COMMISSION
DES COMMUNAUTÉS
EUROPÉENNES

THE EVOLVING COMPETITIVE CHALLENGE FOR THE EUROPEAN AUTOMOTIVE COMPONENTS INDUSTRY

Executive Summary

July 1993

THE BOSTON CONSULTING GROUP

COMMISSION DES COMMUNAUTÉS EUROPÉENNES
Direction Générale III
INDUSTRIE

III/E/5

Bruxelles, le 11/11/93
LV/

Madame, Monsieur ,

Comme suite à votre demande, je vous prie de bien vouloir trouver ci-après une copie de l'étude du BCG intitulée " The evolving competitive challenge for the european automotive industry " qui constitue, en fait, une mise à jour de celle que le BCG a effectuée en 1990 pour la Commission sur l'industrie des composants automobiles dans le contexte du marché unique.

Il s'agit là d'une étude dont les conclusions ne sont pas entièrement partagées par la Commission qui estime que l'évaluation faite par le BCG de 400.000 pertes d'emplois à l'horizon 2000 dans l'industrie communautaire des équipements automobiles est contestable.

La Commission est d'avis, tout comme le BCG, que le niveau actuel de productivité de l'industrie européenne des composants est nettement inférieur à celui de l'industrie japonaise et qu'une restructuration importante doit encore avoir lieu afin d'améliorer le niveau global de compétitivité du secteur.

La Commission considère toutefois que le gap de productivité indiqué par le BCG dans son étude et l'effort de rattrapage qui en découle ont été surévalués pour des raisons méthodologiques.

D'autres études indiquent un gap de compétitivité de l'industrie européenne des composants nettement inférieur à celui mis en évidence par le BCG[1].

La Commission a transmis l'étude à l'association européenne des constructeurs (ACEA) ainsi qu'à l'association des équipementiers (CLEPA) afin d'obtenir leur avis sur cette question. Le CLEPA a déja fait savoir qu'il contestait , tout comme la Commission, les estimations du BCG.

Je vous prie d'agréer l'expression de mes salutations distinguées.

R. WRIGHT
Chef d'unité

[1]Ainsi, "The Intelligence Economist Unit" a estimé, début 1993, que le gap par rapport aux Japonais en terme de coût global de production variait entre 13 et 24%.

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prepared for

THE COMMISSION OF THE EUROPEAN COMMUNITIES
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THE EVOLVING COMPETITIVE CHALLENGE FOR THE EUROPEAN AUTOMOTIVE COMPONENTS INDUSTRY

Summary of Key Findings and Conclusions

- The value of production of the EC independent components industry in 1992 was ECU 93bn, with value added of ECU 40bn. Employment of 940,000 represented only a marginal increase over 1988, as an increase of production over the period of 15% was counterbalanced by a similar increase in productivity.

- Profitability levels of both component and vehicle manufacturers in the EC have declined since 1988, although original equipment manufacturers (OEMs) continue to be more profitable than component producers, in contrast to the situation in Japan where returns are similar in both parts of the chain reflecting their close partnership.

- In both productivity and stock turns the EC components industry only achieves one third the Japanese level and this alarming gap has not changed over the last few years. This competitive disadvantage versus the Japanese is significantly greater in components than in OEMs; Japanese vehicle productivity is now only 30% higher than European OEMs.

- Employment is likely to decline by at least 40% up to 1999, or by over 400,000 jobs in component production. This represents a 50% convergence to current Japanese productivity levels, which is the absolute minimum for the industry to be viable after 1999.

- The vehicle manufacturers are beginning to implement fundamental changes in their relationships with suppliers, including
  - increased outsourcing
  - divestiture of their component subsidiaries
  - single sourcing
  - purchasing of complete systems or sub-assemblies
  - increasing delegation of design to suppliers.

  One of the most significant actions is the reduction in the number of direct suppliers, from around 1250 on average in 1988, to 900 currently, with plans to reduce to around 400 by 1997.

- The structure of the EC components industry is likely to change radically, with a clear movement to a tiered structure similar to that in Japan. A concentration of first tier suppliers to around 500 principal ones in Europe is probable, with only 2-6 main competitors in the EC for most key subsystems. The number of companies operating as second or third tier suppliers may reduce by up to a third.

- First tier suppliers will need to develop their own supply chain management capabilities. Their effectiveness at this largely new role will be critical for the overall competitiveness of the European automotive industry. The second tier suppliers, often small and medium enterprises, are the part of the overall chain where lies the greatest challenge to improve productivity and where awareness of means to improve competitiveness is least advanced.

- EC support in training, employment measures, harmonisation of standards (for quality certification, EDI, and if possible CAD/CAM), support for R&D and new product development and education on improved manufacturing processes can all play a useful role in assisting the industry to improve its competitiveness.

- Although the individual companies in the industry need to undertake major restructuring to enhance their competitiveness, it will be equally important to improve the relationships *between* OEMs and first tier component producers, and between the latter and their suppliers. The realisation of true partnership relationships along the value chain is

perhaps the critical challenge to create a viable and strong European automotive industry by the end of the decade.

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INDEX

1. INTRODUCTION AND OBJECTIVES

This study examines the size, competitiveness and main trends affecting the EC automotive components industry in order to assess the recent evolution of the main parameters and develop guidelines for improving the competitive position of the European industry. The study is an update of the report on "The Competitive Challenge Facing the European Automotive Components Industry", presented to the Commission of the European Communities - Directorate General for Internal Market and Industrial Affairs in February 1991.

The study covers the following main aspects:

- Sizing of the EC automotive components sector demand and supply;
- Analysis of financial performance and key indicators of competitiveness of components manufacturers and original equipment manufacturers (OEMs);
- Analysis of key industry trends and changes in the OEM-components suppliers relationship;
- Implications for EC policies.

The study investigated components for passenger cars and light commercial vehicles (below 3.5 tonnes) and covered both original and replacement equipment. Product groups covered were: fuel system, cooling system, internal engine components, exhaust system, transmission and other drivetrain, suspension, steering, body and external parts, interior trim, brakes and electrical componentry. Products specifically excluded from the study were paint, adhesives, fasteners, communications equipment, tyres, unfinished components and materials, accessories and care products.

The geographical scope includes all the EC countries and takes into account the impact of unification on the German industry.

The analysis of the different trends and its implications for EC policies are based on an extensive face-to-face interview programme, consisting of over 50 interviews carried out in the second quarter of 1993. These included interviews with major European vehicle manufacturers, Japanese transplants, different types of component producers in the EC (by subsector, size, and country), and CLEPA officials and member industry associations.

The update on the industry size estimates and financial analysis was based on an improved and more precise version of the model used in the previous study. Changes in the model (e.g. in calculating the replacement market in each country), are described in more detail when discussing specific results.

The following sections describe the main findings and conclusions of the study.

* * * * *

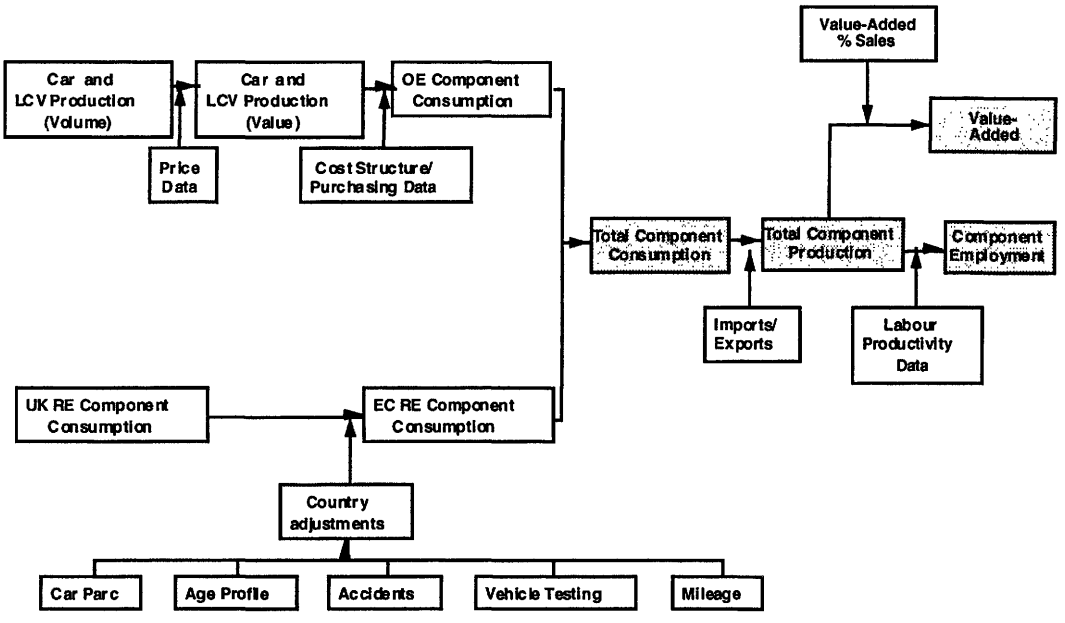
2. INDUSTRY SIZING

2.1. Methodology

As stated in the 1991 report, the existing published statistics relating to the size of the EC automotive components industry present a variety of problems, including incomplete coverage, double counting, inconsistent segmentation country by country and widely differing estimates of the replacement market. Moreover, the sizing of the industry using existing statistics has several major drawbacks: in the first place, there is not an accepted definition of the industry; secondly, component producers are often part of larger companies operating in several industries, making it difficult to separate out their component activities.

Given such problems, a specific methodology was developed in the earlier study for quantifying and forecasting component consumption, production, value-added and employment. The chart below outlines schematically the approach taken in determining the size of the industry.

INDUSTRY SIZING
Outline Methodology



Car and light commercial vehicle (LCV) production values are based on production volume and price data. Component demand for original equipment (OE demand) was estimated from vehicle production value using information about levels of vertical integration and detailed production cost structures obtained from annual reports and vehicle manufacturer interviews.

Replacement component demand is very well documented in the United Kingdom, but not in other EC countries. Demand in other EC countries was modeled by adjusting for country differences in parc size, parc age structure, average annual mileage, accident rates, and the strictness of compulsory vehicle testing. Replacement component demand is principally affected by number of accidents, testing requirements and mileage driven.

Production, value added and employment were calculated from total component consumption using EC trade data, value added statistics and labour productivity.

Following suggestions from CLEPA and industry experts, a number of improvements have been made in 1993 to the sizing methodology: car parc age profiles have been more accurately modeled for the replacement component market; detailed discussions have been held with insurance companies to assess accident spending; finally, a detailed value segmentation of car markets by model type has been incorporated.

The approach taken to forecast industry growth is the same as that in the 1991 report. Original equipment demand was derived from vehicle production forecasts and predictions about changes in vehicle manufacturers' level of vertical integration obtained from interviews. Replacement component demand was calculated from forecast parc growth and assumptions about changes in components durability and convergence in vehicle testing requirements and accident frequencies across EC countries. Production and employment forecasts were estimated from consumption forecasts using trade balance and labour productivity growth projections and assumptions.

The information given for 1988 for comparative purposes differs slightly from that which was given in the 1991 report, due to the adjustments and improvements to various aspects of the model, including pricing and productivity data. The net result of these changes is to reduce the estimate of 1988 overall EC employment by 2.3%.

2.2. Current Industry Size

The European independent component industry accounted in 1992 for ECU 93 billion in production, ECU 40 billion in value added and currently employs around 940,000 people. The importance of the different key countries is also shown below.

INDUSTRY SIZING - 1992

Country	Production		Value Added		Employment	
	ECU Bn	%	ECU Bn	%	'000	%
Germany	43.6	47	20.9	53	436	46
France	18.0	19	6.1	15	144	15
UK	10.8	12	4.4	11	150	16
Italy	10.2	11	3.5	9	101	11
Spain	6.9	7	3.1	8	73	8
Rest of EC	3.3	4	2.1	4	36	4
Total	92.7	100	40.1	100	940	100

The production at vehicle manufacturers (including assembly and key components like engines and transmissions) is twice the size at ECU 186 billion, with value added at ECU 65 billion, and employment slightly higher at 1,025,000 people. The higher level of value added, given only a slight difference in employment, is explained by better productivity in the vehicle assembly sector, as will be discussed later.

2.2.1. Consumption

Total EC component consumption is estimated at ECU 88.8 Bn in 1992. This represents an important increase from the 1988 market, which was estimated at ECU 73.4 Bn, and is equivalent to a Compound Annual Growth Rate (CAGR) of 4.9% in nominal terms. The top five countries represent 95% of total consumption, with Germany alone accounting for 44%.

TOTAL COMPONENT DEMAND - 1992

Country	ECU Bn	%
Germany	39.3	44
France	15.9	18
UK	11.2	13
Italy	9.4	11
Spain	8.2	9
Rest of EC	4.8	5
Total	88.8	100

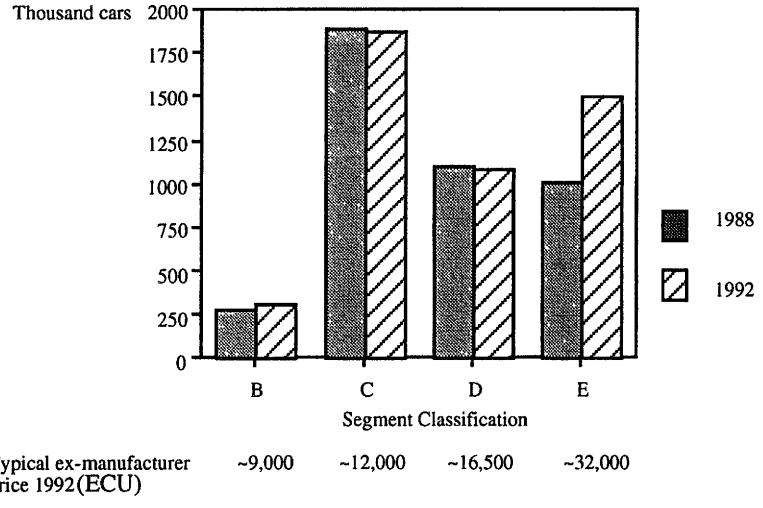
The **original equipment market** (OEM) which represents 77% of the total has gone from ECU 57 Bn to ECU 68 Bn. As shown in the figure below, Germany is the most important market which represents 50% of the total followed by France (20%), the UK, Italy and Spain each with aproximately 10% . This mainly reflects the geographical location of vehicle manufacturers. Germany and Spain have shown particularly high growth rates.

OEM DERIVED CONSUMPTION (ECU Bn)

Country	1988	1992	Δ
Germany	24.7	34.3	39%
France	11.8	12.2	3%
UK	6.4	6.9	8%
Italy	6.4	6.3	-2%
Spain	4.8	6.5	36%
Rest of EC	2.4	2.0	-16%
Total	56.5	68.2	21%

The rise in original equipment demand is due to a small increase in vehicle production, an increase in the outsourcing of components by vehicle manufacturers, the use of more sophisticated components in vehicles, and a shift to the production of higher value vehicles. The latter effect is particularly noticeable in Germany, as can be seen in the graph below, and, to a lesser extent, in the UK.

PRODUCTION OF CARS IN GERMANY



The **replacement market** demand is now ECU 21 Bn compared with ECU 17 Bn in 1988, representing a growth of 4.6% CAGR in nominal terms. Demand stemming from mileage-related repair is the major driver of the replacement market, accounting for 71% of the total at the European level. Accident related repairs account for 22% of the total, with vehicle testing responsible for only 7%. There are significant differences country by country, with for example, test related expenditure highest in southern European countries.

Even though the replacement component demand in *unit* terms has decreased as a result of higher quality and reliability of vehicles and a decrease in the number of accidents due to better road infrastructure, the replacement market has remained level at 23% of the total market in *value* terms. This is a result of increases in the prices of replacement components, whereas prices of components supplied to OEMs have remained more or less constant.

If we analyse the total market by **component type**, we can observe that the most important component groups are body parts (20%), interior trim (15%), electrical (14%) and internal engine (12%). Compared with 1988, there has been an increasing importance of body and external parts and interior equipment. The greater importance of electronics is not fully

shown in the figure as many of the improvements and additions in electronics are considered within other component type categories (e.g. interior equipment).

TOTAL MARKET SIZE BY COMPONENT TYPE

Component type	1992	
	M ECU	%
• Fuel systems	3.9	4.4
• Internal engine	10.3	11.6
• Engine cooling	1.9	2.1
• Exhaust system	4.3	4.8
• Transmission	3.5	3.9
• Other drive train	4.7	5.3
• Suspension	2.6	2.9
• Steering	2.2	2.5
• Body/external parts	17.7	20.0
• Interior equipment	13.2	14.9
• Brakes	6.6	7.5
• Wheels	5.3	5.9
• Electrical	12.6	14.2
Total	88.8	100.0

2.2.2. Production

Total EC component production is estimated at ECU 92. 7 Bn representing an increase on the 1988 estimate which was ECU 81 Bn, or a 3.5% CAGR in nominal terms. The increase in production has been particularly important in Spain and UK with growth rates of 6.2% and 5.7% CAGR respectively. Germany still represents the most important production base in Europe with 47% of the total.

COMPONENT PRODUCTION
1992

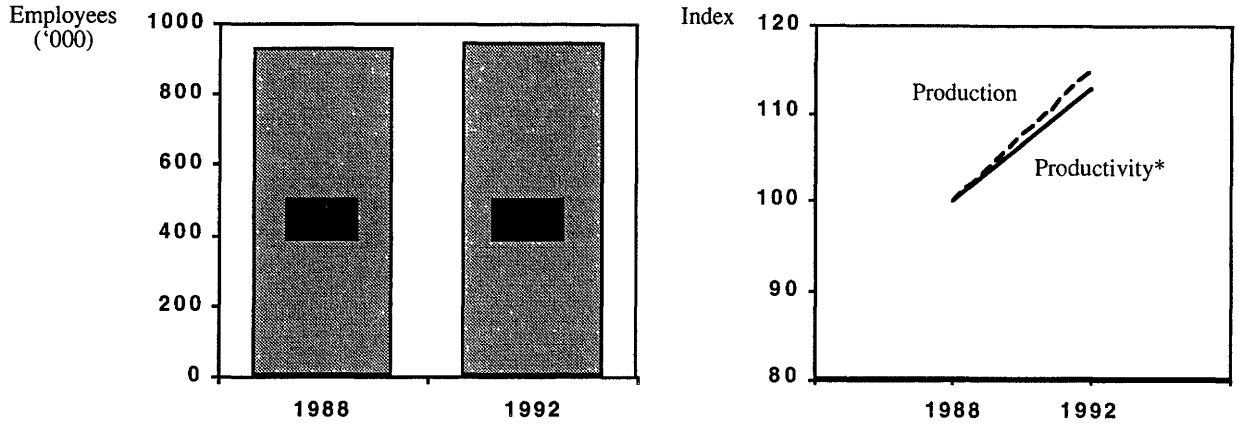
Country	ECU Bn	%
Germany	43.6	47
France	18.0	19
UK	10.8	12
Italy	10.2	11
Spain	6.9	7
Rest of EC	3.2	4
Total	92.7	100

The distribution of production across Europe is likely to change in the future as a result of vehicle plant investments, europeanisation of purchasing and changes in the competitiveness of different suppliers within the EC, as shall be discussed in later sections of the report.

