respects (Reich 1989):

- Determining the *degree of access* to its domestic market that the state allows, including the terms under which foreign firms are permitted to establish production plants there

- Establishing the kind of *support provided by the state* to its domestic firms and the extent to which the state *discriminates* against foreign firms.

Use of tariff and non-tariff barriers against automobile imports has been pervasive in virtually all countries at various times. Of course, through successive GATT rounds, the level of tariffs has fallen precipitously, though unevenly. In general, 'automotive industry trade regimes were significantly more open by the end of the 1990s' (Humphrey and Oeter 2000: 42). Today, few of the developed market economies operate particularly high tariffs against automobiles, although there are significant differences between the EU's common external tariff of 11%, the United States' tariff of 3% and Japan's zero tariff. Tariffs are substantially higher, though unevenly so, in the developing markets. Far more prevalent has been the continued use of various non-tariff barriers, including import quotas.

The specific geographical configuration of the automobile industry has been, and still is, influenced not just by the *level* of tariffs or quotas but also by frequently used *differential* tariffs and quotas between assembled vehicles and components. States may, for example, levy high tariffs on imported vehicles but, at the same time, charge lower tariffs on imported components in order to stimulate local production, especially where there is an insufficiently well-developed local components sector. In particular *local content* regulations have become particularly pervasive. Such policies were an integral part of import substitution industrialization policies pursued in most Latin American and some Asian countries from the 1950s onwards. In the face of growing Japanese competition in the 1970s, most European countries also adopted them with some vigour.

Local content requirements have been especially influential in influencing automobile firms' policies towards their suppliers and in influencing the geographical configuration of the automobile components industries. Within the emerging market economies – for many of whom development of an automobile industry has become a key policy objective – there has been considerable change in the policy environment during the 1990s, as Humphrey and Oeter (2000) show in some detail. They argue that three types of automobile regime have become apparent in emerging markets, each of which has evolved distinctive policy emphases:

- *Protected autonomous markets* (PAMs) – 'countries which continue to provide strong protection to the national market and the domestic

industry' (46). Examples relevant to this paper include China, and Malaysia. South Korea developed its automobile industry in this way until very recently (see, for example, Dicken 2003; Lee 2002; Huang 2002).

- *Integrated peripheral markets* (IPMs) – countries which have chosen to develop their automobile industry through integration with a geographically-contiguous core automobile market. The relevant example here is Eastern Europe (notably Poland, the Czech Republic and Hungary), where national automobile industry policies are directed towards integration with the EU.
- *Emerging regional markets* (ERMs) – groups of emerging market countries which have 'sought to increase the efficiency of their motor industries by reducing protection and increasing competitive pressures and by using access to the domestic market as a lever to promote investments by transnational companies' (55-56).

The key point, then, is that the state continues to be a major player in the automobile industries through a varying combination of regulatory and stimulatory policies. The state is also heavily involved through environmental and vehicle safety policies, each of which has profound implications for the design, technology and materials used in cars and, therefore, in their cost. Complying with changes in legislation can be especially problematical where it involves fundamental design changes. Legislation to control noxious emissions from automobile engines has become increasingly stringent. A more recent development within the EU is policy towards 'end-of-life' vehicles. Here, the EU has issued a directive, to come into force in 2007, under which automobile manufacturers will have to cover the cost of recycling the vehicles they have manufactured. It is estimated that the annual cost of this operation in Europe will be around 2.1 billion euros. Manufacturers will also have to ensure that recyclable components account for 85 per cent of each vehicle's weight.

Globalizing – or regionalizing - the automobile industry: Europe and East Asia

Although, in one sense, the automobile industry is a 'global' industry it is, as Figure 9 shows, highly concentrated geographically. Around 80% of world

automobile production takes place in the three 'triad' regions. Europe and East Asia, together, account for almost two-thirds of total world production. Indeed, current developments in the geography of the industry strongly support the view that the dominant trend is the *regionalization* – rather than the globalization - of automobile production networks. The recent evolution of these production networks in both regions illustrates the fundamentally *political-economic* nature of the processes involved. In both cases, it has been the dynamic interaction between political decisions of states and the economic/business decisions of automobile companies that explains the changing organizational and geographical configuration of production networks in this industry.

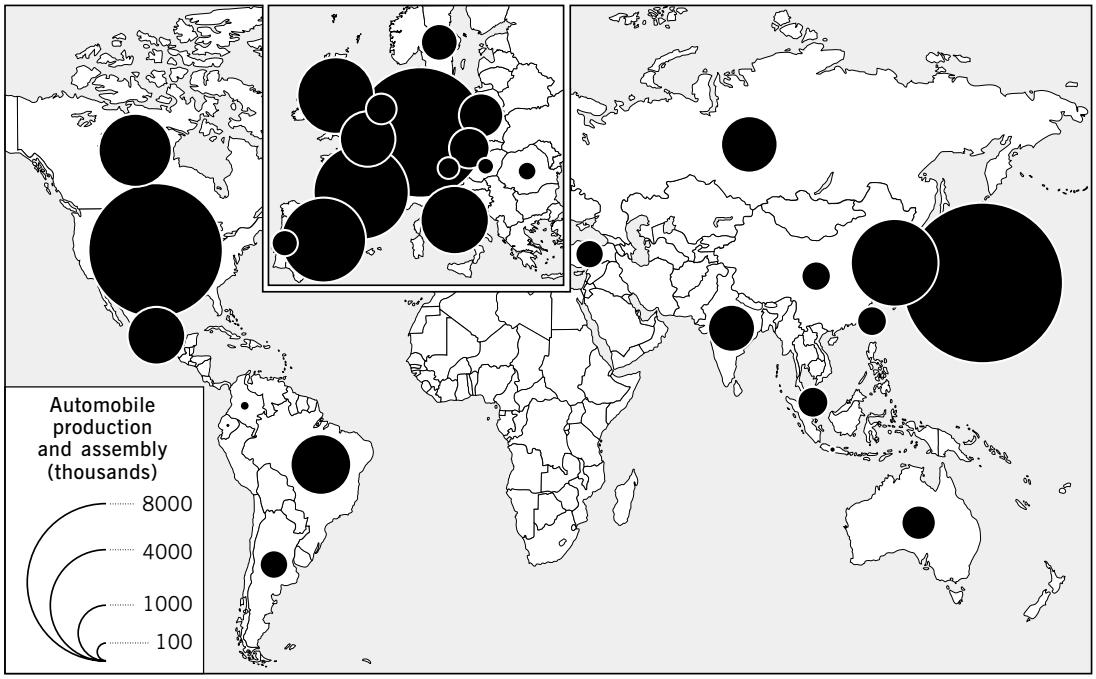

Figure 9: Global production of automobiles

Source: Dicken (2003) Figure 11.3

Reorganization and rationalization of the automobile industry in Europe

Figure 10 maps the current pattern of automobile production within Europe, including the share that each major producer has in each individual country. Within Europe Germany remains the dominant focus followed, a long way behind, by France, Spain, Italy, and the UK. The most recent developments within Europe have been the growth of automobile production in some of the Eastern European countries, notably Poland, the Czech Republic, Slovakia and Hungary.

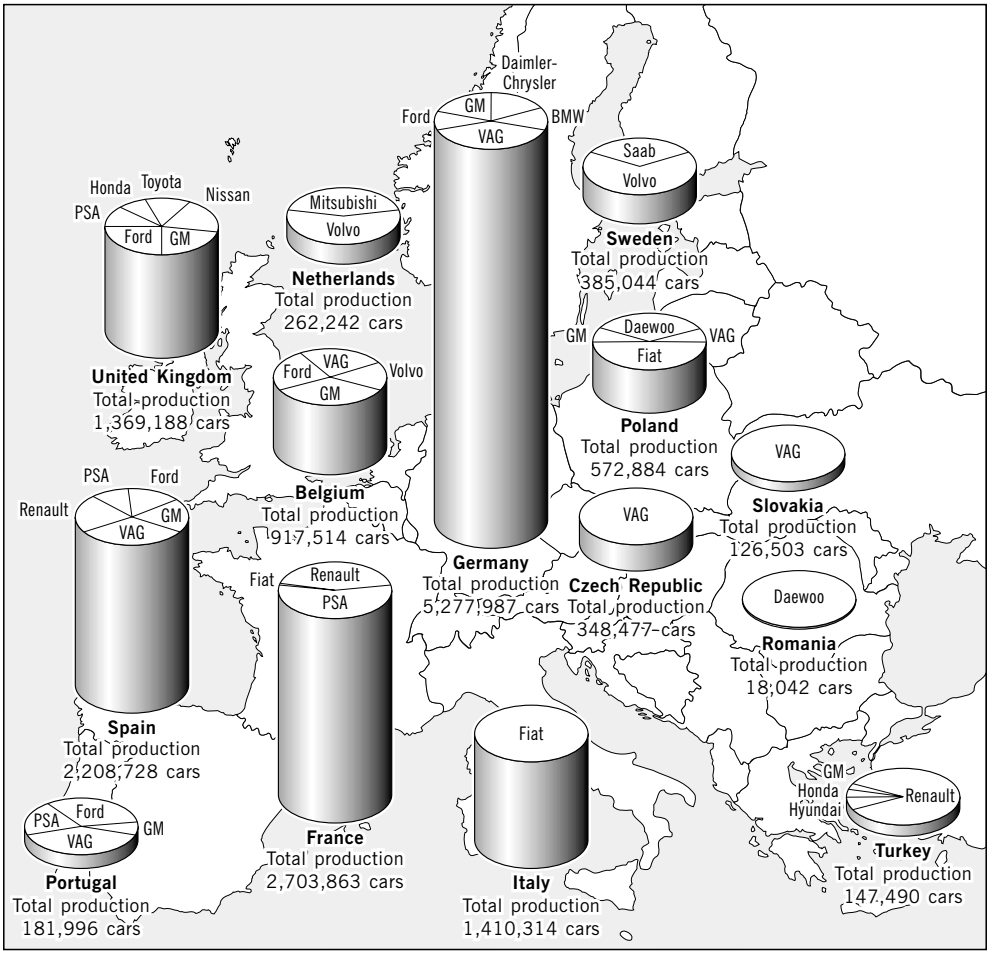

Figure 10: Automobile production in Europe

Source: Dicken (2003) Figure 11.1

Because of its particular political history and its increasingly high degree of political integration, Europe has probably the most complex automobile production networks in the world (see Hudson and Schamp 1995). This complexity reflects both the legacy of formerly nationally-oriented automobile industries, the particular ways in which the political environment has evolved in the past four decades, and the responses of automobile firms to these changes in the context of increasingly intensive global competition. The political-economic transformations have involved two major events, both of which have had a dramatic influence on the shape of the automobile industry within Europe.

The first, of course, was the establishment of the European Economic Community in 1957, the progressive intensification of economic and political

integration (including the completion of the single market in 1992, which removed the remaining technical and physical barriers to the flows of vehicles and components), and its subsequent enlargement from six to the present 15 member states.

With the completion of the Single European Market in 1992, local content policies, and also import quotas, imposed by individual member states were replaced by an EU-wide system (see Dicken 1992). Automobile industry policy within the EU is now positioned at the level of the European Commission, which oversees national policies of support for the industry and sets limits on the nature and the level of state financial and other assistance. In the case of the automobile industry, policy clashes between the European Commission and individual EU member states have been fairly common. Most recently, for example, the European Commission has started legal action with the German government over the alleged 'bid proof status' of Volkswagen (*The Guardian* 20 March 2003). The issue is made more complex by the fact that both the German government and the government of Lower Saxony have a direct involvement in the appointment of members to VW's supervisory board.

The second significant event occurred a little more than three decades after the initiation of the EEC. The collapse, in 1989, of the political system dominated by the Soviet Union, which led to the opening up of the Eastern European region, created a huge contiguous region with the potential of being both a large consumer market and also a low-cost production location for sourcing both components and finished vehicles. The political developments of the late 1980s and the early 1990s presented major strategic opportunities for automobile manufacturers operating in Europe (see Czaban and Henderson 1998; Havas 2000; Sadler and Swain 1994). The impending enlargement of the EU to include most of Eastern Europe serves to reinforce the functional integration of the European automobile production system.

Thus, as a result of both the more complete integration of the EU itself and the increasing integration with the eastern European economies the European geo-economic space has changed dramatically for the major automobile firms (Hudson 2002). Such changes resonate throughout the whole of Europe as the relative advantages of different areas are modified. Continuing rationalization and restructuring in the core has now been joined by changes in the relative position of the European periphery. Most notably, what had been seen, since the early 1970s, as the major developing core of the European automobile industry – Spain and Portugal – now finds itself threatened by the opening up and integration of Eastern Europe.

The actual geographical configuration of automobile production within Europe (Figure 10) bears the very strong imprint of each firm's national origins and the history of their development within this evolving political framework. For example, Ford and GM both have a long history of manufacturing cars in Europe and have built up, over time, a multi-locational, initially nationally-oriented, production network. Indeed, it could be argued that Ford's decision in 1967 to begin to integrate its European operations marked the real beginning of a pan-European automobile industry. Currently, both GM and Ford are in the throes of massive rationalization and reorganization of its entire global operations. In the case of Ford this has involved the closure of five plants, a 20 per cent reduction in capacity, and change in function of some plants. For example, automobile assembly has ceased at Dagenham in the UK and the plant transformed into a centre for the design and production of diesel engines both for Ford and for companies such as the French firm PSA. In fact, the UK's position within Ford is becoming primarily that of engine and transmission production rather than car assembly (although the Jaguar is produced on Merseyside). Ford's European vehicle assembly operations are becoming increasingly concentrated in Germany and Spain (with the likelihood of Ford's Japanese affiliate, Mazda, building cars at one or other of Ford's European plants). Volvo's Swedish operations are also becoming integrated into Ford's European operations.

GM's European operations have long been based upon two separate national subsidiaries: Vauxhall in the United Kingdom and Opel in Germany. During the 1970s Vauxhall's performance became progressively weaker as the investment emphasis shifted towards Opel. Like Ford, GM also built a major new manufacturing plant in Spain. In the 1990s, GM built a major car assembly plant near Katowice in Poland and an engine plant in Hungary. Again, in light of the major problems facing GM globally, major reorganization and rationalization is occurring in Europe. In broad terms, the path being followed by GM is very similar to that of Ford, although with some individual differences reflecting the two companies' history and corporate culture. Just as Ford has closed its assembly plant at Dagenham in the UK, GM has announced the closure of its Luton plant. Production of the next generation of Vectra models will now be at a new plant being built at GM's Opel site at Russelsheim, near Frankfurt in Germany. Production is also being drastically cut back at the Antwerp, Belgium, and Bochum, Germany plants. As with Ford's treatment of Volvo, GM is now integrating Saab's Swedish operations, having now taken 100 per cent ownership

Whereas the geographical configuration and reconfiguration of the US automobile manufacturers has evolved from a long-established multinational presence in Europe, the position of the Japanese car firms is very different. With no history of European car production and no inherited structure, the Japanese have been able to treat Europe as a 'clean sheet'. Beginning in the early 1980s, Japanese firms established production facilities in Europe. All three of the three leading Japanese firms – Toyota, Nissan, Honda – built their plants in the UK. In so doing, they avoided traditional automobile manufacturing areas, opting instead for greenfield sites. Although the UK is a major market in itself, the Japanese plants in the United Kingdom were specifically oriented towards the European market. This led to political friction within the EU during the 1980s and 1990s. Significantly, given both the political friction and the fact that the UK remains outside the eurozone, Toyota's second European plant was built at Valenciennes in northern France, beginning production in 2000. Toyota has also established a joint venture with the French company, PSA, to develop and assemble small cars for the European market. This will be at an entirely new plant located at Kolin in the Czech Republic.