2.2.3. Employment

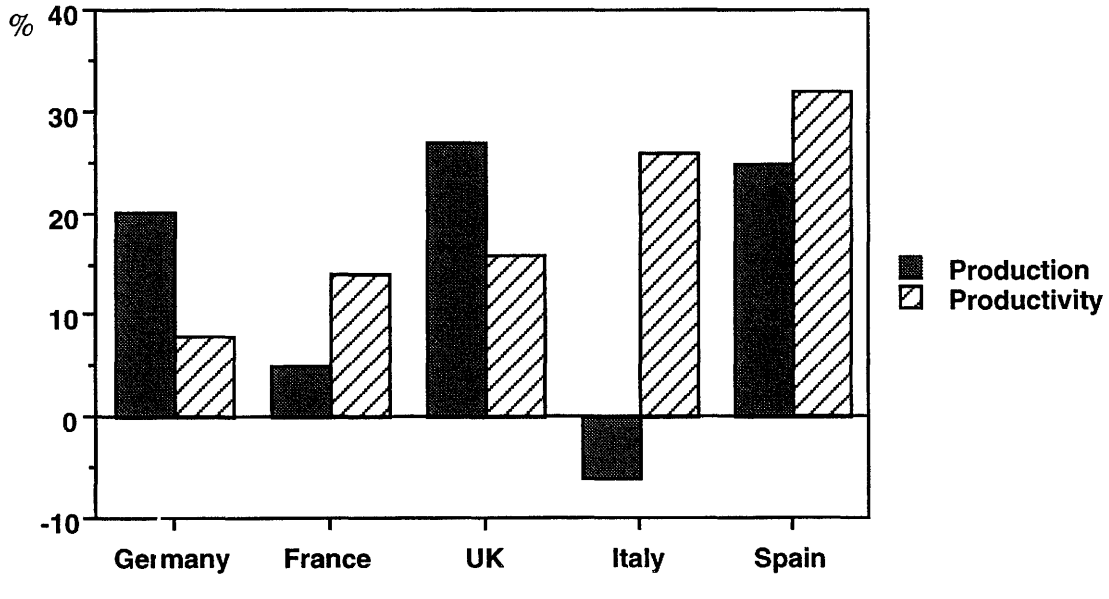
Employment in the components industry has increased marginally from 1988 to 1992. The 15% increase in total production over the period has been counterbalanced by an increase of 13% in labour productivity measured in terms of sales per employee. This reflects the improvements in efficiency achieved by component manufacturers under pressure from increasingly demanding vehicle manufacturers' purchasing practices.

PRODUCTION AND EMPLOYMENT



In Germany and the UK, the increase in production has outweighed productivity increases, hence employment has increased. In France and Spain, however, increases in production have not been sufficient to offset large productivity gains, so employment has decreased. The largest drop in employment is seen in Italy, as a result of the decrease in production and restructuring measures taken to increase productivity. This is summarised below.

PRODUCTION AND PRODUCTIVITY EVOLUTION BY COUNTRY 1988 - 1992



EMPLOYMENT
'000

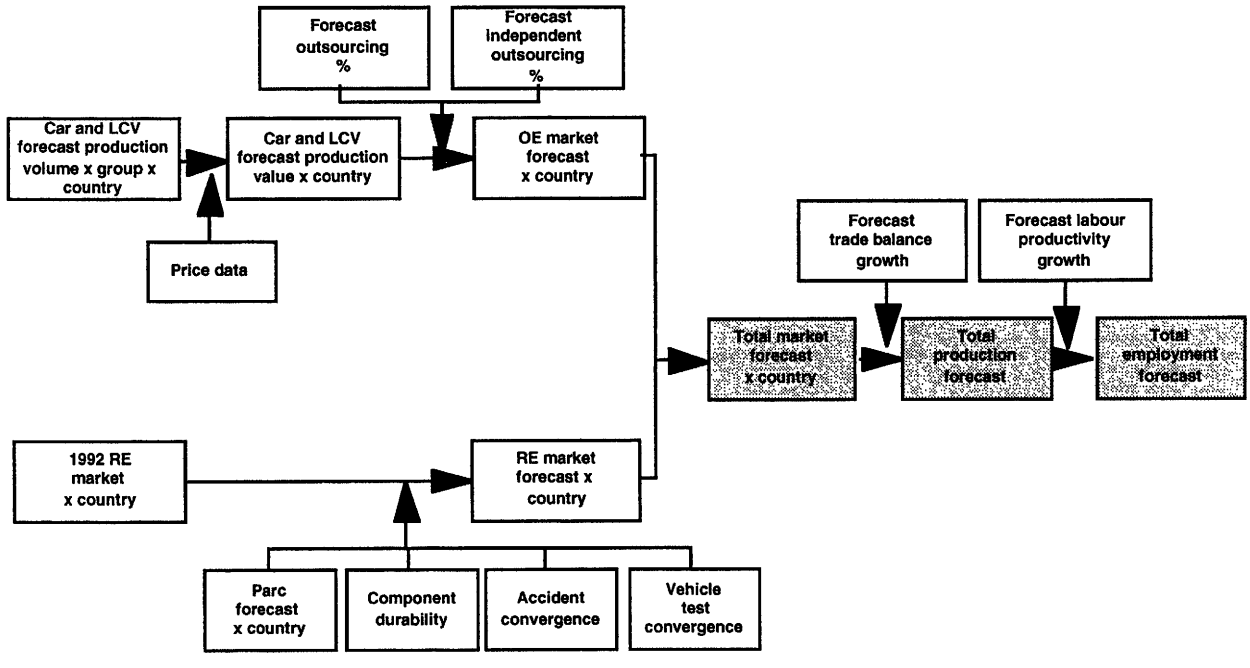
Country	1988	1992	Δ
Germany	389	436	12%
France	156	144	-8%
UK	137	150	10%
Italy	134	101	-25%
Spain	77	73	-6%
Rest	35	36	0%
Total	928	940	1%

As discussed later in the section on financial performance, there is still much scope for productivity improvement relative to the Japanese component manufacturers. Increases in productivity to date appear to have been made by increasing sales with constant employment rather than by reducing employment at an industry level.

2.3. Forecast

The approach taken to forecasting industry growth is the same as that in the 1991 study. OE demand was derived from DRI vehicle production forecasts, and estimates of manufacturers' levels of future outsourcing obtained from interviews. Replacement market demand was calculated from forecast parc growth, assumptions about changes in component durability, and predicted convergence in vehicle testing requirements and accident levels across the EC.

COMPONENT MARKET FORECAST
Methodology



The original equipment market (OE) is forecast to increase in overall size, with growth in production volume, value mix, car component content and volume of outsourcing by OEMs outweighing the component price reduction currently being achieved by OEMs. The replacement market (RE) is expected to remain virtually level in real terms, with increases in

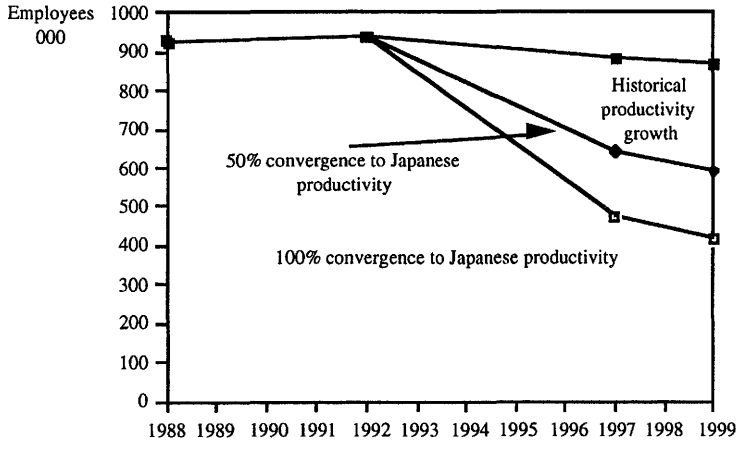
vehicle testing related demand compensating for decreases in mileage-related and accident-related demand due to improved quality and reliability.

CONSUMPTION (ECU Bn 1992)

Country	OE Market		RE Market		Total	
	1992	1999	1992	1999	1992	1999
Germany	34.3	30.5	5.0	5.0	39.4	35.5
France	12.2	13.4	3.8	3.4	15.9	16.8
UK	6.9	13.5	4.3	4.2	11.2	17.7
Italy	6.3	7.6	3.1	3.3	9.4	10.9
Spain	6.5	7.7	1.7	1.8	8.2	9.5
Rest	1.9	3.6	2.8	2.5	4.7	6.1
Total	68.2	76.3	20.6	20.1	88.8	96.4

Employment is likely to decline dramatically in the future, as the growth of consumption and production slows down and the rate of productivity increase by necessity accelerates. The chart below indicates the level of employment in 1999, the date that the "Elements of Consensus" agreement with Japan governing imports expires, under different assumptions about productivity.

AUTOCOMPONENT EMPLOYMENT IN THE EC



	Employment Change 1992-1999 (%)	Implied Productivity CAGR 1992-1999 (%)
Historical productivity growth	-11%	4%
50% convergence to Japanese productivity	-43%	12%
100% convergence to Japanese productivity	-54%	14%

At the rate of productivity growth (in value-added per employee) of the last several years of 4% per annum, employment would only be reduced by 11%. However, this level of productivity growth would leave the industry hopelessly unviable at the end of the period and in danger of collapse. **If the European components industry were to reach in 1999, the level of productivity of the Japanese industry in 1992, then employment would be reduced by 54%, implying a 14% per annum improvement.** As will be discussed later, it is highly likely that the Japanese will continue to increase their productivity at the 5-6% pa steady rate of the last decade. Therefore, even such a drastic employment reduction in the EC would not guarantee reaching parity with the Japanese industry. Assuming only a 50% convergence by the EC industry in 1999 to the Japanese levels of 1992, would still imply an employment reduction of over 40%.

The very large employment reductions announced by many EC component producers during the first half of 1993 are the beginning of this process of radical restructuring. The recent demands by several leading European OEMs for cost and price reductions from their suppliers of over 10% pa indicate the seriousness of the pressures that will be brought to bear on the components industry to improve its productivity.

BCG believes that the 50% convergence scenario is the absolute minimum necessary for the industry to be in a position to survive after 1999. The likely decrease of direct employment in the independent components industry of over 400,000 will imply the need for retraining of the displaced workers to help them find alternative employment, and training for those employed to give them the skills needed to achieve the much higher level of output per man. Implications for possible EC policies to deal with these issues are discussed later in this report.

3. FINANCIAL PERFORMANCE

The financial analysis was based on a representative sample of component suppliers. Several data sources such as ICC in the UK, DAFNE in Germany, Value Line in the USA, FIEV and SESSI in France, and JAPIA in Japan were used. The component supplier sample was composed mainly of first tier suppliers representing the different sub-sectors of the industry. Data for different years was deflated using country specific deflators and then converted to ECU using 1992 exchange rates.

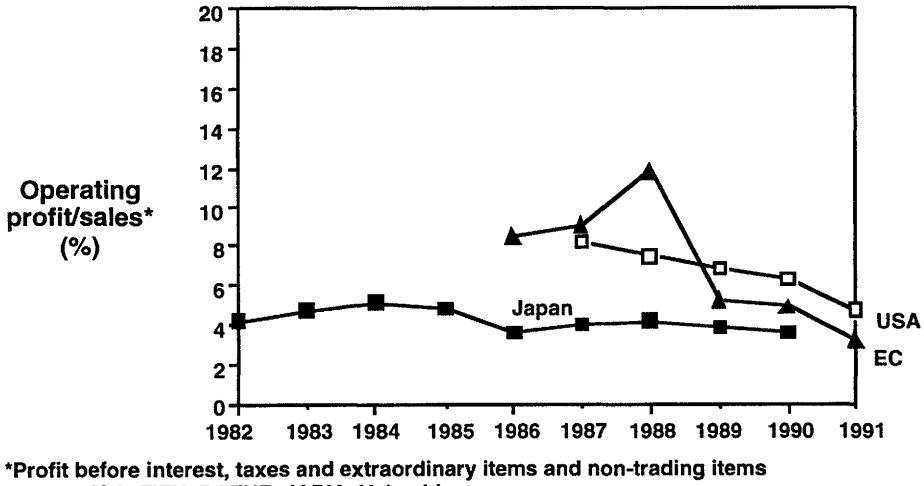
3.1. Component manufacturers

In measuring financial performance, the study had two main objectives. The first one was to understand the profitability of the European industry relative to the Japanese and US industries and its recent evolution. The second one was to analyse different parameters of financial performance, such as labour productivity and stock turns, which permit an understanding of the competitiveness of the European industry at an aggregate level.

3.1.1. Profitability

The profitability of European component manufacturers has been decreasing in the 1988-91 period particularly in the UK and France. This reflects the slowdown in demand, increases in capacity, reduction in prices and the fierce competition that is accompanying the sector restructuring. The decreasing profitability, which affects also US and Japanese manufacturers, appears to be converging to aproximately 10% measured in terms of Return on Net Assets (RONA) and to roughly 5% Return on Sales (ROS) over the cycle.

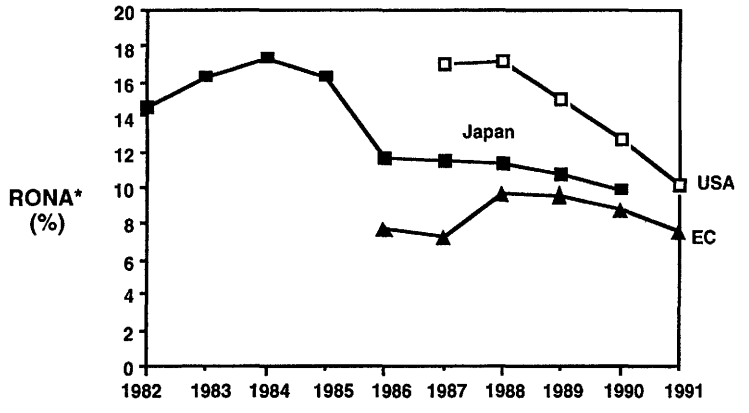
OPERATING PROFIT



*Profit before interest, taxes and extraordinary items and non-trading items
Source: ICC, FIEV, DAFNE, JAPIA, Value Line

In 1988, RONA was as high as 17% in the US and 15% in the UK. In Germany, on the contrary, it has increased significantly from around 4% in 1987 to 8% in 1991, probably due to the boost induced by the process of unification; since then, however, profitability has declined as a result of the recession. Italy and Spain have been excluded due to lack of publicly available data, although representative interviews carried out in Spain indicate that returns in that country have also decreased, following the general trend in the European sector, from around 15% in 1987 to 4% in 1992.

RETURN ON NET ASSETS

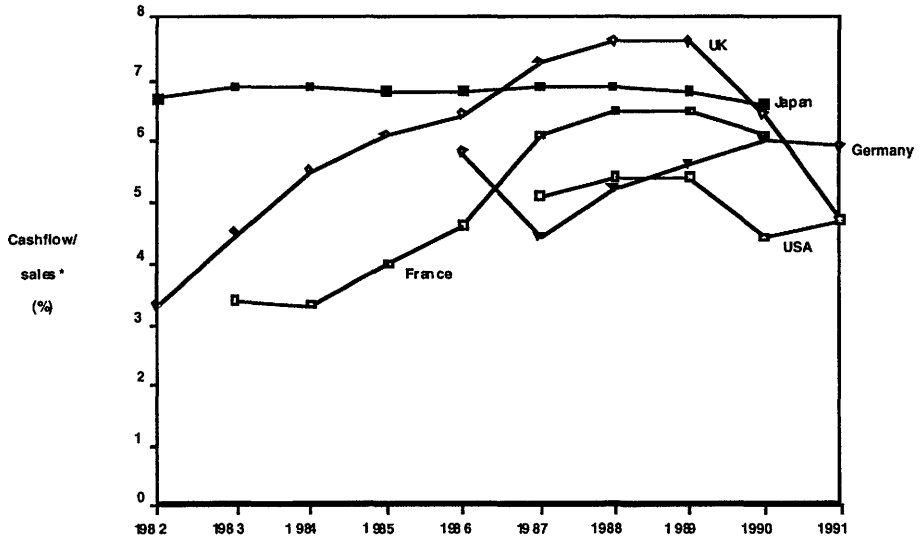


*RONA = $\frac{\text{PBIT}}{\text{Fixed assets + current assets - current liabilities}}$

Source: ICC, SESSI, DAFNE, JAPIA, Value Line

It is important to point out that even though European manufacturers' cash flow as a proportion of sales is approaching Japanese levels, *the Japanese component manufacturers cash flow has been remarkably stable at around 7% of sales.* This is the result of a non-confrontational supply chain management, where prices are set on a "cost-plus"basis and costs managed down every year. This stability of cash flows helps Japanese manufacturers to plan long term investments. A proof that the system is still different in Europe is the fact that as soon as vehicle demand decreases, the cash flow of component manufacturers is affected significantly.

CASHFLOW AS A PROPORTION OF SALES

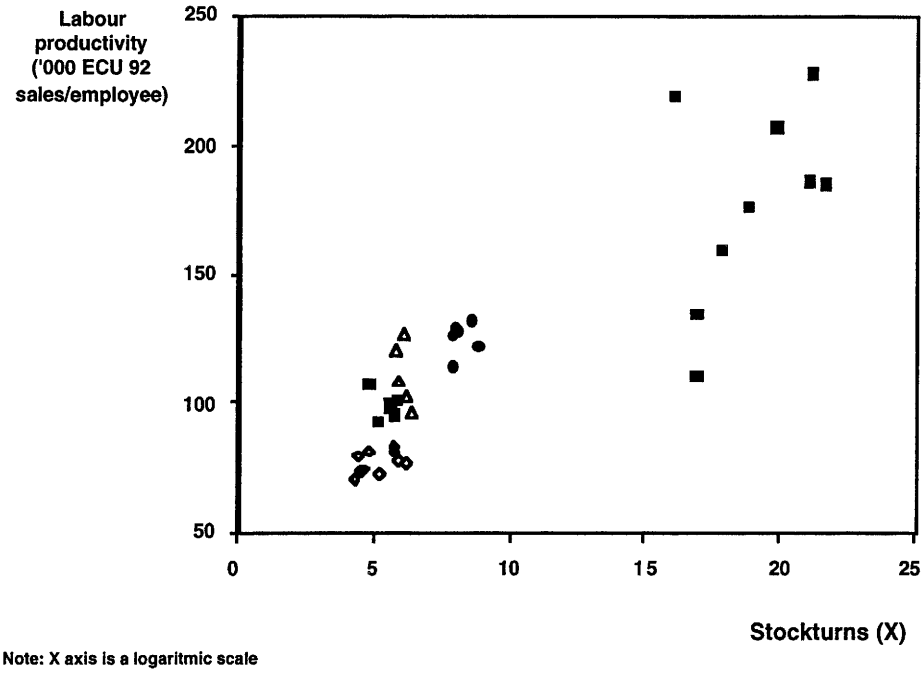


* Cashflow = Profit after tax plus depredation
Source: ICC,FIEV, DAFNE, JAPIA, Value Line

3.1.2. Productivity indicators

Competitiveness was analysed by looking at key overall indicators, such as labour productivity and stock turnover. Both measures are correlated and are key drivers of operational competitiveness. The figure below shows the correlation of both drivers. Japan excels in both dimensions whereas European manufacturers have ratios similar to US companies.