The geographical configuration of the indigenous European automobile producers is, of course, much more embedded in their national contexts. Only VW has anything approaching a pan-European production network, focused around the three nodes of Germany itself, Spain, and its acquired Eastern European plants in the Czech Republic and in Slovakia. Prior to the opening up of Eastern Europe, VW concentrated its production in two countries in a clear strategy of spatial segmentation. High-value, technologically advanced cars were produced in the former West Germany; low-cost, small cars were produced in Spain where VW undertook a massive investment programme in Seat. During 1990, after the collapse of the Soviet-dominated system, VW moved very rapidly to establish production of small cars in eastern Germany and to take a controlling stake in the Czech firm, Skoda. In 2001, the company announced a major reorganization of its entire operations.

The two French automobile companies, Peugeot-Citroen (PSA) and Renault, have both traditionally been strongly home-country oriented in their production. Peugeot-Citroen was formed by a state-induced merger of the separate Peugeot and Citroen companies in 1975. Seventy-seven per cent of Peugeot-Citroen's production is located in France with a further 12 per cent in Spain and 8 per cent in the United Kingdom. However, in 2003 Peugeot-Citroen announced plans to build a large

assembly plant at Trnava in Slovakia and a big joint venture assembly plant with Toyota at Kolin in the Czech Republic. Renault was, for more than 40 years, the French government's national champion, supported by massive state aid, which served to constrain its activities. State control has been reduced to 44 per cent and Renault, like Peugeot-Citroen, has been involved in major restructuring. Since 1999, the alliance with Nissan has become the central pillar of Renault's strategy. For Renault itself, France remains the dominant production location with 63 per cent of its total world production. A further 26 per cent is located in Spain.

While VW was expanding its European production base to incorporate Spain in the 1980s, the Italian automobile firm, Fiat, initially moved in the opposite direction and re-concentrated production in its home market. Sixty-seven per cent of Fiat's production is located in Italy. A key element in Fiat's more recent strategy has been to create an extensive production network in the former Soviet Union and Eastern Europe where it has the longest-established links of any automobile producer in the world. Fiat's 'grand European design' was to build a manufacturing network extending from the Mediterranean to the Urals. In Eastern Europe, Poland is now Fiat's main base, following its acquisition of FSM in 1992. Poland (with Brazil) became the major bases for Fiat's small 'world car', the Palio. Fiat aimed to produce more than 50 per cent of its cars outside Italy by the year 2000 but failed to reach that target. As yet, it is too early to assess the effect of Fiat's recent strategic alliance with GM.

The automobile components industry broadly reflects the pattern of assembly within Europe, although with some significant variations (see Sadler 1999). Germany has the largest automobile components industry in Europe, a reflection in part of its dominance as an assembler. In Germany, as in France, Italy, and the UK, 'the components industry evolved with an assembly industry that is native to the country. As a result, the manufacturing of components has long traditions, and tight relationships with the assemblers' (Veloso 2000: 26). Elsewhere, most notably in Spain and Portugal, the development of automobile components manufacture has occurred as a result of national industrial policies (and local economic circumstances) attracting foreign direct investment. Apart from the activities of the indigenous European component firms, there has been a major influx of United States and Japanese firms in recent years, at least in part through the processes of merger and acquisition discussed earlier.

However, it is, above all, the developments in Eastern Europe that are now the primary focus of change in the European automobile industry.

> In just a few years all the major Czech, Hungarian and Polish automotive firms were privatised and sold to foreign investors, the existing car assembly and components manufacturing capacity was substantially modernised and extended, and new firms were established. As a result of these FDI projects, the products, processes, management techniques and markets of the Central European motor industry were radically restructured in a short period of time. The region has become integrated into the Western European automotive space through ownership links, production, procurement and sales networks…
>
> FDI projects have reinforced pre-existing production patterns: the Czech Republic and Poland are specialising in car production, while components manufacturing has remained the core activity in the Hungarian automotive industry (Havas 2000: 239).

It is not difficult to explain this concerted drive into Eastern Europe by the major OEMs and also by component firms. The need to find new markets in the face of stagnant demand elsewhere in Europe and the need to reduce costs can both be satisfied in Eastern Europe, which has the added advantage of immediate geographical proximity to the EU market. In addition, Eastern European governments have offered generous tax incentives to assemblers and component manufacturers. The Czech government, through its FDI agency CzechInvest has been especially successful. As a result, Eastern Europe has been completely integrated into a pan-European division of labour. Havas (2000: 245-250) identifies three major forms of intra-regional specialization in Eastern Europe:

- Low-end, high-volume models for multiple markets
- High-end, low-volume models for EU markets
- Components manufacturing for export

There is abundant evidence of leading components suppliers following their major customers into Eastern Europe for the reason outlined earlier: the pressure to engage in ‘follow sourcing’. There is also some evidence of the kinds of more revolutionary practices in which some component manufacture is embedded into the OEM’s assembly lines. The case of Skoda’s new system was noted earlier (see also Havas 2000:250-251).

Overall, the components sector in Eastern Europe (as elsewhere in Europe) tends to be dualistic. On the one hand, there are the affiliates of foreign companies set up primarily to follow the OEMs. While some of these investments may be genuinely 'new' (in the sense that they did not formerly exist elsewhere), or are acquisitions of local companies by foreign firms, others are, in effect, locational transfers from elsewhere in Europe. One of the major supplier companies interviewed in the UK was quite open about moving some of its labour-intensive production to Eastern Europe. However, such locational shifts made on the basis of lower labour costs are not necessarily stable:

> We are moving the low-cost production from…[X]…to emerging markets. In the Czech Republic it is cheaper than here, but it has got to the point now where costs are increasing. We are moving towards Slovakia and Russia because the Czech crown is strong. All of our costs are in crowns and all our sales are in euros…In Slovakia, their currency has weakened considerably in the last few years…So quite clearly we have an advantage in being in Slovakia (*Supplier company interview* 2002).

On the other hand, there are the indigenous suppliers, many of them the successors of formerly state-owned enterprises prior to the onset of privatization. There is a view that indigenous suppliers tend to be restricted to low-value, low-technology operations and there is considerable evidence for this.

> The power of companies such as VW and GM-Opel has led to the emergence of sharp asymmetries of power within reconstituted supply chains. Some domestic component producers have been integrated into newly established supply networks…More commonly, however, local producers incorporated into these networks generally manufacture less complex and lower value components…Consequently, many well-established plants have been excluded from supply networks (Hudson 2002: 271-272).

However, at least some of the newly-engaged foreign OEMs are making real efforts to develop a stronger local supply base. This is not for altruistic but for hard business reasons-

> We will develop local suppliers…We have the obligation to develop them. It is not just about finding one, we have no illusions here. We have to invest in the qualification of our suppliers there. But we can make more money, if you think about logistics there, the increasing problems with motorways, with trucks…waiting times of 50 hours at the Polish border aren't rare. So we have

> no choice but to invest. And it pays, as I said (*OEM company interview* 2001).

The evidence regarding the quality of the relationships between indigenous suppliers and their foreign customers (whether OEMs or suppliers) is mixed. Some interviewees spoke favourably, others less so. In the latter case, some of the unfavourable reactions relate to the difficulties some firms have had in adjusting to the new market-driven system and a yearning for a return to the certainties of the old system. There is also evidence of some friction between local firms and the local and national state, particularly where decisions to sell assets have been taken by state agencies and not by the firms themselves.

The case of the Korean firm, Daewoo, provides an interesting example of the potential volatility of some of these developments. Daewoo adopted an especially aggressive European entry strategy, using innovative methods of direct distribution. Daewoo's strategy was to build

> a global network of car plants in emerging markets, where the growth rate for car sales was expected to boom. Investments poured into Poland, Romania, Uzbekistan, Ukraine, India, and Vietnam as Daewoo sought to produce 2m cars by 2000, including 1m in Korea. The goal was reached but at a heavy cost. None of the foreign plants were profitable. Car sales failed to match projections as many of these markets suffered from the financial crisis of 1997-98 in developing countries (*Financial Times* 9 November 2000).

As a consequence of this strategy, almost one-quarter of Daewoo's car production was located outside Korea by the end of the 1990s (in Poland and Romania).

Daewoo's supplier network in Eastern Europe consisted of a mix of formerly state-owned plants and Korean firms persuaded by Daewoo to follow it to Eastern Europe (Jeon 2001). Daewoo invested more than $1.8 billion in Poland, more than 90% of this being in the huge FSO company over which Daewoo took control in 1996. Daewoo acquired not only FSO's assembly facilities but also

> the 12 geographically dispersed (and inefficient) subsidiaries of FSO, which were mostly component manufacturers in Poland. During 1997 and 1998, however…Daewoo-FSO transformed the 12 subsidiaries into 18 individual component group companies to secure more efficiency and competitiveness…
>
> Daewoo-FSO invited Korean small and medium-sized companies to set up joint ventures in Poland. Daewoo-FSO has recognised it is vital to establish

> local component companies to extend its business territory into the EU…At that time, many Korean component companies also looked for the internationalization of their businesses through a strategic alliance with the automaker. A director of Daewoo-FSO suggested at interview that "to some extent, Daewoo pushed the Korean component manufacturers to invest in Poland. However, most companies intended to become involved in Daewoo's global engagement. Some companies, like Seojin and Hanyang, which have yet to supply their products to Daewoo Motor in Korea, looked for the possibility to have a business relationship with the headquarters by first contributing as a vendor in Poland"…Four companies, namely DPI, Koram, Kwangjin, and Tongheung, which were affiliated companies of the Daewoo Group, were pursued to invest in the bulky components production, from fuel tank and rear axle to care seat and bumper systems (Jeon 2001: 183)

However, Daewoo's highly ambitious expansion strategy was based on a very high level of external borrowing. The fragile nature of this strategy was exposed by the 1997 financial crisis and the company was declared technically bankrupt in 2000. Although GM acquired the Korean assets of Daewoo, it did not take on its European facilities. The fate of these is still uncertain.

In sum, three broad geographical trends have been apparent within the European automobile production network during recent years:

- First, there has been a substantial geographical rationalization of core country operations as major firms grapple with problems of over-capacity and outdated physical plant. In the case of the UK, this trend has been offset to a considerable degree by the influx of Japanese firms since the late 1980s that have, in effect, created a new automobile industry there
- Second, starting in the 1970s and intensifying during the early 1980s, there was substantial development of automobile production in the south-western periphery of Europe, notably in Spain and, to a lesser extent, Portugal, as US, French, and German manufacturers established production in lower-cost locations capable of serving the entire European market
- Third, and most recently, there has been a significant development of automobile production (and, especially, of component production) facilities in Eastern Europe. Here, the major developments have been in the Czech

Republic, Slovakia, and Hungary. European (notably VW, Fiat, and now PSA with Toyota) and US firms (notably GM) have led this development but there have also been important entries by the Japanese firm, Suzuki in collaboration with GM, and the Korean firm Daewoo. Such a relative shift towards the east within Europe poses a considerable threat to Spain and Portugal.

Transformation of the automobile industry within East Asia

As Figure 11 shows, automobile production in East Asia is dominated by Japan and, to a lesser extent, Korea. Elsewhere, the volume of production is still very limited. Outside Japan and Korea, the major automobile production foci in East and South East Asia are China, Malaysia, Taiwan, Thailand, and, to a lesser extent, Indonesia and the Philippines. Not surprisingly, therefore, the region's automobile production is dominated by Japanese firms (for a recent analysis, see Horaguchi and Shimokawa 2002). Through a network of assembly plants and joint ventures with domestic firms, Japanese cars are assembled in Thailand, Malaysia, the Philippines, Indonesia, Taiwan, and China. In several of these countries, Japanese manufacturers totally dominate the automobile market. In Thailand, for example, Japanese firms have a market share of more than 90 per cent; Toyota alone controls almost 30 per cent of the Thai vehicle market. Most of these are assembled locally in individual countries to serve the local market. 'Everywhere in the region, Toyota and other Japanese car makers have, in effect, re-created a whole supply chain in order to serve the local market (*The Economist* 24 June 2000). This is less out of choice on the part of the Japanese manufacturers than out of the necessity created by high levels of import protection in virtually all the East Asian countries, particularly those in South East Asia (notably Malaysia). Faced with increasingly difficult circumstances in the Japanese market itself (for example, the problems created by the high value of the yen, the slowdown in demand) Japanese firms have placed increased emphasis on raising their penetration of the Asian market by beginning to develop cars specifically tailored to that market and not just versions of existing models. In the late 1990s, for example, both Toyota and Honda introduced completely new models based upon a very different approach to producing cost-efficient cars for a low-income market.

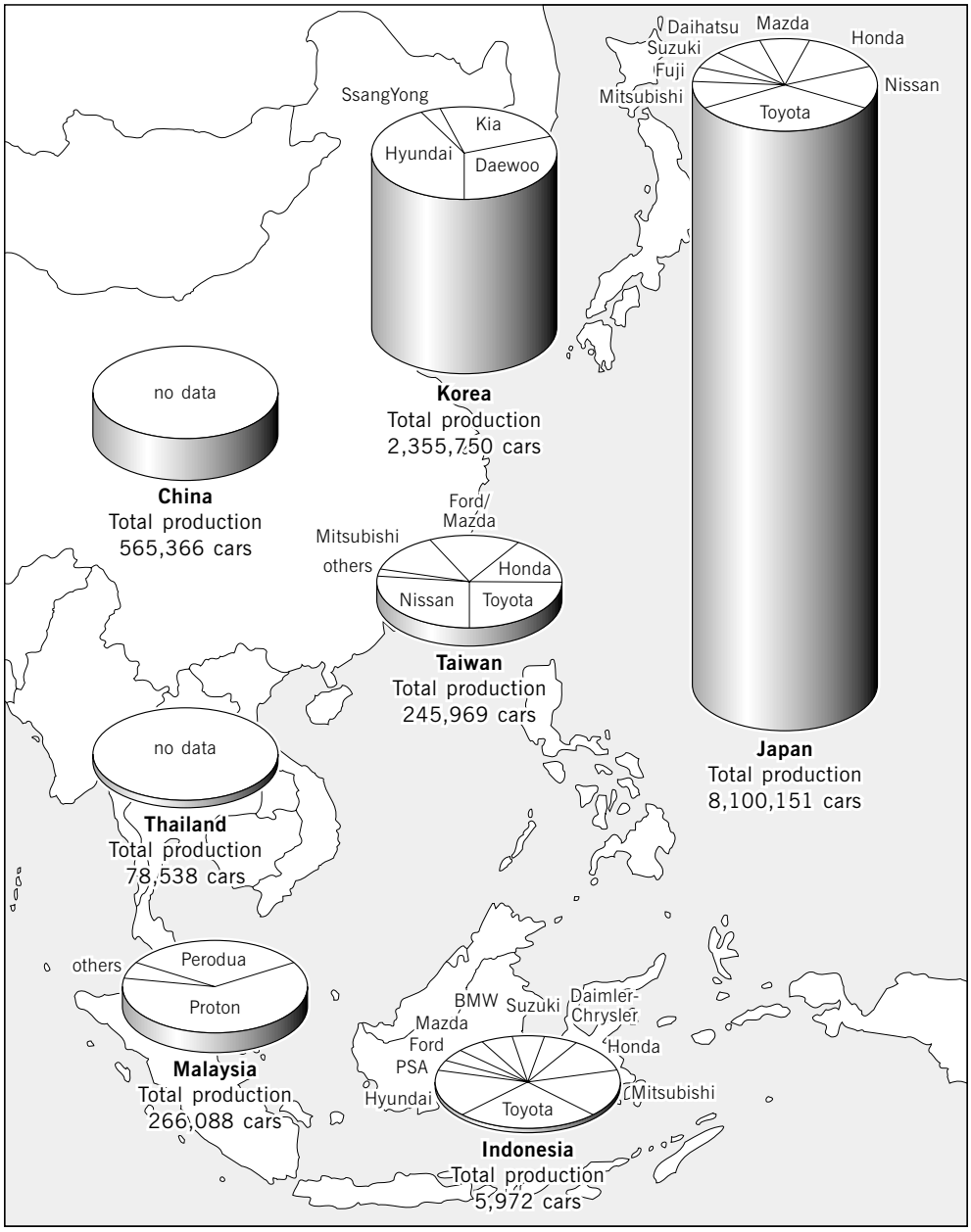

Figure 11: Automobile production in East Asia

Source: Dicken (2003) Figure 11.14

In comparison, Korean firms have preferred to serve East Asian markets from their domestic bases, although Hyundai has operations in Indonesia. Western automobile companies have only recently taken a really serious interest in East Asia. Of course, several US and European firms have had small CKD plants in different parts of the region for many years, while GM and Ford have had significant equity involvement in Japanese firms (Isuzu and Suzuki in the case of GM; Mazda in the case of Ford). Today, virtually all the major western automobile companies are in the