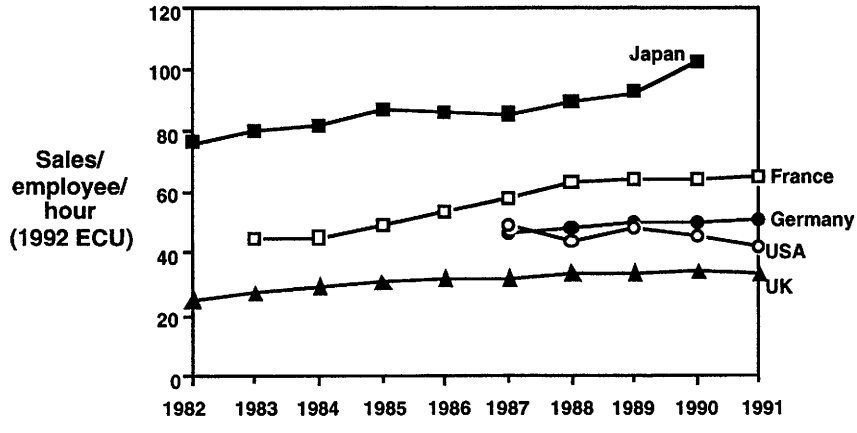
OPERATIONAL EFFECTIVENESS



Note: X axis is a logaritmic scale

Labour productivity measured in terms of sales per employee in Europe appears to be growing slowly in real terms. The Japanese labour productivity, however, has been steadily increasing at a growth rate of 5.6% per annum.

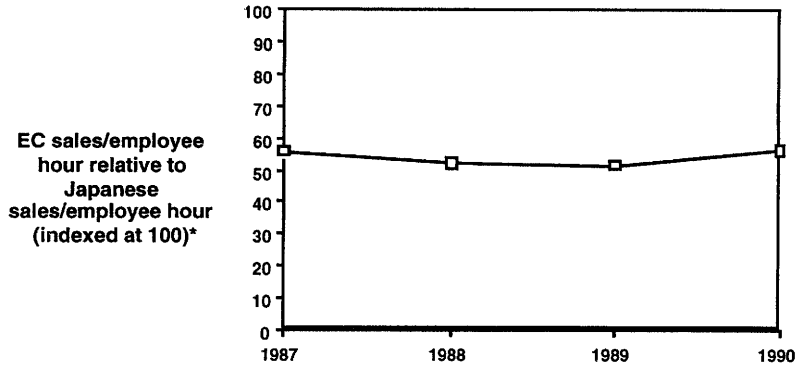
LABOUR PRODUCTIVITY



CAGR (%) 1987-1991	
Japan: (1987-1990)	5.6
France:	2.8
Germany:	2.5
USA:	-3.7
UK:	1.2

Source: ICC, FIEV, DAFNE, JAPIA, Value Line

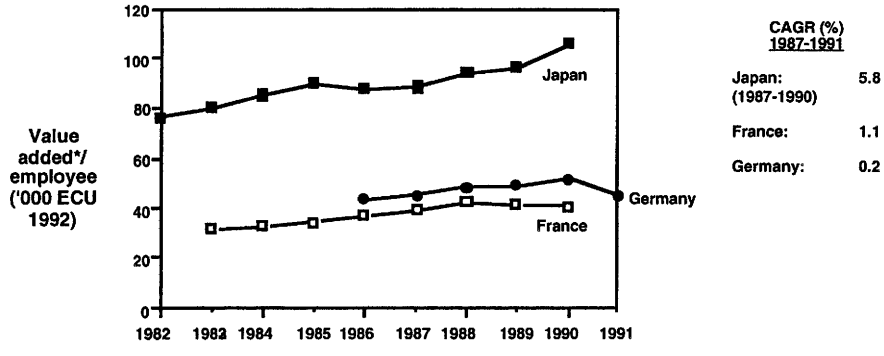
To compare productivity between the various countries it is important to take currency effects into account. This shows that the movements in value of the Yen have limited the ability of Japan to pull away from the EC.



*Calculated by using historical exchange rates in each year

If we analyse **productivity in terms of value added per employee,** the Japanese industry is again seen to be improving faster than the EC. (Value-added data is only available for France and Germany). However, as mentioned before, currency effects have in fact largely compensated for this gap in growth.

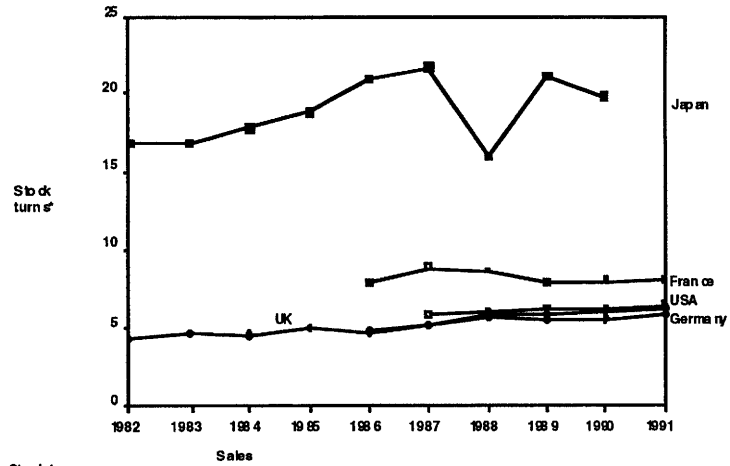
VALUE-ADDED PER EMPLOYEE



*Value added = Sales - purchases
Source: FIEV, DAFNE, JAPIA

On **stock turnover** (sales / materials, work in progress and finished goods stock), another key measure of competitiveness, Japan has successfully maintained its lead but appears no longer to be increasing it. During the 1987-1990 period, average stock turn in Japan has decreased 2.9% CAGR. This may reflect the fact that Japan has reached a "plateau" in its efficiency improvement. It could also be due to the excess of variety of both cars and components, which the Japanese are already cutting back, as we will discuss later.

STOCK TURNS



Stock turns = Sales / (Materials, WIP and finished goods stock)

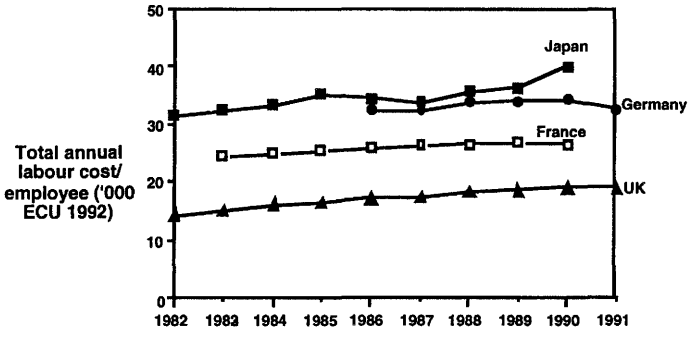
Source: ICC, SESSI, DAFNE, JAPIA, Value Line

Although European component producers have focused efforts in this area and have succeeded in improving stock turns, they are still on average at only 5-7 stock turns compared with nearly 19 turns for Japanese companies. UK and German companies have improved significantly at 4.6% and 3.2% CAGR, respectively. Interviews of larger component companies show that these often have stock turns of around 12-15X. That implies that the average of European companies is affected by the presence of many low performing manufacturers.

Stock turnover is a crucial measure because it reflects the adoption of just-in-time delivery systems and the increasing degree of adoption of lean manufacturing processes.

Labour costs per employee in Europe are lower than in Japan, but there are still important differences across European countries that show little sign of narrowing.

LABOUR COSTS

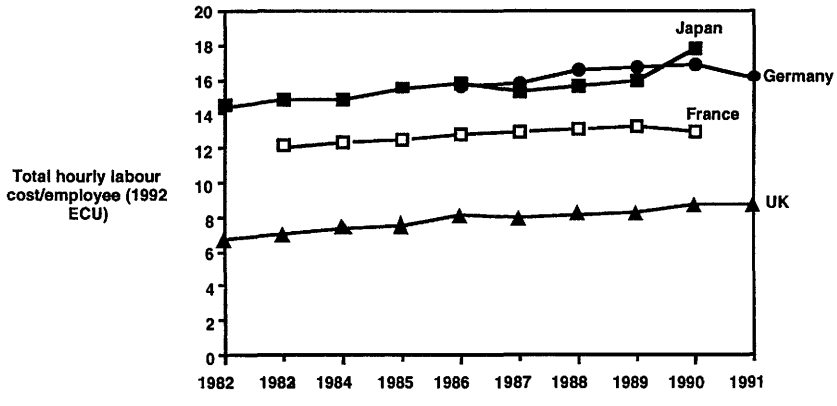


CAGR (%) 1987-1991	
Japan: (1987-1990)	5.3
Germany:	0.3
France:	0.2
UK	2.1

Source: ICC, FIEV, DAFNE, JAPIA

On an *hourly* basis the gap between European countries and Japan is less, with German costs equivalent to those in Japan. The UK industry has the only significantly increasing labour costs among the EC countries, but the levels remain far below those in France and Germany. The Japanese figures may be slightly overstated as the Japanese third tier suppliers reportedly have costs around 1/3 lower than the first tier suppliers, whereas in Europe they are only 20% lower on average. This is another source of competitive advantage for the Japanese industry.

LABOUR COSTS ON AN HOURLY BASIS

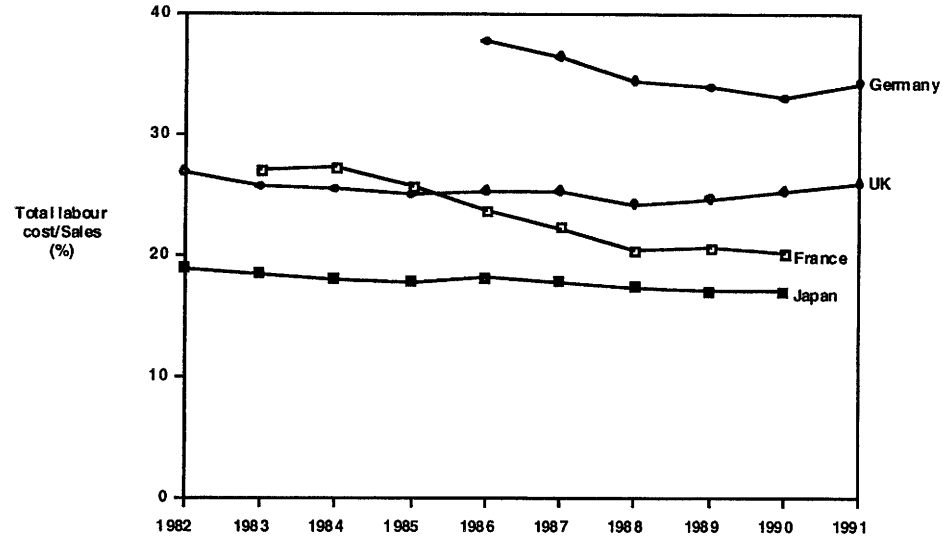


CAGR (%) 1987-1991	
Japan: (1987-1990)	4.5
Germany:	0.7
France:	0.1
UK	2.0

Source: ICC, FIEV, DAFNE, JAPIA

If we analyse labour costs as a percentage of sales, the situation changes completely, reflecting the higher productivity of the Japanese industry and the slightly higher levels of outsourcing. Whereas in Japan the ratio is around 17%, in Germany it is over twice as large at 35%. France has show an impressive improvement over the last five years or so.

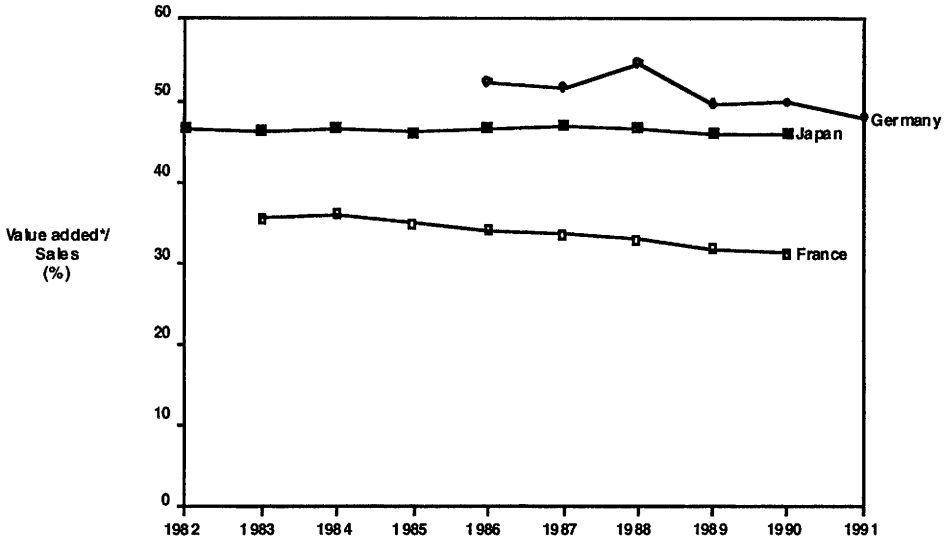
LABOUR COSTS AS A PROPORTION OF SALES



Source: ICC, FIEV, DAFNE, JAPIA

As opposed to the OEMs, the **outsourcing levels** of first tier component producers are quite similar in Japan to those in Europe. The French numbers indicate a high level of outsourcing by the larger component companies.

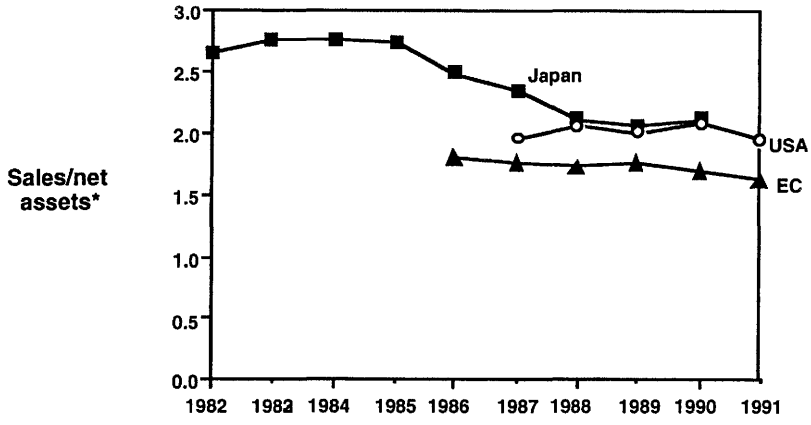
VALUE ADDED AS A% OF SALES



* Value added = Sales - purchases
Source: FIEV, DAFNE, JAPIA

The components industry is in general relatively capital intensive but an important finding is that European asset intensity is high compared to the Japanese and, to a lesser extent, to the US. This reflects the higher stock levels of the European component manufacturers, but also heavy fixed asset investment. The latter is a consequence of high levels of investment in automotion, which have not led to higher productivity levels.

ASSET INTENSITY



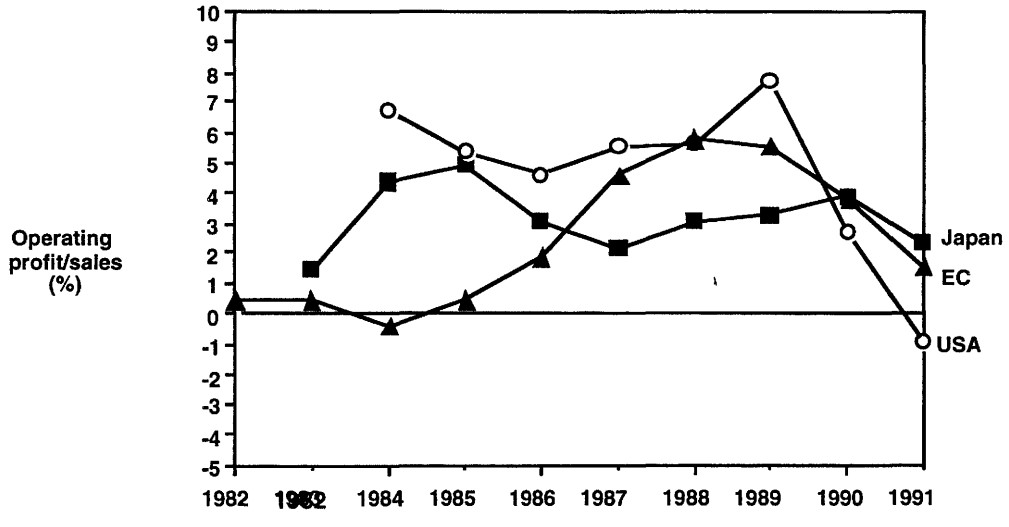
*Net assets = Net fixed assets + current - current liabilities
Source: ICC, SESSI, DAFNE, JAPIA, Value Line

3.2. OEMs

3.2.1. Profitability

Operating margins are low in all countries for vehicle manufacturers. Results have ranged from -3% in the case of UK-based OEMs to 3% in the case of Spanish-based manufacturers. These are the results for the car business only, other operations being removed from the calculations.

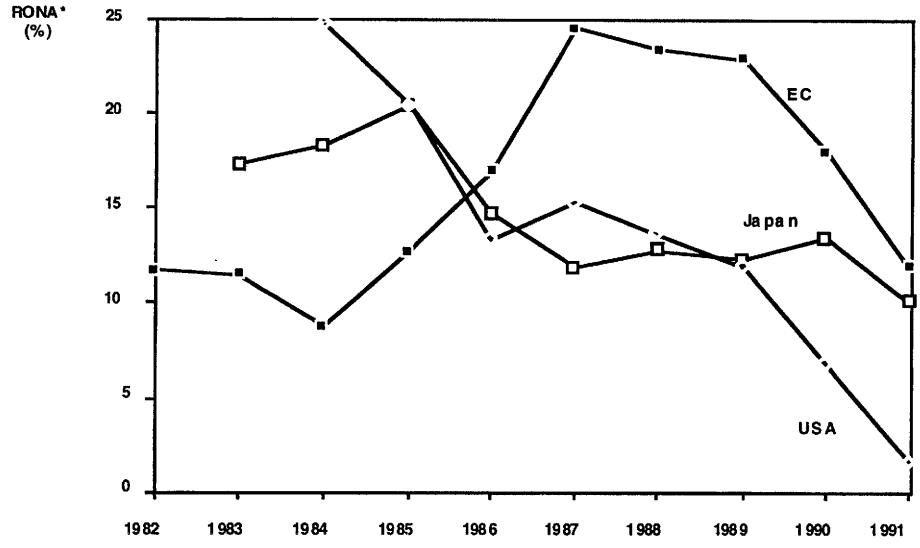
OPERATING PROFIT MARGINS



In all cases the margins have been declining since 1989, showing the crisis affecting the industry, as a result of the drop in demand and overcapacity.

As we saw with component suppliers, the Japanese OEMs profitability ratios have remained remarkably steady during the 1982-1992 period: cash-flow around 6%, RONA around 10%, and ROS around 5%. On the contrary, European OEMs have seen their profitability decline sharply in terms of operating profit (from 7% to -3% in the UK during the period 1988-91), ROS (from 14% to 7% in France, 1987-91) and RONA (from 28% to 20% in Spain, 1987-91). The same is true of US vehicle manufacturers.

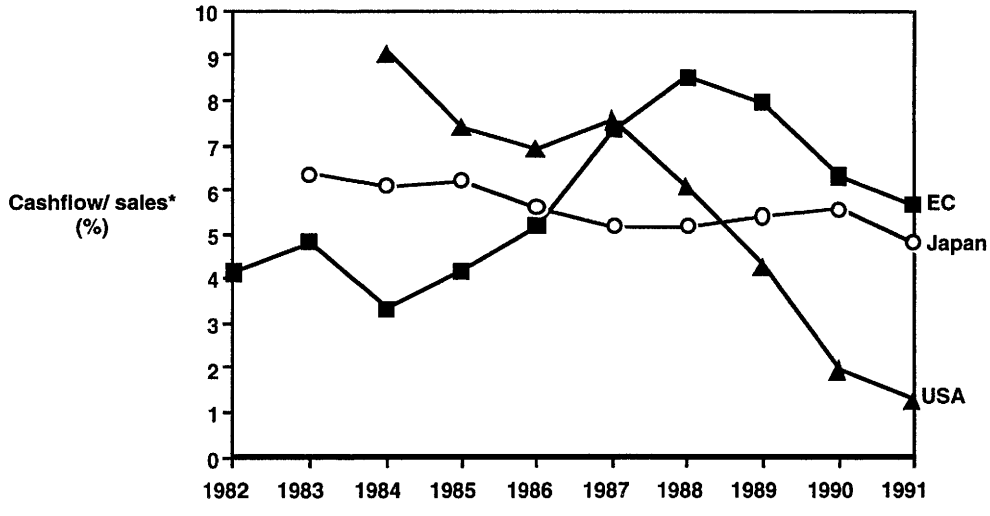
RETURN ON NET ASSETS



Euromotor reports, Japanese Analyst's Handbook, annual reports

In particular, Japanese OEMs' cash flow has remained stable at 6% of sales during the period 1984-91, while their European and American competitors have seen cash flow decline significantly, as the chart below shows.

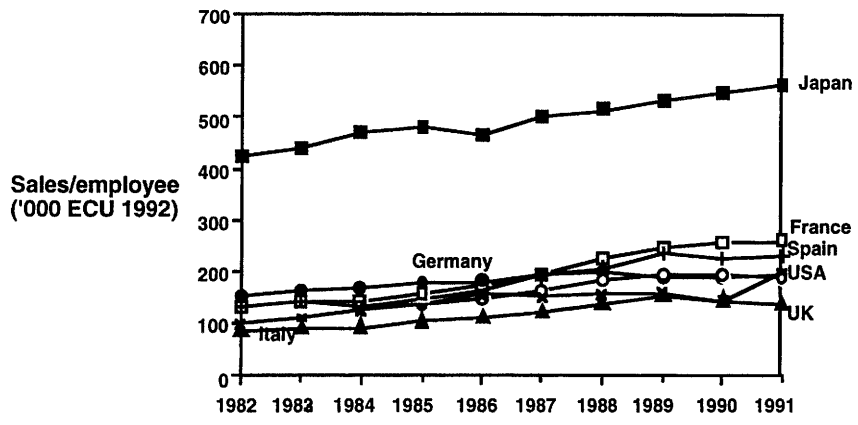
CASH FLOW



3.2.2. Productivity indicators

As stated in the 1991 report, the **productivity** gap of European OEMs compared with their Japanese counterparts is very important. The new analysis shows that the most significant progress in productivity has been made by French vehicle manufacturers, with sales per employee in real terms growing at 7.0% per annum.

SALES/EMPLOYEE

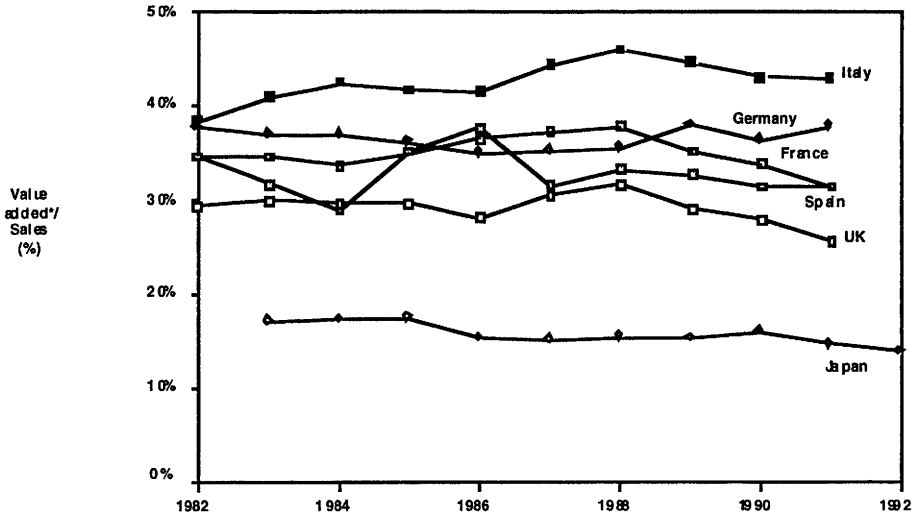


CAGR (%) 1987-1991	
Japan:	3.0
France:	7.0
Spain:	4.8
USA:	3.7
Germany:	0.2
Italy:	-2.2
UK:	2.7

Source: Euromotor Reports, Japanese Analyst's Handbook, Annual Reports

Moreover, sales per employee are higher in Japan than in Europe and the US due to the higher level of subcontracting of the Japanese industry. As we can see in the graph below, European OEM value added as a percentage of sales is significantly higher than Japan's, reflecting lower **outsourcing** to independent component producers. In any case Japan seems to have attained the maximum level of subcontracting possible in this industry, around 85%, although in some specific models (like in the Honda *Today*, sold only in Japan) it can represent up to 90% of the cost of the car.

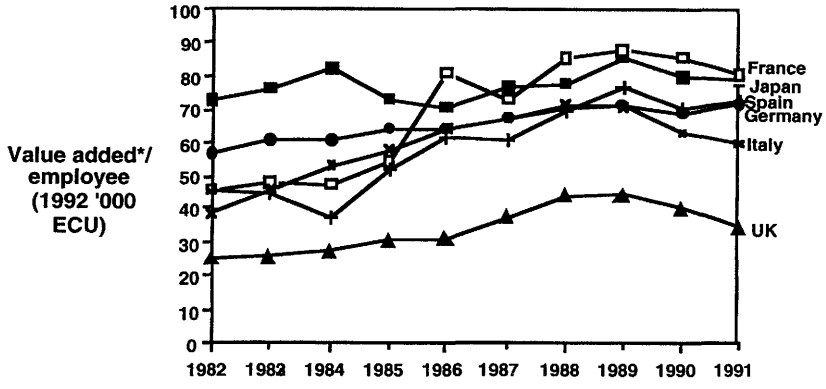
VALUE-ADDED AS % OF SALES



* Value added = Sales - purchases
Source: Euromotor Reports, Japanese Analyst's Handbook, Annual Reports

If we measure productivity in terms of **value added per employee**, then we can see how several European countries, especially France, have attained Japanese levels. The lowest productivities in Europe correspond to Italy and the UK. Spain has experienced the largest improvement, with a 4.6% CAGR in the period 1987-91. This evolution is the result of the efforts carried out by Spanish based OEMs to increase plant automation and reduce the workforce.

VALUE ADDED PER EMPLOYEE

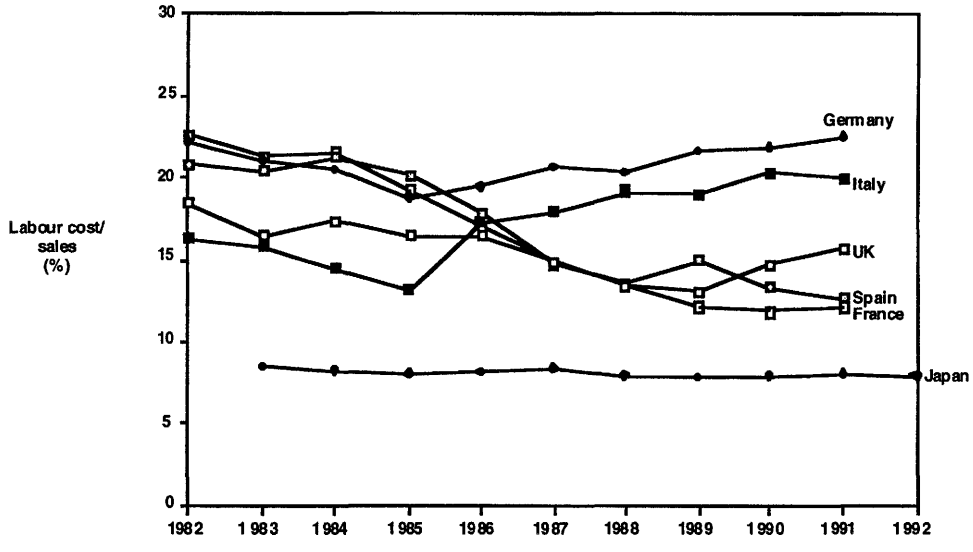


	CAGR (%) 1987-1991
Japan:	0.6
France:	2.6
Spain:	4.6
Germany:	1.8
Italy:	-2.8
UK:	-1.6

*Value added = sales - purchases
Source: Euromotor Reports, Japanese Analyst's Handbook, Annual Reports

Japanese **labour costs** account for a significantly lower proportion of sales than European labour costs (1/2 to 1/3 less), although there is a significant amount of variation within Europe. Spain and France have improved more than manufacturers located in Germany and Italy. Again the figures in Japan have remained nearly constant over the past ten years at 8%, and there is not much competitive leverage to be gained by the Japanese in further productivity increases beyond offsetting increases in real wages.

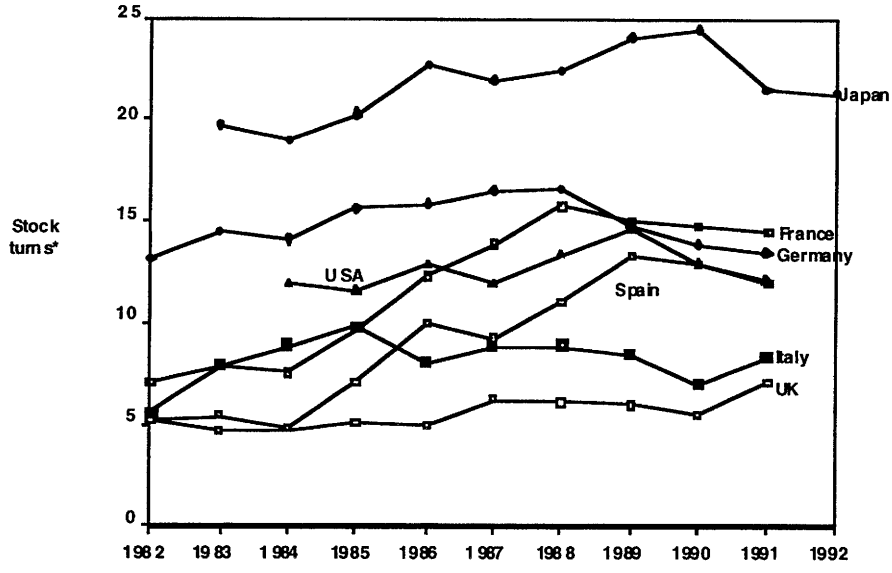
LABOUR COSTS



Source: Euromotor Reports, Japanese Analyst's Handbook, Annual Reports

Stock turns have slightly declined in Japanese OEMs during the period 1987-91 (-0.6% CAGR) leveling at 21x, while from 1983 to 1987 they had grown at a 2.8% CAGR. European producers' stock turns range from 7x in the UK to 14x in France, but are still far from Japanese levels. Once again, Spanish-based manufacturers have obtained the highest improvement, reaching 12x in 1991. This is due to the progressive introduction of JIT techniques by Spanish factories during the period and relatively focused product lines.

STOCK TURNS

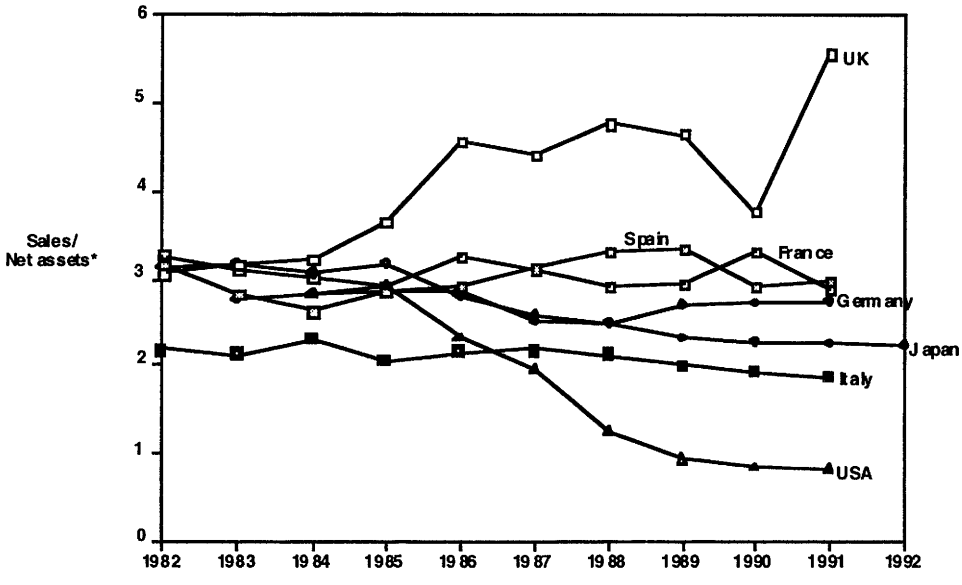


$$\text{* Stock turns} = \frac{\text{Net sales}}{\text{Materials + WIP + finished goods stock}}$$

Source: Euromotor Reports, Japanese Analyst's Handbook, Annual Reports

American and Italian OEMs have a much higher **asset intensity** than the Japanese and other European manufacturers. Efforts to improve productivity by plant automation have not brought the results expected in the USA and Italy.

ASSET INTENSITY



* Net assets = Fixed assets + current assets - current liabilities

Source: Euromotor Reports, Japanese Analyst's Handbook, Annual Reports

3.3. Comparison of OEMs and component suppliers

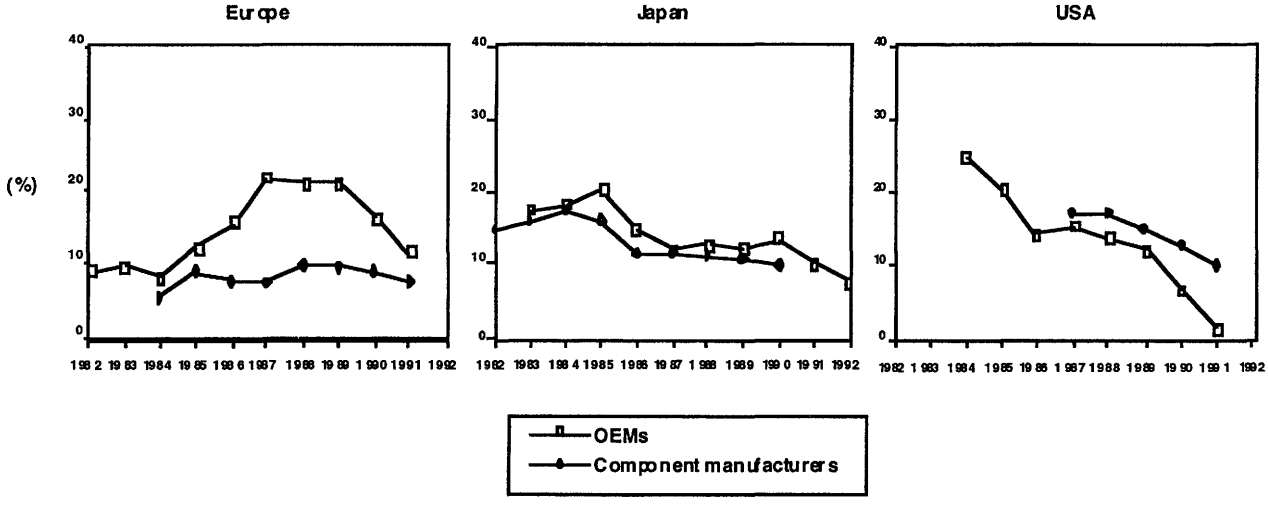
The comparison of the financial performance of both car manufacturers and component suppliers is useful in order to know whether a real optimisation of profitability and productivity is taking place within the whole value chain.

3.3.1. Profitability

The similar financial results of Japanese OEMs and their suppliers in the 1991 report suggest a high degree of cooperation between them. Improvements in performance are pursued together and increases and reductions in profitability over the cycle shared equally.

The updated figures below shows again how in Japan profitability levels between OEMs and suppliers move together, while they are dissimilar in the US and Europe. While RONA of component manufacturers is currently higher than that of OEMs in the US, it is significantly lower in Europe. This might be explained by two factors: the special problems that American OEMs have had with the increasing Japanese presence in their main market, on the one hand, and the traditional confrontational system between European OEMs and component producers, on the other hand.