process of establishing operations in the region. In the case of Renault this has involved the acquisition of 44% of the equity in Nissan. More broadly, however, the nature of automobile firms' operations in the region is determined not only by the specific strategies of the firms themselves but also by the highly differentiated political environment within East Asia.

The situation in East Asia is very different from that in Europe, where the size and affluence of the market, the high degree, and wide geographical extent, of political integration have facilitated the development of an increasingly sophisticated intra-regional integration of production. Although East Asia is regarded as potentially the fastest-growing market for cars over the next few decades, the size and composition of the regional market remains limited. In addition, the East Asian automobile market remains primarily a series of individual *national* markets, some of them very heavily protected against automobile imports. On the other hand, the undoubted potential of the East Asian market, set against the saturation of most Western markets, makes it an absolutely necessary focus for the leading automobile manufacturers. It is against this background that the current automobile production network in East Asia needs to be set.

In this section, we focus on two specific areas in East Asia – ASEAN and China.

The automobile industry in ASEAN

Although ASEAN is the only regional political grouping in East Asia it is still, from an economic point of view - and despite the establishment of AFTA (the ASEAN Free Trade Agreement - a fragmented entity. The major problem facing automobile and component producers in South East Asia is that the region remains one of largely separate markets. This is despite the fact that a 'complementation' plan was devised as early as the 1960s among the four largest ASEAN members to reap the benefits of scale economies in production. In the case of the automobile industry, it was not until the late 1980s that the BBC (Brand of Brand Complementation) scheme was implemented to allow some degree of reciprocal tariff reductions on mutual transactions by specified firms between their operations within ASEAN. The BBC scheme excluded non-OEM component manufacturers. However, in 1996, a new complementation scheme, AICO (ASEAN Industry Cooperative Organization), was introduced which does include components. In addition,

> in a move towards the Common Effective Preferential Tariff Scheme (CEPT), due to take effect in 2003, tariffs on products traded within AICO were lowered to between zero and 5 per cent. At least 30 per cent of the capital of any firm participating in the AICO had to be owned locally (a condition that will disappear with CEPT)…However, no single local content requirement prevailed throughout the entire zone, as each member state remained free to make its own decisions in this area. Procedural complexity remains as trade reciprocity must still be proven. Nevertheless, the first agreements within an AICO framework were signed in 1998, between such vehicle makers as Volvo, Toyota, Isuzu, and parts makers such as Sanden, Denso, and Nihon Cable (Guiheux and Lecler 2000: 214-215).

Within ASEAN, Malaysia stands apart as a special case that has invested very heavily in a national car project: the Proton. Initiated by the government in 1985, the Proton project was based upon a close relationship with Mitsubishi. The Japanese company still retains a stake in Proton, but the Malaysian firm is now growing rapidly in its own right and is now the largest car manufacturer in the ASEAN region. It also has joint-venture assembly plants in the Philippines and Vietnam (UNCTAD 2000: 164). However, to protect Proton in its domestic market,

> Malaysia has decided to delay the opening of its car market to 2005, rather than the 2000 agreed by the AFTA [ASEAN Free Trade Area] regional trade grouping. Proton now benefits from preferential treatment over foreign carmakers, who must pay high import tariffs (*Financial Times* 11 October 2000).

Despite remaining intra-ASEAN problems there has been considerable progress towards creating a more integrated market for automobiles and components. Certainly it is the expectation of further progress that underlies the very rapid growth of foreign investment in the region. Within ASEAN, Thailand has emerged as the major focus of automobile and component production (outside the special case of Malaysia). Development of an export-oriented automobile industry has been a central plank of Thailand's industrialization strategy since the early 1990s. Virtually all the major foreign assemblers and component manufacturers either already have, or plan to have, a presence there. Thailand has emerged not only as a major concentration of Japanese automobile and components production but also as the favoured point of entry of Western car manufacturers, notably GM and Ford through their Japanese partners (Isuzu/Suzuki and Mazda respectively). GM established a $600 million

assembly plant in 2000 and BMW has also recently opened an assembly plant in Thailand.

As a consequence of the large number of inward investments, Thailand has become the third largest exporter of automobile products in East Asia, after Japan and Korea; in effect it is the South East Asian export hub for Japanese, US, and European firms. There is a particular emphasis on the production of pick-up trucks and small, basic cars and on a high concentration of component production. 'Thailand has more than 725 components producers, with roughly 225 supplying the OEM market and the rest catering to the after-market' (UNCTAD 2000: 160). Figure 12 shows the major geographical concentrations of automobile assembly and component production in Thailand. The Thai government has invested heavily in a Porteresque cluster policy for the industry, with a particular emphasis on the provinces of Rayong and Samutprakarn, south of Bangkok. Currently, there are almost two-dozen car manufacturers operating in that region, surrounded by several hundred suppliers.

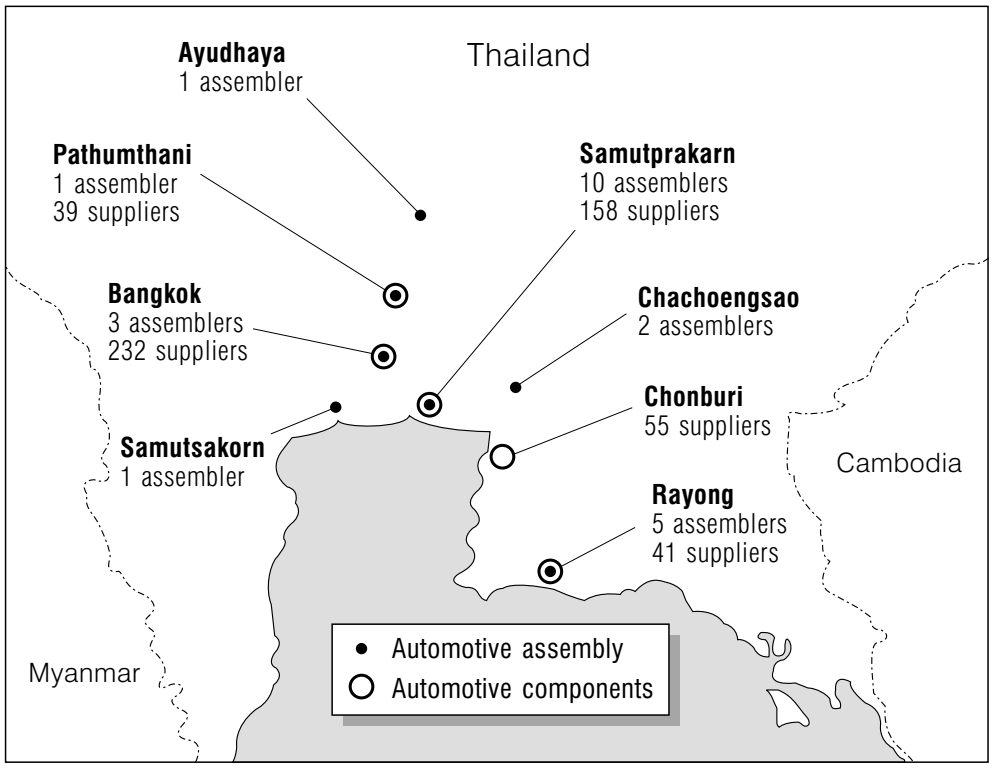

Figure 12: Location of automobile assemblers and component manufacturers in Thailand

Source: Thailand Automotive Institute

BMW is one of the foreign assemblers that recently located in Rayong. It has made an initial investment of €25 million in a plant to manufacture its 3-Series vehicles. In 2003, it intends to invest a further €15 million to install a new assembly line for the production of 7-Series cars to be sold in both the domestic and regional export markets. The Rayong plant currently employs around 250, assembling almost 4000 cars per year from kits imported from Germany. Roughly 40% of value-added is derived from ASEAN-based suppliers (both foreign and domestic. Figure 13 shows where Thailand (and ASEAN as a whole) fit into BMW's global production network.

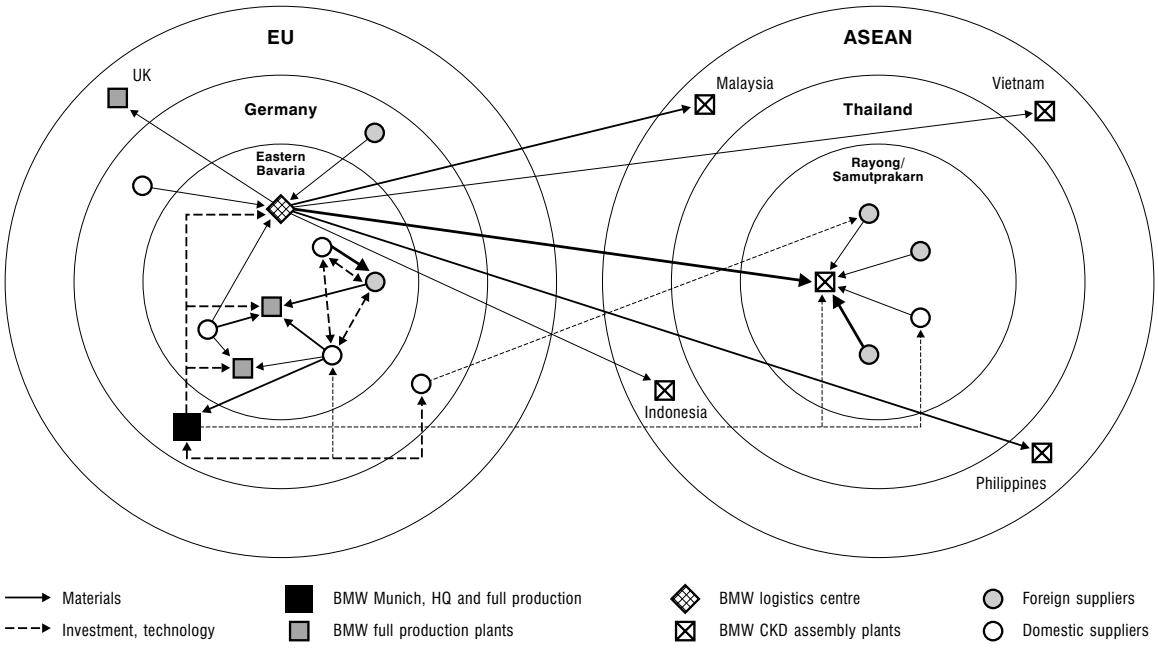

Figure 13: ASEAN and Europe within BMW's global production network

For all the automobile assemblers, unrestricted access to the regional market is absolutely essential to achieve economies of scale and to be able to develop full, rather than mere CKD, production. Free flow of materials and components within ASEAN is even more important to enable both OEMs and component manufacturers to establish an intra-regional division of labour. The leading Japanese components firm, Denso, provides a good example of this (Figure 14). The evolution of its network strongly reflects the industry policies of the individual countries. Denso's first operations in South East Asia were established in Thailand in 1972, followed by Indonesia in 1975, Malaysia in 1980, and the Philippines in 1995. In 2001, an operation was established in Vietnam. These operations are controlled from the company's regional headquarters in Singapore (DIAS -Denso International Asia),

which is responsible for a range of key functions, notably: materials purchasing for all the operations in the region, financial management, intra-regional complementation. DIAS has varying equity stakes in each of the plants in the ASEAN countries as well as in Taiwan and Australia.

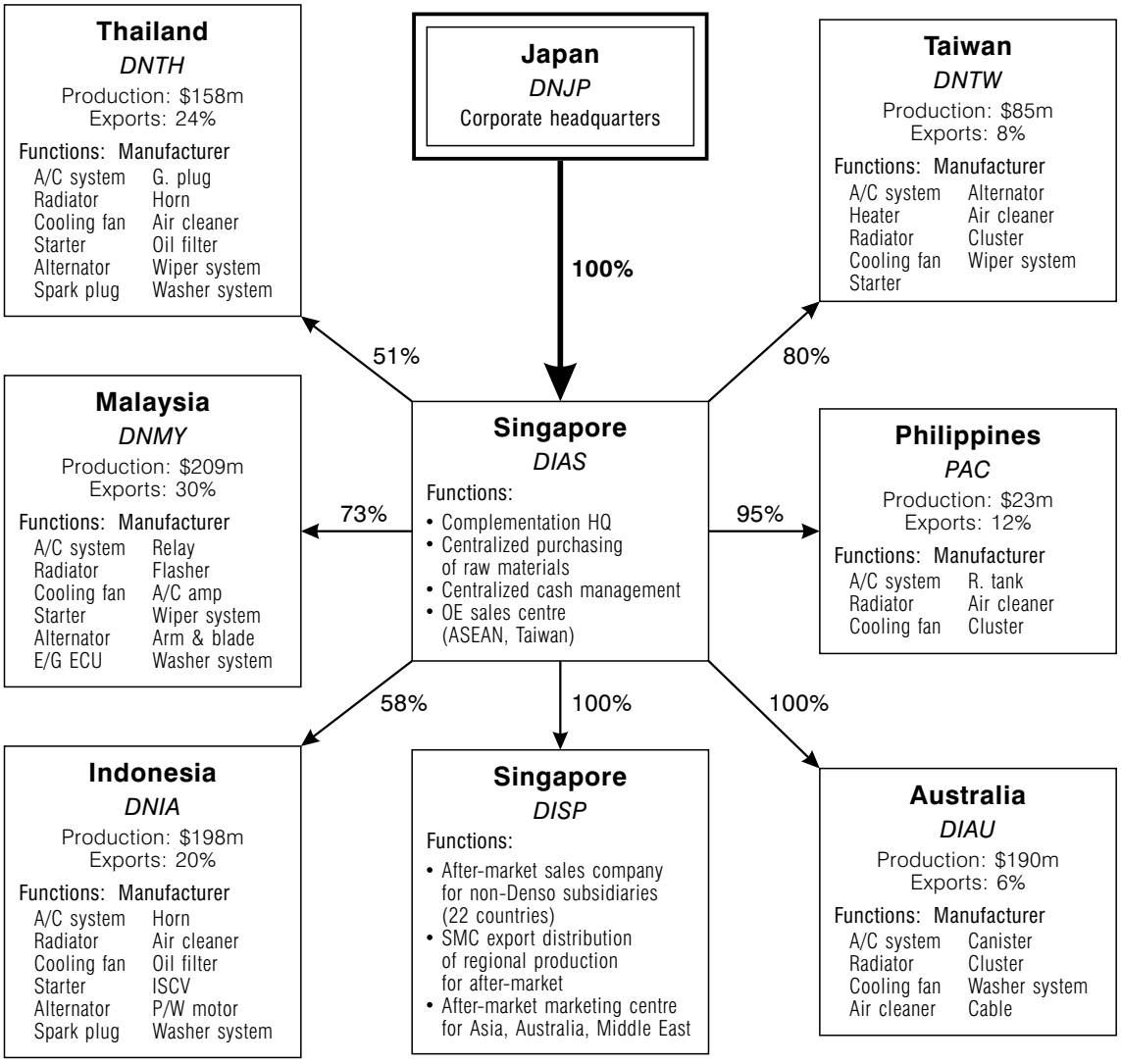

Figure 14: Denso's production network in South East Asia

Source: based on company information

In terms of production, Malaysia is the most important, followed by Indonesia, Australia, and Thailand. As Figure 14 shows, most production in each case is for the local market, a reflection of the regulatory restrictions imposed by individual countries on automobile assembly. The components manufacturers have to follow the assemblers. However, the leading ASEAN countries export significant proportions of their output (Malaysia 30%, Thailand 24%, Indonesia 20%.). Some of this is for the

world market but a significant proportion is designed for inclusion in the 'complementation' scheme in ASEAN and represents a developing intra-regional division of labour. The products involved are shown in Figure 15.