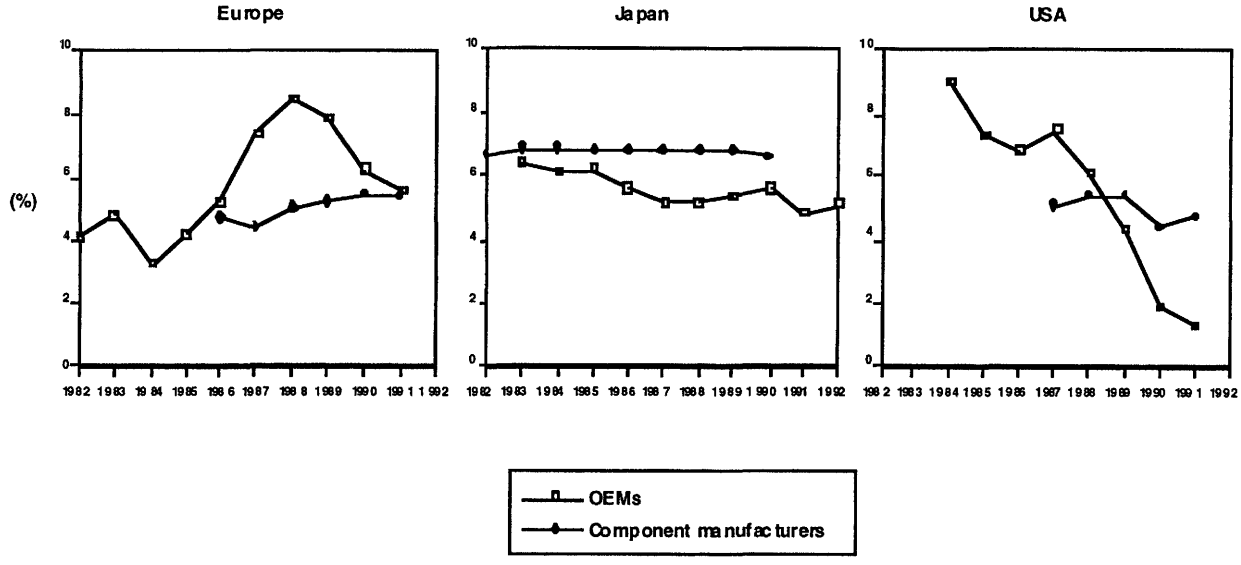
RETURN ON NET ASSETS



In terms of **cash flow**, Japanese component manufacturers and OEMs show a very stable evolution, with ratios of around 6% during the period 1982-90. Since the mid-1980s Japanese OEMs have seen their cash flow decrease somewhat as a consequence of the large investments they made during the 1980s in transplant production in the US and then Europe.

In contrast cash flow in Europe and the US has been very unstable, varying according to the cyclical fluctuations of the car market. Again, the OEMs' cash flow has been traditionally higher than that of component makers, although in recent years the gap seems to have decreased, both in Europe and especially in the US. The recession seems to have hit OEMs harder than component producers.

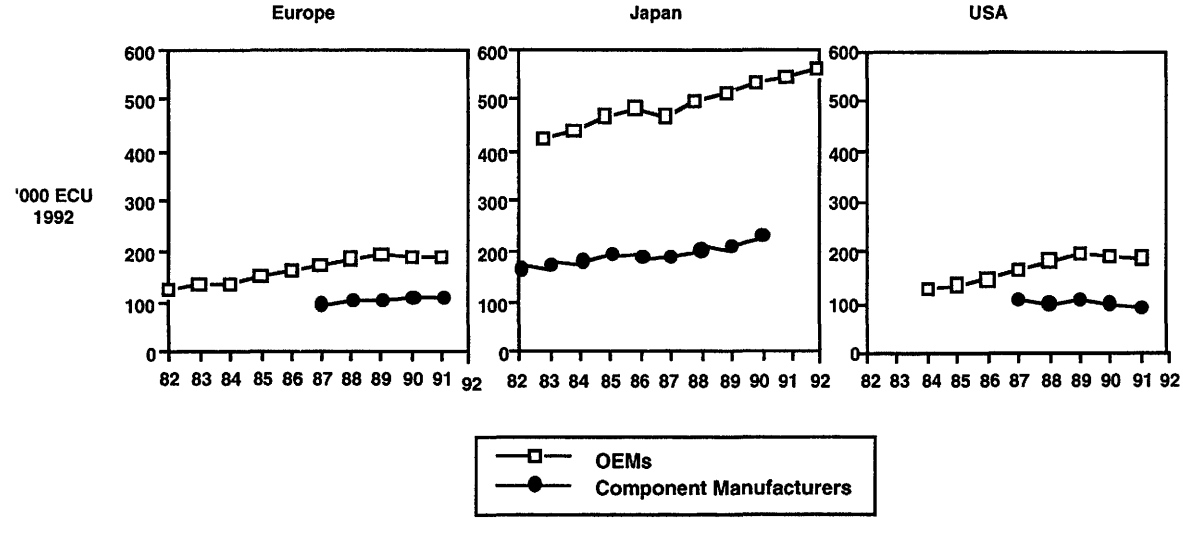
CASHFLOW/SALES (%)



3.3.2. Productivity

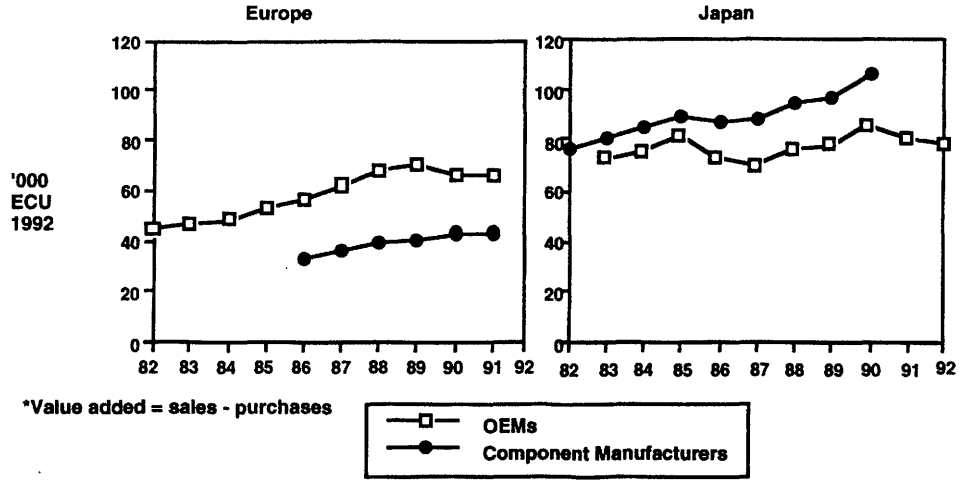
Measured in terms of sales per employee, both OEMs and component manufacturers in Europe show large productivity disadvantages compared to Japan.

SALES/EMPLOYEE



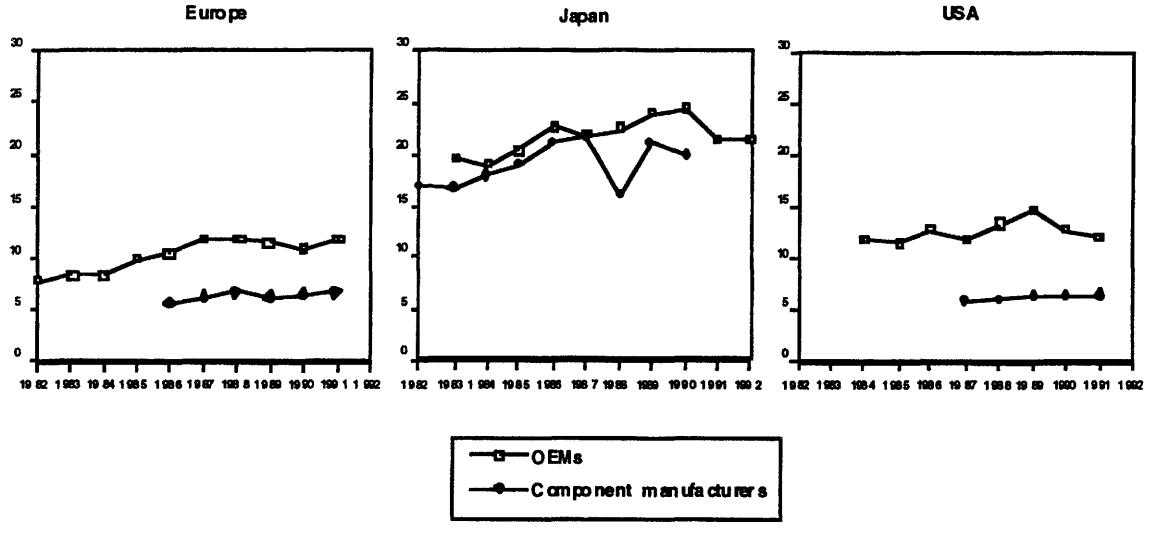
To compare OEMs against component manufacturers, it is better to examine value added per employee (for reasons discussed in 3.2.2.). This shows that **the competitive gap versus the Japanese is significantly greater in components than in OEMs: Japanese productivity is 30% higher in OEMs but around 2.5 times greater in components.**

VALUE ADDED/EMPLOYEE



Comparing **stock turns** performance, two main points must be highlighted. In the first place, Japanese performance is again higher than that in Europe or the US - a logical consequence of the greater implementation of "lean production" and JIT techniques in Japan. Secondly, stock turns of OEMs are significantly higher than those of component producers in Europe and the US, in part reflecting the displacement of stock from OEMs to component producers through the requirement that the latter hold buffer stocks next to the factory.

STOCK TURNS



3.4. Competitiveness

The 1991 study suggested that in order to close the competitive gap between the European automotive industry and the Japanese:

- "It is imperative that European automotive component and vehicle producers effectively adopt modern flexible manufacturing and new product development processes";
- "There is a compelling need for structural change in the components industry ...";

- "... And for fundamental changes in the OEM-supplier relationship towards partnership".

European vehicle manufacturers have in the past three years begun to focus their efforts on improving their competitiveness in costs, quality and time by implementing effective design and development processes and flexible and reliable assembly processes. Therefore, they are following the challenges set by the Japanese industry and have begun to introduce new dimensions in the management of the supply chain like: black box design, JIT processes, and increased outsourcing. Nevertheless, the analysis of productivity and stock turns suggests that improvement is still needed and the gap with Japan remains large.

European component manufacturers lag even further behind Japanese in terms of labour productivity, measured in terms of both sales and value added per employee. This gap is significantly greater than in the OEM industry, where Europe appears to be successfully catching up with Japan. The other key indicator of operational effectiveness, stock turns, demonstrates that the European component industry also lags well behind Japan in the implementation of more advanced production technologies. **In both productivity and stock turns the EC components industry only achieves one-third the Japanese level and this alarming gap has not closed over the last few years.**

While the European automotive industry struggles to catch up along the well established competitive dimensions set by the Japanese, there is increasing evidence that the Japanese automotive industry is rethinking its strategies for the future. This may gradually change the demands placed on the European industry to maintain its competitiveness in the future.

Japanese development and basis of competitive advantage was founded on: product cost and quality, short model cycles and product variety, whereas European advantages were based more on: engineering excellence, brand values and long model lives.

Japanese new product variety reached a peak by 1991. Nissan, for example, had 29 basic models and 2,200 variations of models: the Laurel model was offered with 86 types of steering wheel and 173 types of steering columns, and Mazda offered 4,000 permutations of cars. Toyota had advanced its pace of product innovation to one distinct new vehicle every 10 months.

The "variety wars" of the late 1980s/early 1990s by Japanese producers, particularly in their home market, impeded cost reduction and put pressure on profitability. The Japanese industry went too far in their search for variety assuming that the proliferation of models, features and specifications was a source of competitive advantage. The result has been :

- Excess of product variety, much of which was not valued and, in some cases, resented by the consumer;
- Limited production of common parts between models;
- Extremely rapid new product introduction cycles;
- Overload even on very "lean" and flexible production systems.

As a result Japanese automotive producers have recently announced major changes in their product policies. All the OEMs are aiming to cut the number of **model variations**: Nissan has announced cuts up to 50%, Toyota 30%, Mazda 30%, and Mitsubishi 20%. Another area where cost savings are being sought is by increasing the **commonality of parts** across different models. As a result, Nissan is aiming to cut by 40% the number of parts, Toyota expects a 35-45% cut (e.g. from 11 to 6 varieties of the Corolla model) and Mazda 30% (e.g. 76 less variations in its 929 model car). Finally, the **model cycles** are no longer being shortened, and most producers are stabilising them at around 4 years.

A paradigm shift appears to be taking place in the Japanese automotive industry. Profitability is replacing market share as the key objective. Variety as a strategy weapon is becoming played out. Increasingly faster new product introductions has been driving up costs, has created management complexity and has put strain on the distribution system. At the same time innovation has started to become a commodity not producing meaningful variety of value to the customer.

During the last year or so Japanese OEMs are changing their strategic focus:

- Reducing the number of models and variations;
- Extending product life cycles;
- Increasing parts commonality across models;
- Entering into cooperative agreements with competitors.

All these actions will imply changes in the competitive challenge facing the European automotive industry.

The previously alarming gap in new product development speed between Japan and Europe now look less threatening. The best European automotive producers are reaching the development time of four years that the Japanese now seem to be establishing as their new norm. The rest should reach this goal within a few years. The leading EC component companies are now capable of rapid prototyping together with their OEM customers to meet the new product development cycle needs. Similarly, European vehicle and component manufacturers are catching up in overcoming the **quality** gap, although efforts need to be continued in this area.

On the other hand, **the new Japanese strategies imply increased pressure on costs in the future.** Given the already very reduced levels of value-added of Japanese vehicle assemblers, their efforts will be concentrated on translating the reduced product complexity demands into lower costs through even tighter coordination of the supply chain. *The European components industry, already the weak link in the European automotive industry's cost competitiveness today, will be under even greater pressure in the future.* Unless drastic action is taken soon, the competitive gap in components risks widening even further. Changes in structure, as well as the efforts of the individual companies themselves will play an important role in improving competitiveness.

4. THE CONCENTRATION OF THE INDUSTRY

4.1. Introduction

The concentration of the automotive component sector is one of the main structural changes that the industry is facing. It is the result of two main driving forces:

- The lack of competitiveness of many suppliers in an extremely fragmented industry;
- The changes in the key dimensions of competitiveness among vehicle manufacturers.

The most important changes are being driven by the vehicle manufacturers, in an attempt to improve their competitiveness in an increasingly difficult market and competitive environment. These are reflected in changes in their purchasing policies, namely:

- Increase in outsourcing;

- Single sourcing;
- Purchase of systems;
- Formation of strategic alliances for purchasing.

As a result the number of component suppliers is being reduced and is leading to a different configuration of the industry:

- Higher subsector concentration;
- Tiering of supplier base;
- Changes in the value chain activities performed.

This has implications not only for the structure and competitiveness of the industry but also for the OEM-component supplier relationship. As explained later, the capabilities required by first tier suppliers, second tier suppliers or commodity suppliers will be very different.

4.2. OEM driven changes

4.2.1. Increase in outsourcing:

The degree of outsourcing is critical in reducing management complexity and costs at the OEM level. The 1991 study showed a clear difference between Japanese and European car manufacturers. EC car manufacturers typically had a much higher degree of vertical integration than Japanese, particularly if component divisions and subsidiaries were taken into account.

Based on internal data provided by the companies, BCG estimates were that in 1990, on average, value added as a percentage of sales in European OEMs was 46% without component subsidiaries and 56% including them, while the Japanese OEMs were far less vertically integrated with only 36% of total value added.

During the last three years the situation has clearly changed in Europe and the majority of OEMs have moved along two lines:

- Divesting their component subsidiaries;
- Increasing the level of outsourcing.

Examples of divestitures by OEMs of their component manufacturer subsidiaries are: Rover selling its fuel systems division to the Hobourn Group Ltd, and Llanelli Radiators to Calsonic, Fiat selling its Magnetti-Marelli Brakes subsidiary to Allied-Signal Automotive, PSA Group selling its small electric motors division to the Holding Henri Heulieg and GM selling a majority shareholding of its seat belt and electronic component plant in Belfast to Takata.

The result of this has been that, in 1992 according to the data provided by OEMs, the percentage of the ex-plant value of the vehicle production that is outsourced has significantly augmented ranging from 65% to 84%, the European average being 68%. In all the cases there has been an increase in the outsourcing of at least 5 points, even in the case of OEMs that have followed more restrictive outsourcing policies such as Mercedes Benz. Outsourcing is defined as the proportion of a vehicle's ex-factory value which is accounted for by purchases of components and materials.

The same trend has been followed in the US. GM in the US, for example, has gone from buying over 70% of parts in-house in the early 1980s to 57% by 1992 and has announced further disposals of operations in GM's Automotive Components Group.

4.2.2. Single sourcing:

Whereas in the 1980s all EC vehicle manufacturers tended to use multiple sourcing, single sourcing is now increasingly being implemented for component systems and for the majority of "development components".

The only components where multiple sourcing is still the norm are "commodity components". These include components like standard rubber tubes, nuts, bolts, fasteners, springs and other low value items that have the following characteristics:

- They are not jointly developed under a "black-box design";
- They are unbranded;
- They do not affect the safety of the vehicle;
- Investment in tools and equipment is reduced.

The objective of multiple sourcing, where several suppliers offer the same component per model, is to obtain cost efficiency through the direct competition of suppliers. The main drawbacks of it are smaller production series, more complicated logistics and higher administrative costs.

Single sourcing, as implemented in Europe, consists in having one component supplier per model. Although, in the case of seats, single sourcing implies one supplier per assembly plant. However, there are normally different manufacturers supplying the same type of component to different vehicle models of the OEM. The objective is to obtain cost efficiency through greater volume, target costs and prices agreed jointly and early involvement of the supplier in design.

Many Japanese OEMs have gone one step further and are applying the single sourcing concept to a family of products and for all the models of the OEM, thus creating a complete partnership between the OEM and its component supplier. The major drawback of such a complete single sourcing is the risk of depending on one supplier. For this reason, it is unlikely that many European OEMs will emulate the Japanese practice.

The interviews indicate most European OEMs intend to implement single sourcing for key components over the next few years, although different suppliers will coexist for the same component used in different vehicle models. From the point of view of the supplier this will imply a deeper relationship, a greater volume per component and a higher and earlier involvement in the design phase. From the point of view of the OEM this will imply the possibility of continuously reducing costs by working closely with a reduced number of suppliers. Nevertheless, some component suppliers claim that as a result of the implementation of single sourcing, competition between suppliers has become more fierce, thus eroding the margins.

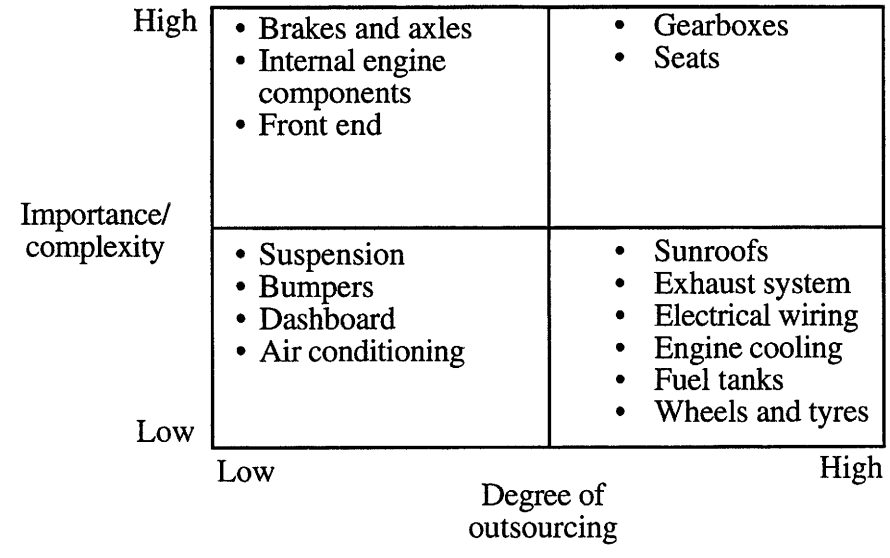
4.2.3. Systems purchasing:

The purchase of complete systems or subsystems, rather than large numbers of individual components for final assembly by the OEM, is the characteristic pattern in the Japanese industry. BCG's interviews indicate that European OEMs are now beginning to move in this direction as well. The rationale behind this is to reduce the costs associated with complex management of purchasing and assembly of a series of components. This is also a consequence of the implementation of black-box design of systems by the component system supplier.

The most common systems or subsystems being outsourced by EC OEMs include:

- Fuel system: Fuel tank;
- Wheels system: Wheels and tyres;
- Interior equipment and trim systems:
  - Seats and seat adjusting systems;
  - dashboard and instruments clusters;
- Air conditioning system;
- Body and external parts systems:
  - Front end;
  - doors (panels, window power system, mirror and wiring);
  - bumpers;
  - sun roof;
- Suspension system: Shock-absorbers and springs;
- Brakes and axles system: Drums, discs servo unit and axles;
- Transmission system: Gearbox;
- Exhaust system: Exhaust pipe, silencer and catalyst;
- Engine systems:
  - engine management (ignition + injection);
  - engine internal components (piston and connecting rod);
  - engine cooling system;
  - electrical wiring.

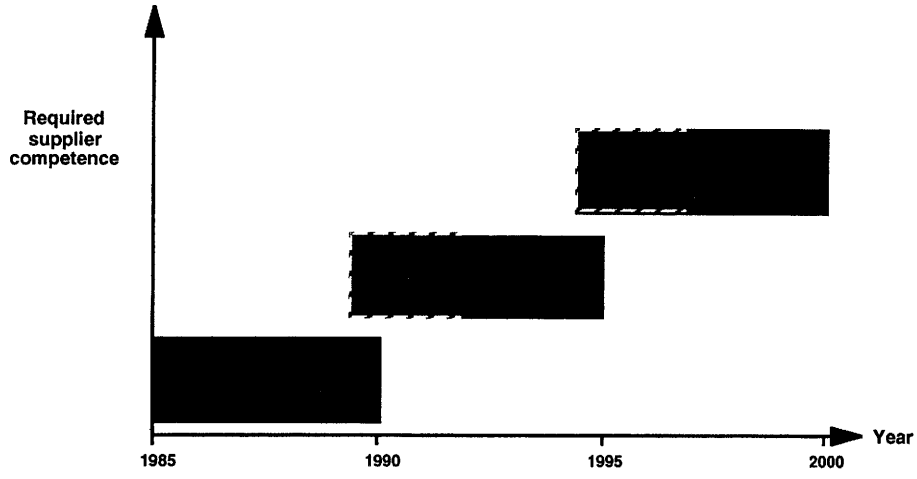
The implementation of systems purchasing varies between different OEMs as they have various degrees of confidence with the concept and also because of their different make vs buy policies. According to the interviews with European vehicle manufacturers, the different systems or subsystems/subassemblies can be ranked according to various levels of outsourcing:



Although all OEMs intend to move towards greater systems purchasing, the implementation of the concept varies significantly. The degree of implementation depends in many cases on the design phase and is obviously greater in the case of new models.

Although the trend is clear with wide acceptance in the industry, it is still at a very early stage, well behind the Japanese situation. As discussed later, the capabilities to be developed as a first tier supplier of systems represent a significant change from the current situation. The speed of the full tiering process is limited by the willingness of OEMs to outsource the complete system or parts of them.

SUPPLIERS' DEVELOPMENT FOCUS



Therefore we view the evolution in three steps as shown in the figure above. In the first phase first tier suppliers have been focusing on enhancing their subsystems: building of competence through developing more sophisticated solutions and expanding their international presence in order to maintain global competitiveness in the subsystem.

The second phase that has already started is based on the assembly logic that is shifting the limits of subsystems. There will be an increasing tendency to supply units which are ready for assembly . Suppliers of enhanced subsystems will have to build up material, process and assembly know-how as well as corresponding manufacturing and assembly capacities. Examples of areas moving in this direction are : a) preassembly of complete shock absorbing legs (springs/shock absorbers) including suspension parts and brake disks (Delco), b) preassembly of complete axles and suspensions including steering parts (Benteler), c) preassembly of brakes including wheel suspension (Teves).

The third phase will consist in the co-development of enhanced subsystems or complete system under the leadership of one supplier that will imply a greater horizontal integration between suppliers in order to be able to design, manufacture, assemble and deliver the systems in the most efficient ways.

There are several big European component groups that are moving in this direction such as: Mannesmann AG, who have recently integrated their automotive division Fichtel & Sachs; Boye AG; VDO Adolf Schindling AG; Mannesmann Kienzle; Rexroth; and Hartmann Braun, or like ITT, which is restructuring its European operations, merging Alfred Teves, SWF, De Konig, WIVO, and ITT Bergenstadt, in order to improve synergies and transfer of capabilities.

4.2.4. Strategic alliances for purchasing:

Another trend followed by vehicle manufacturers, that has an impact in the automotive components industry, is the establishment by OEMs of strategic alliances for purchasing. The rational of these strategic alliances is to reduce the cost of components by purchasing from common suppliers in larger quantities. It also reduces the size and costs of the purchasing

departments. Examples of such alliances are the constitution of Sogedac by Citroën and Peugeot in 1980, and the alliances between GM Europe and Saab in 1989, and Renault and Volvo in 1993. These two OEMs, for example, have plans to have at least 80% of their suppliers in common.

These alliances may be the first step towards a deeper collaboration in the design of new cars, more common components, and increasing sourcing of complete vehicles from other producers. These kind of cooperative agreements were rare in Japan until recently when a number of agreements have been announced:

- Honda-Isuzu: Isuzu withdrawing from passenger car production will source from Honda, and Honda will buy certain LCVs from Isuzu;
- Nissan-Mazda: They will swap vans/LCV to cut development costs;
- Mazda-Isuzu: Agreement to share large components;
- Nissan-Toyota: Nissan will buy components from Aisan, an affiliated supplier partly owned by Toyota. The scope of the agreement involves even engine components like pumps.

Examples of recent agreements involving European OEMs are:

- VW-Renault-Opel: Agreement to buy gearboxes supplied by VW;
- Peugeot-Fiat: Agreement to exchange engines;
- Renault-Peugeot-Volvo: Joint production of engines;
- Ford-Volkswagen: Agreement to manufacture a monospace vehicle in Portugal;
- Seat-Suzuki: Agreement to design a small car in Spain.

The impact of these agreements on the automotive components industry will be to increase the pressures for concentration.

4.3. Impact on the components suppliers industry

All these changes in the OEMs industry are driving a restructuring of the supplier base in Europe. This is leading towards a reduction both in the number of direct suppliers to the automotive industry and in the total number of suppliers.

4.3.1. Subsector concentration

The 1991 study showed that the European component industry was relatively fragmented and composed mainly by medium and small companies: only 150 companies out of around 3,200, had more than 1,000 employees, and 55% of the turnover was accounted for by 25 groups.

The number of component companies operating in the different subsectors is decreasing as the concentration process continues. This process is a result of three simultaneous forces that are facilitating the attainment of the necessary critical mass of component supplier size:

- The acquisition of medium size companies, normally country leaders, by big European or US based multinationals or Japanese transplants;

- The integration (merger or joint-venture) of various small or medium size companies operating normally in the same country;

- The exit from the sector of low performing companies with no survival prospects, and of companies with low percentages of their sales in the automotive sector.

During the 1987-92 period around 350 mergers and acquisitions have taken place in the automotive components industry in Europe reinforcing the weight of the major groups. Around 70% of these have taken place between companies in different countries, thus reflecting the europeanisation of the industry as will be discussed later. Around 35 of these acquisitions in Europe have been made by Japanese manufacturers. The countries where the Japanese have been more active are the UK and Spain, countries where the Japanese OEMs are located.

In some subsectors the concentration is leading to a very reduced number of main players: 2 in carburettors (Weber-Solex and Pierburg), 2 in dashboards (Magneti-Marelli and VDO-Mannesmann), 2 in sun roofs (Rockwell and Webasto), 3 in rear mirrors (Hohe, Britax-Geco, and Gilardini), 3 in brakes (Bendix, Teves, Lucas-Girling), 3 in injection systems (Bosch, Marelli, GM), 3 in seats (Epéda-Bertrand Faure, Johnson Controls, Kaiper/Recarro), 4 in clutches (Look, Valeo, Fichtel und Sachs, and Automotive Products), 4 in glasses (St. Gobain, Pilkington, SIV and ASAMI), 5 in pistons (KS, Mahle, T&N, Nural, and Tarabusi)...

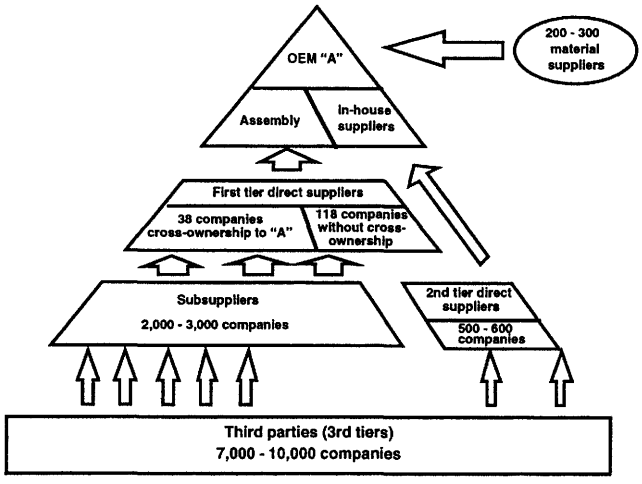
Even in subsectors such as the production of electrical wiring, where 11 manufacturers coexist, the financial difficulties (9 are losing money) of most of them will lead to increased concentration (7 are reportedly for sale). Another example of recent subsector concentration is in engine management systems. In 1989 there were 9 suppliers of which 3 were affiliated with major OEMs. Four years later there are only 4 suppliers - the rest have either abandoned the sector or have sold out to other companies, for example the Valeo operations who have been bought by SAGEM.

The limit to this concentration process will be set by OEMs which are not interested in a higher concentration of components suppliers as this will shift the negotiating power within the value chain. An example of this was the opposition of OEMs to the Epeda-Bertrand Faure acquisition offer by Valeo in 1988.

4.3.2. Tiering of the industry

The change from components to systems purchasing and the increased level of outsourcing are now forcing the tiering of the European automotive components industry. This tiering process is still in its early phase in Europe, but we believe that the process will continue and as a result the European industry will look more like the Japanese model by the end of the decade. In the figure below we show the supplier base for a typical Japanese OEM. The number of suppliers in each tier is very similar to what European vehicle manufacturers think will be the final outcome. For every first tier supplier there will be approximately 10 second tier suppliers and for every second tier supplier there will be another roughly 10 third tier suppliers.

THE TIERING OF THE JAPANESE SUPPLIER INDUSTRY



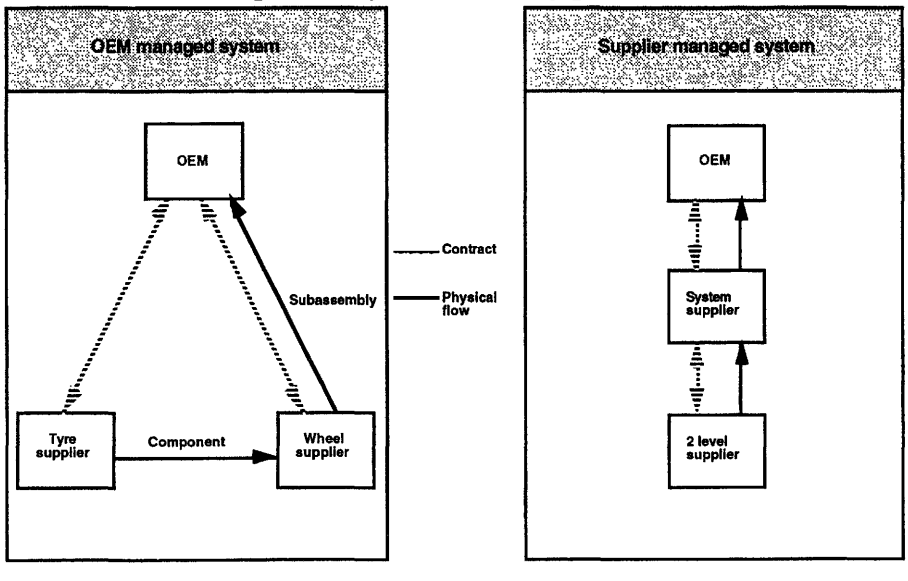
Source: Small and Medium Enterprise Agency

Two different models for managing the chain are coexisting in Europe:

- OEM managed system;
- Supplier managed system.

The OEM managed system normally represents the first phase in the tiering process. Under this model the OEM purchases the different components that constitute the system from different suppliers, but asks one of them to assemble the different parts and deliver the system to the OEM. This is a simple way to purchase systems and it is normally applied where there is not joint development. The assembly of the system is made by the supplier more conveniently located, who has the appropriate technology or the lowest costs. An example of this model is the tyre and wheel system that is normally purchased this way.

The supplier managed system constitutes one step beyond in the tiering process. Under this model the OEM contracts the whole system or subsystem with one supplier (first tier) who in turn contracts with second tier suppliers the different parts of the system. This model is used mainly with systems that are jointly developed under a black-box design by the OEM and the first tier supplier. The first tier supplier is normally the one that needs to be more closely involved in the design phase, who has more importance in the cost structure or has higher quality requirements. An example of a system normally purchased under this model is seats.



Some OEMs are adopting this approach using a two-step model. They manage the process directly in the first phase and then transfer gradually the full responsibility to the first-tier supplier.

4.3.3. Changes in the value chain activities performed

The same trends and changes introduced by OEMs in relation with their first tier suppliers are being implemented by these in relation to the rest of the value chain. More specifically first tier suppliers are in general terms:

- Outsourcing the less critical activities;
- Reducing the number of suppliers;
- Increasing the europeanisation of their purchasing activities.

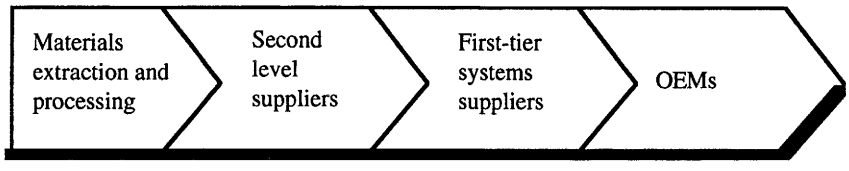
From the interviews, these trends are more apparent in the case of the biggest first tier component suppliers whereas smaller firms are less inclined to implement them. Their smaller size and the current recession create a strong pressure against higher levels of outsourcing at present.

Several first tier system suppliers interviewed claim to have reduced the number of direct suppliers by around 30% and have plans to reduce by another 30% over the next three years. In some specific cases suppliers have been reduced by two-thirds for some product groups.

At the same time first-tier suppliers have increased their level of outsourcing on average by 50%. Some of them have reached outsourcing levels very close to the ones in the OEM industry: around 55%. As one component supplier put it: "in order to improve our competitiveness we need to apply to our suppliers the same principles OEMs are applying to us".

As shown in the figure below the tiering of the industry is creating several layers of companies with very different structural and capabilities characteristics.

SYSTEM SUPPLIERS WILL BE CRITICAL IN THE TIERING PROCESS



Design capabilities:	Variable	Necessary	Critical	Focused on engines and core competences
Geographical scope:	Regional/ global	Local	Regional/global	Global/regional
Plant locations drivers:	Raw materials or scale	Economies of scale	Logistics optimisation	Cost optimisation
Integration with OEM:	None	Low	High	--
Investments:	Variable	Moderate	High	High
Dependence on automotive industry:	Reduced	Important	High	High

The figure on the next page describes more specifically in the case of automotive seats systems, the changes that are taking place in the distribution of competences between the different players in the industry:

4.4. Direct suppliers reduction:

As a result of the above described trends in the OEMs and the consequent impact on the component suppliers industry, there has been an important decrease in the number of direct suppliers to OEMs.

In the 1991 study it was highlighted that the Japanese assemblers had a much smaller number of direct suppliers: between 160 and 300 suppliers vs. 800-2000 for European OEMs. The advantage of a lower number of direct suppliers is in the simplification of management and coordination, the costs benefits derived from larger scale, the participation of the supplier in design and the possibility of a deeper relationship with the remaining ones.

Since 1990, nearly all European vehicle manufacturers have reduced the number of direct suppliers, between 40 and 80% in the case of OEMs that have centralised their purchases, and all of them claim to have set more ambitious goals over the next several years. According to the interviews the objective will be to have around 150-300 direct suppliers by model by around 1997, which will be in line with Japanese practice. The total number of suppliers by OEM will be higher as there will be some holdovers for old models.

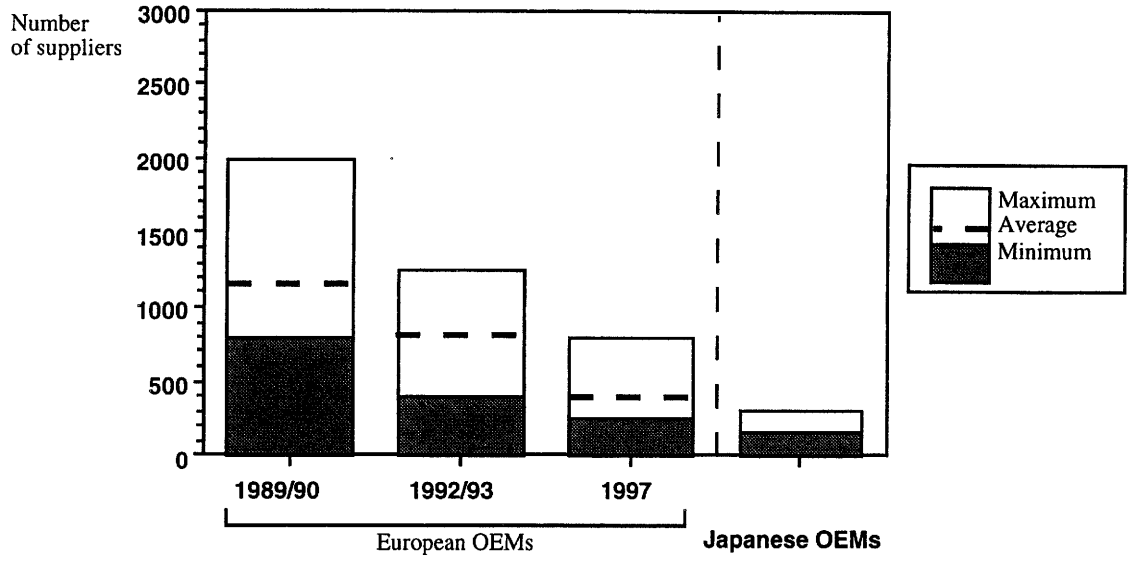
This reduction in the number of direct suppliers has been greater than that which OEMs were considering when interviewed during the 1991 study, showing a clear change in the beliefs of the industry and a willingness to adopt a system much closer to the Japanese one.