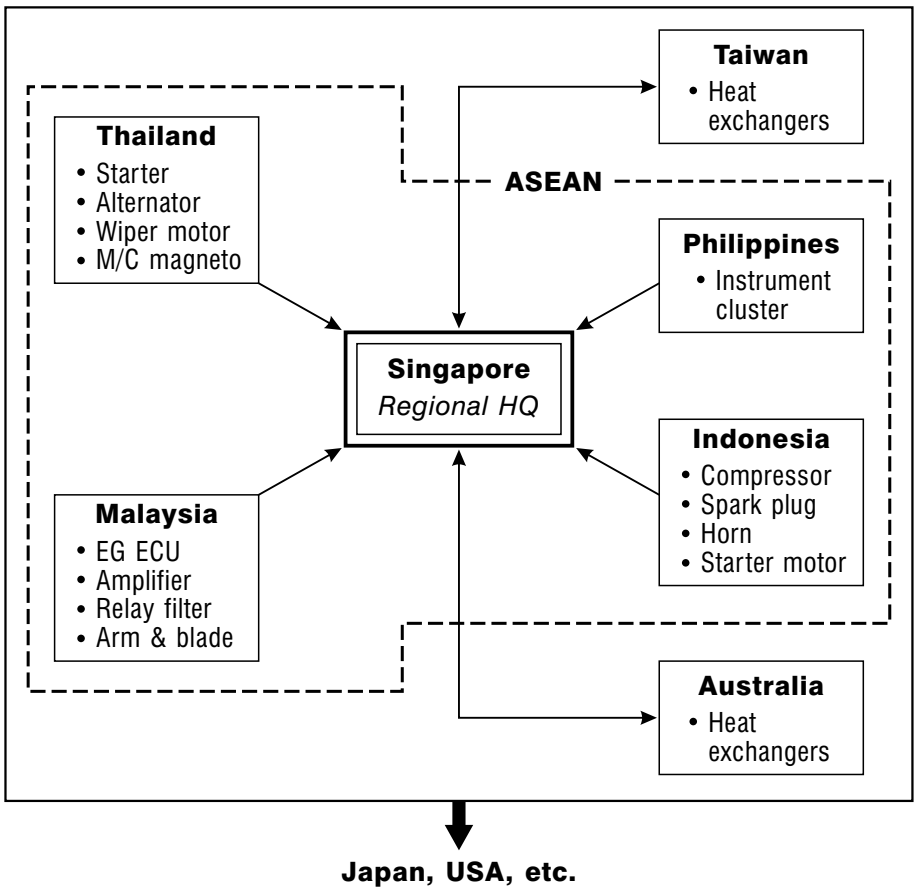

Figure 15: Denso's regional complementation scheme

Source: company information

Most of the key components produced in the ASEAN region are manufactured by foreign-owned companies. Gradually, however, some locally-owned firms are emerging and attempting to break into the established networks. One successful example is the Summit Auto Group (SAG) of Thailand, which has managed to establish itself as a first-tier supplier to all the foreign assemblers in Thailand. SAG consists of two companies – Summit Auto Body (SAB) and Summit Auto Seats (SAS), both of which are 100% Thai owned. SAB makes metal body parts while SAS makes interiors (especially seats, door panels, sun visors, etc.) Together SAB and SAS employ around 4,000 workers in five plants located between Bangkok and

Rayong (see Figure 12). The group is also involved in some 15 joint ventures with foreign partners, many of them with Japanese companies (e.g. Summit Advanced Material which supplies parts to SAG. SAG itself uses around 55 suppliers, 35 from within Thailand itself and 20 from overseas. These are organized through a Summit Suppliers Association. There are close and long-term relationships with customers and an increasing level of R & D, both by SAG itself and through its collaborative ventures.

The automobile industry in China

Whereas foreign automobile assemblers and component firms see Thailand as, potentially a base for serving the whole of South East Asia, their reasons for wishing to establish operations in China are rather different. China is, in itself, potentially the mega-market for automobiles in East Asia. While all the major automobile manufacturers are extremely anxious to establish themselves in China, the Chinese government has imposed specific entry restrictions (see Liu 2000, Sit and Liu, 2000). The Chinese automobile industry consists of a small number of state corporation groups together with a number of joint ventures between members of these groups and foreign firms.

> By the end of 1997, there were nearly 500 FDI-involved automotive firms in China. Among them, 80 are assembly joint ventures (including specialist vehicle assemblers), 410 are auto parts joint ventures, and 10 are wholly foreign-owned firms…Of the total vehicle production, nearly half came from FDI-involved assemblers (Sit and Liu 2000: 664).

Table 5 shows that more than four-fifths of the total market is served by just seven joint ventures, of which by far the largest is Shanghai-VW (36.5%) and FAW-VW (18.1%). Quite clearly, VW is the dominant foreign automobile firm in the Chinese market with well over 50% share. The fact that 'a joint venture with existing Chinese auto firms is the only available choice for FDI in assembly by MNCs in China…[means that]… the location of FDI depends heavily on the locations of existing Chinese firms and the government's approval of these firms' plans for Sino-foreign joint venture projects' (Sit and Liu 2000: 665). However, the nature and level of restrictions on entry to, and operations in, China are in the process of very significant change following China's accession to the WTO in 2001.

Table 5: Major automobile assembly joint ventures in China, 2000

Assembler	Ouput (units)	Major models	Local content (per cent)	Capacity (unit/yr)	Market share (per cent)
Shanghai-VW	221,514	Santana Passat-B5	90.45 >60.00	300,000 30,000	36.5
FAW-VW	110,006	Jetta Audi	84.03 >60.00	150,000 30,000	18.1
Shenlong-Citroen	53,900	Citroen-ZX	>80.00	150,000	8.9
Chang'an-Suzuki	48,235	Alto	85.28	150,000	7.9
Guangzhou-Honda	32,228	Accord	>40.00	30,000	5.3
Shanghai-GM	30,024	Buick	>40.00	100,000	4.9
Beijing Jeep	9,967	Cherokee	82.30	40,000	1.7
Total	505,884			980,000	83.3

Source: Liu and Sit (2002) Table 1

Although there are thousands of components manufacturers in China, again it is the joint ventures between foreign firms and domestic firms that are most significant. Component firms are under very strong pressure to follow the assemblers to China primarily through joint ventures. Table 6 lists some of the most significant joint ventures involving US, British, German, and Japanese component manufacturers in 1997.