In some very specific cases there has been an increase in the total numbers of suppliers during this period due to a change in the mix of models manufactured that has caused a temporary coexistence of the suppliers of the old and new models.

In all the cases the new models recently developed are designed to require less suppliers. According to the figures of one OEM, the number of suppliers per model used to be around 600-800 and has decreased to around 170-140 in the 1993-1994 models. Another OEM mentioned a 35% reduction of the number of suppliers going directly to the assembly line between the last two models they have launched.

The historic and planned reduction of direct suppliers to the OEMs, compared to the Japanese, is shown below:

DIRECT SUPPLIERS TO OEMs



US auto companies' number of suppliers has also been steadily decreasing. Ford, for example, has reduced its worldwide supplier base by more than half since 1980 and has plans to pare 1992 supplier level by one third by 1995. Chrysler, who had around 2,500 suppliers in 1992 expects to use less than 1,000 suppliers by 1995 and around 750 by the end of the 1990s. Nevertheless, this number of suppliers is still high compared with Japanese levels.

The greater level of concentration of component suppliers with direct contacts with the vehicle manufacturers does not necessarily imply a radical reduction in the number of independent component producers. Many are surviving as second or third tier suppliers to the component companies producing complete systems or subsystems.

Estimates from OEM purchasing managers indicate that 60-70% of the suppliers that are no longer direct suppliers have become second-tier, and the rest have gone out of business or are no longer supplying to the automotive sector. The same process has happened in the US, where the industry associations expect the number of first-tier suppliers to fall 20% from 1991 to 1996, and an even higher percentage in the case of second and third-tier suppliers.

We expect this process to continue in the future, probably at a faster pace. On the one hand, OEMs are continuing to reduce drastically their number of direct suppliers, and on the other hand, the precarious financial situation of the smaller and less efficient suppliers will force many of them to abandon the sector altogether.

5. THE EUROPEANISATION OF THE INDUSTRY

Another structural change that vehicle manufacturers are forcing directly is the europeanisation of the components suppliers. This process has three main drivers:

- Increasing centralisation of vehicle design in one location at European level;
- Increasing trend towards more centralisation at European level of the purchasing decision making;
- The outsourcing of the final assembly of systems.

As a result, component suppliers are more and more forced to adopt a European strategy in terms of design, logistics, commercial activities, and manufacturing and assembling. Therefore Europe becomes the relevant market, instead of the different countries where the OEM and component suppliers are located.

5.1. Design europeanisation

OEMs have been rationalising their design facilities and capabilities by concentrating at European level their design centres in one specific country. Apart from Ford Europe who still has its design centres in two countries: the UK and Germany, the rest of the OEM design centres are centralised in one country and in many cases in just one location. The rationale behind this is the need to be more efficient in vehicle design. The co-location of all the functions involved in the design of the car in one single facility is a key factor for reducing the new product development (NPD) cycle time.

OEMs VEHICLE DESIGN IS CENTRALIZED

Company	Countries	
	Design centre	Plants
Peugeot	France	F, E, UK
Renault	France	F, E, P, B
Citroën	France	F, E, P
Ford	Germany, UK	D, E, P, B, UK
GM	Germany	D, E, B, UK
VW-Audi	Germany	D, E, P, B
BMW	Germany	D
Mercedes	Germany	D, E
Fiat	Italy	I

Consequently components suppliers are moving towards the "co-location", in a broad sense, of their R&D and design next to the OEMs design centers. The tendency towards black-box design and simultaneous engineering reinforces the need for "co-location".

From this point of view, all major European and US OEMs are trying to reduce their NPD cycle times significantly. The new Opel Corsa has been developed in 36 months, containing 30% fewer parts than its predecessor. The Chrysler Neon has been developed in 42 months, thanks to a partnership agreement with 25 main suppliers, with a 70% level of outsourcing. Renault has designed and launched its Twingo model in 33 months. Rover expects a new product development time of 24 months for its new model to be launched by 1995 compared to 27 months for its Rover 600. This fast development time has been possible in part due to the maximum use of standard components besides adapting their NPD to Honda techniques.

This can take different forms, from simply a deeper relationship in the design of new vehicles and their components, to the physical co-location of their design facilities in the client's premises. These can be summarised in:

- Technical collaboration;
- Exchange of engineers for special projects;
- "Liaison", "guest" or "resident" engineers;

- Joint teams for R&D;
- R&D facilities near OEM design center or in logistically convenient places;
- R&D center within design OEM premises.

These forms are used in different ways by the different component manufacturers, depending on the kind of supplier they are and the design phase of the new product. Normally the simpler collaboration mechanisms are used by part manufacturers, whereas the more complex are used by system suppliers where the need for joint R&D is vital for the efficiency of the design.

When first tier component suppliers have various clients as is usually the case, they tend to have centralised R&D centres but they co-locate development teams nearby or within their different OEM customers for prototype development.

5.2. Purchasing europeanisation

As in design, purchasing decisions will be taken increasingly at the European level, even in cases where the OEM has assembly locations in different countries. In a way this is a consequence of both the centralisation of design and the increasing adoption of "black-box" design procedures. Purchasing really starts when the vehicle is being designed and is no longer an independent process.

Another reason for centralisation of purchasing is the need to become more efficient in the major part of the vehicle cost structure, that of purchased components and materials. The centralisation allows a better control of suppliers, a reduction in their numbers, greater volumes per supplier and thus more leverage over prices, and the possibility of buying from the least cost suppliers regardless of country.

Even though the europeanisation trend is clear, four different models coexist:

- Decentralisation;
- Coordinated decentralisation;
- Centralised decision-making;
- Central purchasing.

The decentralised model that was widely used in the 1980s is based on the total autonomy of each country subsidiary or plant to purchase the required components if they meet the product specifications defined by the engineering department. Some OEMs even had several design centres in different countries, which developed different versions of the same model, each of them with different components required, which then had to be bought locally. As a consequence, each subsidiary had its own purchasing organization. There was limited information sharing between the different purchasing organisations in order to optimise their procurement decisions.

The coordinated decentralisation model is a response to the need to coordinate the purchase of components from the same supplier by different country organisations. The model is based on major autonomy of the country subsidiaries under general guidelines or procedures issued at European corporate level. The different country purchasing organisations coexist under this model.

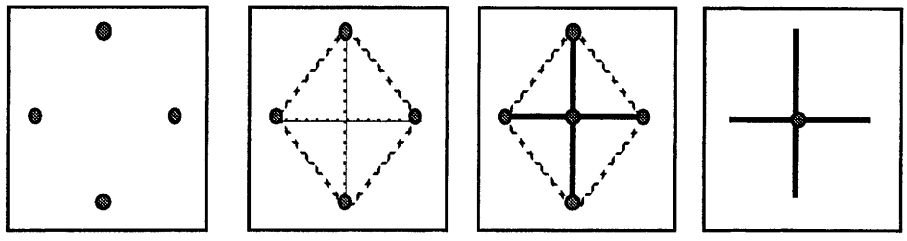
In many cases the model implies the nomination of "lead buyers" at European level for selected components. Normally these are the components bought from the same legal entity or the same company but with different legal entities (this is normal in the case of big

conglomerates or component manufacturers with subsidiaries in different countries). In other cases lead buyers are implemented for critical components (e.g. safety related or high cost) where there is a need for centralised buying. Examples of OEMs that have implemented this approach are Seat and Nissan.

The centralised decision-making model is an evolution of the previous one whose main characteristic is that the decisions are taken at European level either by a committee where the different purchasing organisations are represented or by a central staff. Despite the centralisation of the decision-making there is an operative decentralisation at country level for supplier screening and evaluation, and day-to-day contacts with suppliers. Examples of OEMs that have implemented this model are GM and the PSA Group through Sogedac.

Finally there is the central purchasing model in which the purchasing organisations are basically centralised at both decision-making and operations levels. Examples of this model are Ford and Renault.

DIFFERENT MODELS OF PURCHASING ORGANISATIONS



Decentralised | **Coordinated decentra-lisation** | **Centralized decision-making** | **Central purchasing**

The final outcome of the evolution probably will be a mixture of the last two models. The advantage of the centralised decision making model for the component suppliers is that it allows a higher geographical dispersion of the component suppliers as the operative decentralisation facilitates a better knowledge and continuous screening of suppliers not located in the country where the purchasing decisions are taken.

In response to the previous OEM trend, component suppliers are setting up commercial organisations that match the OEMs purchasing organisations in order to establish a closer relationship. In the case of component suppliers based in only one country, the normal outcome is to create a European wide commercial organisation that covers the countries where OEM decision making is based. In the case of multinational component suppliers, that is with different companies or plants across Europe, this is more complicated.

Japanese component manufacturer transplants tend to use a common model. They set up a commercial organisation independent of their manufacturing structure that manages the relationship with OEM and provides the products from the most appropriate plant. This commercial organisation can be unique for all Europe like in the case of Nippondenso, or can be composed of several legal entities. For example, the Japanese transplant NSK has two commercial companies: one in Spain and another one in the UK. NSK UK centralises and coordinates all the relationship with Nissan UK even though the products may come from the Spanish plant. Another characteristic of the Japanese is the "window man" figure. This is a client account manager, that coordinates all contacts with the OEM.

The situation of European component manufacturers is much less clear and in many cases inefficient. The vast majority of them still have independent commercial organisations by country, but are moving towards a European commercial network that matches the OEMs organisation. In order to speed up the europeanisation process some OEMs are forcing their suppliers to conduct their commercial relationship from the company located in the same country where the OEM is, even if the product is manufactured and sold from a different subsidiary.

5.3. Manufacturing europeanisation

Europeanisation of manufacturing is taking place through two opposite but complementary trends:

- Location of component systems final assembly plants near those of OEMs';
- Concentration of basic component production in single plants at European level.

The first is a consequence of the increasing outsourcing of sub-assemblies. During the early 1980s OEMs outsourced the production of individual components. During the late 1980s they started to outsource the assembly of systems with a variable degree of implementation, and now in the 1990s they are starting to outsource more complex systems - and even, as announced by various OEMs, the assembly of components in the vehicle assembly line itself.

These trends are creating an imperative to be European and to have facilities co-located next to the OEM assembly plants. This has already happened in the case of seat systems and interior trim suppliers which have final assembly plants next to OEMs plants. This allows more efficient logistics and the true implementation of JIT manufacturing as opposed to a JIT delivery that in many cases is based on intermediate stocks held by the component manufacturer.

The second reason for europeanisation is for cost efficiency: there is a need to centralise at European level the production of basic components in plants specialised by product line. The objective will be to take advantage of the economies of scale at European levels in volume products like pistons, brakes or carburettors.

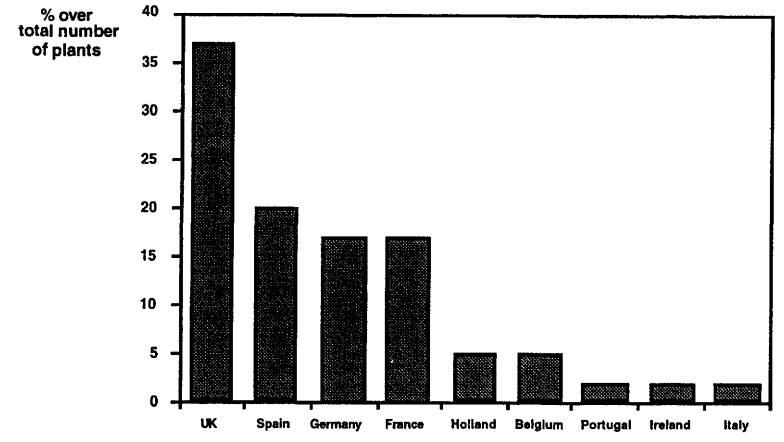
A recent trend that is affecting the europeanisation of manufacturing is the delocalisation of production to Eastern Europe. Although the moves have been limited there are various examples like: Pilkington setting up a plant in the former East Germany and a joint venture in Poland, Teves' new plants in Hungary, Hella plant in Mohalnice (CS) to supply Skoda, Lucas shifting capacity from Germany to the Czech Republic, Magnetti-Marelli investing in Poland to support the Fiat acquisition of FMS, T&N acquiring several companies in Eastern Europe, ...

Some other component manufacturers mentioned having plans to set up joint-ventures in Eastern Europe to supply OEMs based there. In many cases the plants in Eastern Europe represent new capacity added to the European suppliers but in some cases, this represents a shift of capacity from Western Europe to Eastern Europe. Finally, Eastern Europe component manufacturers are starting to be used as second or third-tier suppliers to European component companies.

5.4. Japanese presence in Europe

Japanese component manufacturers' presence in Europe is still very limited. The vast majority of the Japanese component transplants in Europe have been a consequence of the presence of Japanese OEMs in Europe. Nissan has brought with them some of its key suppliers: Ikeda for seats, Kasai for interior trim, Yamato Kogyo for stamping; and Honda: Yachiyo Kogyo for fuel tanks and Yotaka Giken for catalytic converters.

JAPANESE INVESTMENTS IN THE AUTOMOTIVE INDUSTRY



Sources: Japia, Toyo Keizai, LTCB, Press, BCG analysis, 1990

Nearly half of these initiatives have been joint ventures with European or European bases of US multinationals. Some examples are the joint-ventures between Ikeda and Johnson Controls, between Yachiyo Kogyo and Unipart, between NOK and Freudenberg, between Kasay Kogyo and Reydel, between Sumitomo Electric and Lucas, and between Bosch and Nippon ABS and Atsugi Unisia.

More recently some Japanese component suppliers have entered Europe to supply directly European OEMs. Examples of these introductions are Yazaki (wirings), Nippondenso (radiators and coils), Inoue (control instruments), Tokei (dash panel clocks), Ryobi (casting parts for clutches), and Nippon Seiko (bearings).

Nevertheless the presence of Japanese component suppliers is very low compared to the US. This is due to the still low production volumes of Japanese OEMs in Europe and the relatively higher competitiveness of European suppliers today compared with the US ones when the Japanese set up their transplants in the US. It also reflects the weaker financial situation of many Japanese producers today.

Given the fact that the new Japanese transplants (Nissan, Toyota, Honda) have already selected their primary partnership relationships with mainly European producers, further penetration of Japanese component makers will be only gradual, with alliances/joint ventures with European producers the primary mechanism. For example, only 12 of the Nissan UK suppliers are Japanese transplants or Japanese joint-ventures. Therefore, we do not foresee major new greenfield plants will be set up by Japanese component manufacturers in Europe.

It is worth pointing out that there are several examples of joint ventures between Japanese and European component manufacturers entering the US market such as Japan Brake and T&N (brake components), Nippondenso and Bosch (fuel pumps), Yazaki and VDO (meters), Sumitomo Electric and Lucas (disc brakes).

6. SUPPLY CHAIN MANAGEMENT CHANGES

6.1. An emerging paradigm

A new paradigm is emerging in the OEM/component relationship. This new paradigm not only affects the way in which the value added activities are shared between OEMs and component suppliers but also has implications for the kind of relationship established within the industry.

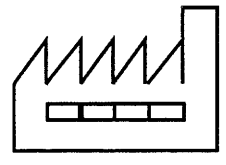
This new paradigm has important implications for the components industry both in terms of its structure and of the capabilities required by component manufacturers. The result will be an industry composed of:

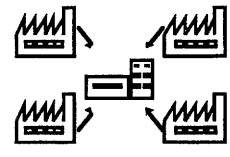
- Fewer but larger suppliers;
- With a European presence;
- Assembling systems near OEMs;
- Manufacturing in scale efficient locations;
- Subcontracting non core production.

And basing their competitiveness on:

- Continuously improving operational effectiveness (productivity, speed and quality) ;
- Creating superior new product/prototype development capabilities;
- Optimising the management of logistics;
- Developing a powerful MIS and human resources platform.

From a structure based on confrontation, the industry is moving towards one based on partnership where profit is shared amongst the different players in the value chain. OEMs will focus their activities on the design of the car, the manufacturing of very few key components based on core competences (eg engines, gear boxes, bodywork and painting) and the assembly of systems supplied by a reduced number of better qualified suppliers that participate actively in the vehicle design.





	The old paradigm	Vs.	The new paradigm
Design:	• All developed by OEM		• Joint development with component manufacturers
Manufacturing:	• High integration • Volume in cars		• High outsourcing • Volume in engines
Assembly:	• Marginal focus		• Main focus
Value chain management:	• Confrontation with suppliers and dealers • OEM profit focus • Many suppliers of fragmented parts		• Deep relationship with suppliers and dealers • Chain profit focus • Few suppliers of systems

Besides the different sharing of the value added activities within the supply chain, the capabilities of the different players of the industry should be adapted to the maximisation of the chain's value.

The dimensions along which a new relationship can be established are:

- Contractual relationship;
- New product development;
- Physical flows;
- Electronic Data Interchange (EDI);
- General support.

These mechanisms and the capabilities required will be very different for first-tier systems suppliers and the rest of the suppliers in the chain. Nevertheless many of the mechanisms that are being established between OEMs and first-tier suppliers will be also set up between the first-tier and second-tier suppliers. This will reflect the adoption by first-tier suppliers of many of the changes that OEMs are implementing: greater outsourcing, JIT logistics, suppliers reduction,... There will also be commodity suppliers with direct access to OEMs, but with a type of relationship different from that of first tier suppliers.

6.2. First tier systems suppliers

As a result of the structural changes underway, a new kind of relationship is being implemented in the industry. Each OEM is likely to have a set of major "lead" suppliers per vehicle model where:

- Contracts will be model-life long;
- R&D efforts will be shared;
- Costs will be optimised for the whole chain and prices driven off costs;
- Suppliers will be continually evaluated;
- Production processes will be improved by common teams.

6.2.1. Contractual relationship

Whereas in the 1980s procurement contracts were mainly short-term (1-2 years duration), the situation is changing and the contract lengths tend to be longer. Legally there are few long-term contracts between OEMs and suppliers, but in practice most already are. The majority of OEMs are adopting the policy of having long-term relationship for complex systems. These in many cases are "model life contracts". Nevertheless, even though the trend is clear there are still some OEMs that have the majority of the components they purchase under one year contracts, like the PSA Group, Mercedes-Benz and Seat.

Another important change is that sourcing decisions are made earlier by European vehicle manufacturers, following the Japanese practice of early supplier involvement in design and product development, therefore moving from contracts for "parts" to contracts for "comakership".