Table 6: Major joint ventures by automobile components firms in China, 1997

Foreign firm	Country	Investment Projects	Major products in China
Delphi (formerly GM)	USA	11 joint ventures	Drive shaft, EMS, electric parts, storage batteries, gears, brake parts, steering parts
Ford (now Visteon)	USA	4 joint ventures	Electronics, instrument panels, radiators, seats, steering wheels, auto glass
Allied Signal	USA	1 joint venture 1 branch plant	A/c compressors Superchargers
DANA	USA	1 joint venture	Filters
ITT	USA	1 joint venture	Brakes, ABS
TRW	USA	3 joint ventures	Engine valves, electronics, seat belts
Lear	USA	1 joint venture	Seats, interior trim parts
Tenneco	USA	1 joint venture	Silencers
Lucas (now TRW)	UK (US)	1 joint venture	Brake calliper assembly, disc brakes
T & N	UK	1 joint venture	Piston rings
GKN	UK	1 joint venture	Universal drive devices
Bosch	Germany	2 joint ventures	EMS, diesel EFI, spark plugs
ZF	Germany	1 joint venture	Steering gear
Valeo	France	2 joint ventures	Generators, starters, wipers, washers
Denso	Japan	4 joint ventures	Generators, starters, micro-motors, wipers, a/c
Aishin Seiki	Japan	2 joint ventures	Engine fan clutches, transmissions
NHK Spring	Japan	1 joint venture	Springs
Toyota Gosei	Japan	1 joint venture	Brake hoses
Koyo Seiko	Japan	1 branch plant 2 joint ventures	Bearings Steering, steering gear

Source: Liu and Sit (2002) Table 2

The Shanghai Automotive Industry Corporation (SAIC) provides a good example of the 'Chinese way' of involving foreign automobile manufacturers to create a more viable domestic industry. SAIC is the largest producer of cars in China, employing 62,000 workers in 51 branches and subsidiaries. It has around 43 per cent of the Chinese car market. Although SAIC operates 56 joint ventures with 52 firms

from eleven different countries, two major joint ventures form the core - one with VW (SVW) established in 1984, the other with GM (SGM) established in 1997. The SAIC Group was formally established in 1995 but its origins lie in the Shanghai Car Manufacturing Plant (SCMP) which, before the 1980s, was one of only two car assembly plants in China.

It is clear that the joint venture with VW has facilitated the development of a local supply base. SVW was originally established to produce the VW Santana, initially as a CKD operation.

> SVW had about 200-300 suppliers throughout China in its early days and the suppliers were dedicated to supply specifically SVW (one-to-one). The reason is that at that time the supply industry in China was very weak, lacking skills and technologies of production. Thus, the one-to-one supply relationship allowed the suppliers to concentrate their resources to improve production quality…To improve the quality of parts making and raise the degree of localization quickly, SVW set up a Production Community of Santana together with its suppliers that are located in different places across the country. SVW introduced foreign partners (most of them are VW's affiliated suppliers) to suppliers and also offered necessary technological and financial support to the latter (*Company interview* 2002).

The more recently established joint venture between SAIC and GM has been able to build on the greater degree of supplier sophistication developed over the past twenty years.

> In 1997, when GM started its assembly business in Shanghai-Gm (SGM), it adopted a different strategy of parts sourcing from that of SVW, that is, SGM did not dedicate any suppliers and did not give any preferential treatment to suppliers under SAIC, but chose 1-2 suppliers for one part/component among 3-5 candidates based on a QSTP rule (quality, service, technology, price), which is, by and large the same practice as GM's global sourcing. That is, GM has benefited from the upgraded supply industry in China, which was driven by the localization of Santana in SVW. After the supply industry was upgraded, SVW changed its rule of parts sourcing in the production of new models, that is, selecting suppliers among several candidates. Thus, the supply relationship is no longer locked into the Santana Community, while the traditional relationships within the Community are still there and, in particular, the traditional inter-personal relations still exist (*Company interview* 2002)

In several respects, therefore, SVW has been a pioneering influence in the development of China's automobile supply industry, at least around Shanghai. Over time, two processes have occurred. One has been the progressive rationalization and further deepening of the supply base outlined above. The other has been the increasing geographical concentration of suppliers in the Shanghai area. One significant element in this process was the implementation by the Shanghai Municipal Government (approved by the central government) of a localization tax on all Santana purchasers. By 1994, when it was abolished, this tax had generated RMB6 billion and was used to facilitate a concentrated and upgraded supply cluster in and around Shanghai.

> Initially, suppliers were scattered widely across China.
>
> Later on, as a result of the increasingly high requirement of quality guarantee and adoption of JIT, suppliers began to relocate their production facilities into Shanghai and surrounding regions so as to make communication with the assembler much easier and to satisfy the demand of JIT delivery. Within SAIC there were around 50 suppliers to SVW for the production of the Santana in the 1980s and they were rationalized into 10 major parts and components making companies later on…These 10 major parts-making companies started to set up new joint ventures with foreign companies…Thus, the number of parts making companies in SAIC increased to more than 40 in recent years and almost all of them are joint ventures. But they supply not only to SVW and SGM but also to other assemblers in China. More recently, SAIC streamlined them into 6 major parts and components making branches, i.e. chassis, air conditioning, power, electrical and electronics, pressing, and body and interior decoration…they are independent in daily operation but decision-making power is centralized. The relationship between suppliers at different layers is by and large the same as the assembler-supplier relationship. That is, the first layer suppliers chooses the second layer suppliers based on product quality, technology, price and service (*Company interview* 2002)

The overall cost base of SAIC has undoubtedly benefited from the strong localization of suppliers, not least because it facilitated the reduction of tariffs on imported parts and components. Under the central government's Automotive Industry Policy, import tariffs were reduced in accordance with the degree of local content; the higher the local content the lower the tariff. The Leadership Office for the

Development of the Automotive Industry within the Shanghai Municipal Government was chaired by the Mayor of Shanghai and played a major role not only in utilizing the revenues from the localization tax on the Santana but also in developing special policies, removing institutional barriers, coordinating different government departments and mediating issues between stakeholders.

> Indeed, the Office acts in many cases as a neutral party to try to keep the selection of suppliers fair. For example, the Office would speak for non-SAIC suppliers if SAIC discriminated against them in selecting suppliers, but would stand for SAIC if the latter got pressures from local government departments. An example is the Shanghai Fengxian Muffler Plant, which is not subordinated to SAIC and a supplier to SVW. When SGM selected suppliers, SAIC did not want to have the plant but one of its own subsidiaries. After mediation of the Office, SGM accepted the muffler plant as a supplier (*Company interview* 2000)

With the development of production of newer models, such as Passat and Polo, SVW has adopted a modular assembly process:

> Module suppliers are required to set up logistics centres within 5km of the assembly line and send in modules by JIT. For example, Supplier X is a module supplier of interior doors to the production of the Passat in SVW. Suppliers to X send parts to the logistics centre of X nears SVW's assembly line, where X assembles the interior door module and delivers it to the assembly line of Passat by JIT. As a result, more and more module suppliers have been located beside the assembly plant (*Company interview* 2000).

Until 1997, when it established its joint venture with GM, SAIC's growth had been closely linked to that of VW's strategies for development in China. The establishment of a new joint venture with a major competitor to VW raises interesting questions of potential conflict of interest. SAIC's view is that the establishment of SGM provided a catalyst for VW to accelerate its new model programme (having been content to build old models in China because of the lack of serious competition).

> SVW started to produce VW's Santana model in 1985 and until 1997 VW introduced no new models to SVW. Santana 2000 is revamped based on the same platform through cooperation between SVW and VW Brazil, thus it is not a new model. That is, SVW produced only one model for 12 years…After SGM was established in 1997, VW soon introduced the Passat and then the

> Polo in 1999 and 2001 respectively, and Bora and Audi A6 to FAW-VW in 2001. The speed of new model introduction to China by VW has been accelerated as a result of increasing market competition in China, from one model per 12 years to one model per 12 months. Besides, the partnership between SAIC and VW has been deepened in the last five years in terms of technology development. In the beginning, cooperation between the two sides existed only in the fields of production and localization. Since 1997, VW has invested more than $120 million to strengthen the technological capability of SVW (*Company interview* 2002).

The case of SAIC, and its joint ventures with VW and with GM, illustrates some of the complexity of the developing automobile industry in China. It also shows how the involvement of central – and especially local – political institutions can play a major role in developing both assembly and component manufacture. Of course, the nature of these interactions will undoubtedly change as China is forced to modify its industry, investment and trade policies as a member of the WTO.

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