As a result of the new contractual relationship, prices are also starting to be set in a different way. During the 1980s prices were typically negotiated every year by the OEMs. This is still valid for commodity components but for systems and complex components there is a trend towards an approach similar to that of the Japanese.

"Target pricing" consists of analysing what the customer is willing to pay compared to competitors, and then working backwards together with key systems suppliers, to cost every component in order to bring in the vehicle at the target price. Once the price is defined for each component, the OEM and the supplier agree on a cost improvement programme for the expected life of the component whose benefits will be shared. Mercedes has recently announced its move towards this system of target pricing.

Nevertheless, European OEMs have not fully implemented this approach yet. The need to reduce the competitiveness gap of European component manufacturers, the drop in demand and the urgent need to reduce costs has led OEMs to mandate yearly price reductions across the board.

6.2.2. New product development

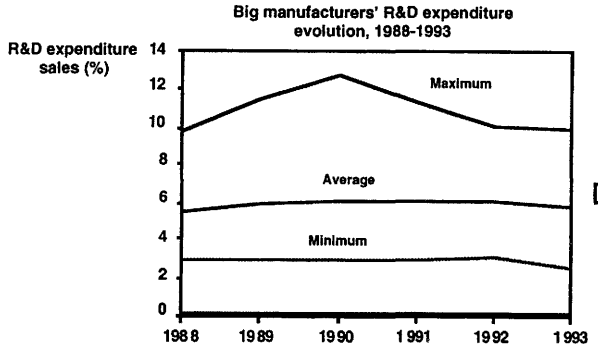
As mentioned before, first tier system suppliers are starting to play a key role in the development of new products:

- OEMs are concentrating their efforts on their core competences: basic design specifications of new models, design and assembly of engines, styling, etc;
- New product development times are being shortened drastically, reaching Japanese standards;
- Black-box design is growing in importance.

As a result first tier suppliers are enhancing their design capabilities, creating joint development centers with OEMs, co-locating them or providing "guest" engineers, investing more in R&D, and integrating CAD-CAM design processes with OEMs. Nevertheless it seems from the interviews with components suppliers that there is still reluctance by some OEMs to delegate design responsibilities to suppliers. As a result instead of pure "black-box" systems, many European OEMs are moving increasingly to "grey-box" design where specifications are jointly developed, the supplier takes on design responsibility and interfaces are developed jointly through a design-in process.

R&D investments of the major system suppliers have been increasing and range currently from 3% to 12% of sales, the European average being 6%. Component suppliers interviewed do not think R&D investments will increase in the future as a percentage of sales. On the one hand current investment is considered, in many cases to be adequate, and on the other the cash-flow generation of the industry does not allow higher investments. The average increase of R&D expenditure of major suppliers has been 6% to the 1988-93 period. The interviews also show that smaller competitors even though they have lower R&D expenditures (around 1-2%), have made an important effort to improve their capabilities with increases of around 45% in that period. Nevertheless, they are facing problems in continuing to invest at the same pace.

R&D EXPENDITURE HAS INCREASED SIGNIFICANTLY AMONG SMALL AND MEDIUM SIZED COMPONENT MANUFACTURERS



Type of manufacturer	Δ%, 1988-93
Big manufacturers	+6%
Medium-small manufacturer	+47%

[redacted]

R&D investments will also be a consequence of the need for enhancing systems in order to improve competitiveness by offering more sophisticated solutions. The main technological trends and requirements in the next ten years for chassis system cited in interviews, for example, are the following:

- Brakes: ABS for small cars, increased use of disk brakes, electronic slip or traction control;
- Axles: Newly designed axles and suspensions;
- Springs/shock absorption: Adaptative springs and shock absorbers, semi-active and active systems;
- Steering: Increased use of power steering, four wheel steering eventually;
- Drive: Intelligent automatic transmissions, slip control, low-cost solution for automatic transmissions in the mass market;
- Wheels and tyres: Light metal rims, tyre-rim concept;
- Overall electronics: Engine electronics, electronic fuel systems, chassis electronics, driver information systems, passive systems, valve timing systems.

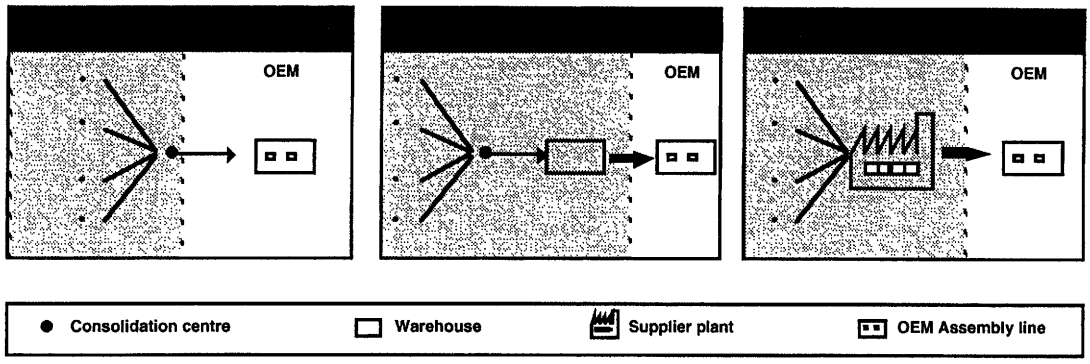
Apart from these technology driven developments there will be others related to environmental and safety issues, thus increasing the investments needed in R&D.

In the medium-term the above described changes in the design process will be leading towards greater industry wide cooperation. OEMs will start developing certain new models together, will favour technical standards harmonisation and complete systems in some cases may be designed by alliances of component manufacturers.

6.2.3. Physical flows

This is an area where the relationships between first tier suppliers and OEMs are changing at a fast pace. The objective is to optimise the operations of both players and reduce the costs and complexities of logistics.

EFFICIENCY OF PHYSICAL FLOWS IS INCREASED THROUGH JIT AND CO-LOCATION



In the 1980s the model most widely used was consolidation centres that were based on the existence of warehouses managed by the OEMs where they consolidated the components sent by their suppliers before sending them to the assembly plant. The objective was to reduce costs through shared transport. The major drawback is the existence of safety stocks in both the OEMs and the supplier's plants. This model is still partially used by several OEMs

In the early 1990s OEMs are starting to use control warehouses with the objective of fully implementing JIT delivery. The concept is to have next to the OEM assembly plants a series of warehouses managed by the component suppliers or by independent companies where the suppliers deliver their products until they are sent JIT to the assembly line. In many cases OEMs require systems or components to be delivered directly to the assembly line by personnel contracted by the suppliers. This model has the drawback of creating buffer inventories at these warehouses, and in fact transfers the costs from the OEM to the supplier. This model is mainly used by Japanese transplants in Europe and other OEMs like Seat.

The last step is the final assembly co-location. This model is starting to be used for component systems like seats, and different OEMs are announcing their move towards it. The idea is to fully synchronise OEM-first tier supplier assembly lines, setting up true JIT synchronous manufacturing and assembly as opposed to a simpler and less efficient JIT *delivery*. The major drawback is the big investments required to co-locate physically both assembly plants. Ford and VW are moving towards a wider implementation of this concept.

All these logistics improvements are supported by the Electronic Data Interchange (EDI) systems that are being increasingly used by OEMs and suppliers. Purchasing programmes, delivery communication and labelling are used by all of them but some other applications like electronic invoicing, payment, and packaging standards, are still in early phases of implementation.

An area of future development will be the use of EDI systems for design (CAD-CAM). The majority of OEMs mentioned in interviews that they had plans to invest further in this area. Currently some OEMs, such as Volvo, are testing the transfer of drawings using the ODETTE system.

6.2.4. General support

With the aim of improving the competitiveness and efficiency of first tier component suppliers, OEMs are establishing ambitious programmes to assist them. Japanese OEMs have a long tradition of programmes where engineers from the OEM visit the supplier premises to analyse the main processes and define the areas where manufacturing process effectiveness can be improved. These programmes range from the "two days quick hits" to one month improvement programmes.

These programmes were pioneered in Europe by GM with the PICOS programme, and are now implemented in different forms by almost all vehicle manufacturers. PSA has its "Global productivity programme", Ford its "Drive for leadership" with cost analysis teams based in the UK, Rover its "RG 2000" programme and so on. It appears from the interviews that the European approach is based more on diagnosing and finding solutions for specific problems whereas the Japanese one is focused more on teaching and implementing methodology on how to improve processes on a continuous basis.

Apart from these supplier development teams, there are other forms of collaboration that OEMs have put in place like blue collar workers exchange (Ford), personnel exchange with major suppliers (Mercedes Benz), training programmes (GM), seminar on human resource management techniques (Rover), ...

All these efforts made by OEMs are complementing the internal training programmes undertaken by the component suppliers. According to the interviews, training costs have increased substantially during the 1988-92 period. In many cases they have doubled and even trebbled as a percentage of sales. This is particularly true for the smaller component suppliers.

The "kyoryokukai" or suppliers clubs is another form of establishing a channel for support and collaboration between the OEM and its suppliers. Although it is widely adopted in Japan, none of the OEMs based in Europe has established such a club. According to the interviews this is due to the fact that European component manufacturers tend to supply to a large number of OEMs. The majority of the European component suppliers have around 4-6 main clients. Nevertheless, Japanese OEM transplants are starting to encourage the creation of such clubs (Nissan and Toyota are experimenting with the concept in the UK).

Even though the supplier clubs do not formally exist, some OEMs are encouraging the transfer of expertise from one supplier to another and the sharing of "best practice" between all of them. This is applied in some cases like Nissan, even to suppliers of the same type of components or of tooling and equipment.

Another kind of support is the initiative set up by Rover to educate its first tier suppliers to work with the second tier and help them to develop the necessary skills.

6.2.5. Supplier evaluation

At the same time OEMs are periodically evaluating their suppliers through an structured process that allows them to benchmark the evolution of the supplier's competitiveness. The main changes from the situation in the 1980s are that the frequency of these evaluations has increased, and the measures have changed reflecting evolution in the competitiveness of European suppliers.

As mentioned in the previous BCG study, the main criteria around which suppliers used to be evaluated reflected the type of relationship existing between OEMs and suppliers and the areas where suppliers were weaker:

- Cost;
- Quality;
- Delivery times;
- Financial soundness;
- Technological expertise.

Nowadays according to the interviews carried out ,these criteria have evolved and tend to measure capabilities as well. At the same time the measures have become more sophisticated. The new criteria include:

- International presence;
- Operational effectiveness;
- Logistics efficiency;

- R&D and design excellence;
- System integration capabilities;
- Investment capacity.

Instead of final cost alone, OEMs tend to measure now also operational effectiveness, that is, the efficiency of all the activities and processes performed by the supplier and their impact on the cost structure. Delivery times are no longer the key criteria as most suppliers are now delivering components on time; therefore a new measure is the logistics effectiveness, that is, how the whole logistic function is performed by the supplier. As design has increased in importance the appropriate measure is no longer technology but the excellence of the design and system integration capabilities. Finally, financial soundness has been substituted by the supplier capacity to generate the required cash for the investments needed.

Quality, traditionally very important, is a minimum requirement where first tier suppliers have reached adequate standards, although improvement is still needed. If we compare quality indicators of Japanese component manufacturers and European ones, as internal data from OEMs show, there is still room for improvement.

6.3. Other suppliers

The relationship between first tier suppliers and second tier suppliers is following some of the changes described above. Nevertheless, the implementation is much slower and will not fully occur until the changes in the relationship are rooted between first-tier suppliers and OEMs.

According to the interviews with OEMs and to the analysis of financial indicators, the competitiveness gap of second tier suppliers is even higher. Therefore urgent action is needed.

The competitiveness dimensions of second tier suppliers are different to first tier ones as a result of the different role within the value chain. Manufacturing process efficiency is critical as cost is the main selection criteria, whereas design is less important even though it will play a more active role as outsourcing from first tier suppliers begins to increase.

The areas where progress has been higher are the ones related to logistics: EDI systems, JIT delivery, and physical flows optimisation. In many cases second tier suppliers are also evaluated by OEMs, reflecting the turn to a whole value chain management perspectives.

On the other hand the areas where the level of changes in the relationship has been lower are the contractual relationship and price setting. Contracts between first and second tier suppliers tend to be short-term, are awarded under competitive tender, and prices are renegotiated periodically.

Addressing the competitiveness of subsequent tiers in the supply chain is a major area for improvement and action during the coming years. *First tier suppliers should force and support improvements in the competitiveness of second and third-tier suppliers.* In some cases this can be done with the involvement of OEMs, but in the vast majority first tier suppliers should lead the process.

7. IMPLICATIONS FOR EC POLICY

The competitiveness gap of the European components industry relative to Japan remains alarmingly large. Clearly the major efforts to improve their competitiveness must come from the individual companies themselves, and increasingly importantly by joint cooperative efforts among the different levels of the supply chain:

- OEMs working with first tier suppliers; and
- First tier producers working with their suppliers, either alone or together with their OEM partners.

Nevertheless, the EC can play a useful supporting role in facilitating the necessary changes. The main policy areas include:

- Training and retraining, employment measures;
- Standards;
- R&D and technology;
- Competition policy.

7.1. Training and Retraining

Very large improvements of productivity are required of the workforce over the next several years to close the competitive gap with Japan. This requires the adoption of improved manufacturing and new product development processes and overall improvements in operational effectiveness. The adoption of leaner production processes will require increased teamworking and interpersonal skills, problem-solving abilities at all levels of the workforce, multifunctional skills, basic computer literacy, etc. All of this will necessitate greatly increased levels of training to upgrade the skills of the workforce in the components industry.

The introduction of **new production methods** like "lean production", and the focus on new parameters like Total Quality Management (TQM) or Time-Based Competition (TBC), require training and education programmes. These should cover issues like the human resource and organisational changes needed to implement the new processes, as well as the techniques, software and methods to develop the activity in a more effective way, including problem solving techniques.

Upgrading the design capabilities implies training on **new product development processes** both in terms of processes and design technologies like advanced CAD-CAM systems. The increase in black-box design and in component systems development is forcing the component manufacturers to build a new set of capabilities internally or with the help of the OEMs.

A third area of training needs is in **logistics**. The europeanisation of the industry that is leading to an increase in cross-border shipments, the fact that OEMs are starting to outsource the logistics management to suppliers, the higher sophistication of the transport and warehouse systems, and the increasing importance of JIT delivery and manufacturing stresses the importance of training in this area.

Another area of basic training is **computer systems**. The increasing use of EDI and other systems both in the production-logistic and administrative areas and, in the future in the design area, will require the workforce to be more systems literate.

Training requirements may be higher in the case of medium and small companies that are second tier suppliers or trying to become first-tier suppliers and therefore need to master the technologies of the other components that are part of the systems they develop or assemble.

These training requirements can largely be met under *horizontal* EC policies in place or under discussion (such as expanded uses of the Social Fund or Structural Fund). Given the importance of the automotive industry in terms of size of employment, and perhaps more importantly, as a continued pioneer in defining leading edge manufacturing techniques for industry as a whole, the automotive components industry should play a key role in defining the specific content of the EC training policies.

One specific *sectoral* policy of limited cost, but potentially high impact in giving impetus to the restructuring process involved and motivating management and the workforce to commit to the prolonged training required is an *EC sponsored education programme.* The UK and other EC countries have sponsored series of regional seminars to component companies to inform them of the nature of the competitive gap to be overcome, key trends in the competitive environment and structure of the industry, and specific steps companies can begin to take (together with their customers and suppliers) to improve their competitiveness. A similar type of programme on an EC-wide basis could be particularly helpful in "jump starting" the restructuring particularly among the smaller and medium-sized second tier companies, where the improvement in competitiveness is perhaps most critical and awareness of the challenges they face and directions of change least well advanced. The programme could consist of a series of 1-2 day seminars/workshops in the key regions of all the main EC countries, with the support of CLEPA and the national associations.

European universities can probably play a role, especially with small and medium sized companies, setting up exchange programmes and helping them to evaluate means to improve their competitiveness.

Apart from the specific training at the workplace (on the job training), the EC should, to the extent possible, foster an improvement of the general education programmes and an adaptation to the current reality. Language learning for example should be emphasized at school level, certain skills like moulding, drop forging, acoustics and automotive electronics should be trained at polytechnics and similar schools in order to reduce the shortage of qualified workers in specific areas. This is causing an inflation of salaries in certain areas or in other cases a less efficient use of the technologies available.

Numerous studies, like the ones carried out by the National Institute of Economic and Social Research in the UK, indicate the need to emphasize high standards of basic education and vigorous programmes aimed at continuous employee development, as shown in the Japanese industry skills model.

7.2. Employment and Labour Policy Measures

The rationalisation of the industry and the need to improve productivity, together with the fact that market growth will be lower than that required to match increases in productivity, are creating an excess of employment in the component manufacturing industry. Compensating factors such as the increase in outsourcing by OEMs and the higher sophistication and importance of equipment and componentry in new models will not be enough to counterbalance it. As mentioned earlier, around 400-500,000 jobs are expected to be eliminated in the next seven years. The impact of this may be particularly severe in certain major car producing regions within the different countries.

The EC, through the Social Fund and other regional assistance measures, can help cushion the social and economic impact of the unemployment caused by the inevitable radical restructuring required. Measures for retraining and redeployment of affected employees will be required.

The labour regulations in general in the EC and specifically in some countries are much more restrictive than in the US and Japan. The flexibility to adapt the labour force to short-term production requirements and long-term demand is very restrictive. Therefore any support from the EC to make the personnel redundancies and short-time working procedures simpler,

quicker and less costly will be well received by the industry, as stated publicly in numerous industry forums.

The EC might assist in its overall labour market policies the industry's need to have higher workforce mobility and flexibility within the sector. In some countries labour regulations and unions make it extremely difficult for a company to move one employee among different areas of even the same plant (e.g. from the maintenance group to the assembly line or from a specialised machining activity to another even after the required training).

The EC Commission may be able to play a role by promoting and coaching a social dialogue as well as by setting the grounds for labour regulations more in line with the new production systems requirements (lean production, flexibility, geographical and functional mobility, etc.).

7.3. Standards

The EC should continue to support the harmonisation at a European level of the different standards, norms and regulations affecting the automotive industry. Technical harmonisation, as the Commission recognises it, is a prerequisite for the practical fulfillment of the internal market.

In the first place, the EC should foster initiatives of OEMs and component suppliers to unify both technical and quality standards. The harmonisation of technical standards will allow component suppliers to reduce significantly the number of references they produce to supply the same product to different OEMs and thereby bring down costs. For example, a leading electrical wiring manufacturer claimed that they could reduce the number of items produced from 1,300 to 50 if OEMs harmonised their technical requirements.

The lack of harmonisation of **quality certification norms and procedures** was a big complaint from the suppliers during the previous study, as it required excessive paperwork, cost and time to satisfy the differing quality certification procedures established by the various vehicle manufacturers. The spread of the ISO 9000 standard across the industry has been a great improvement, buts its application still varies from country to country. The adoption has been, for example, greater in the UK.

Nevertheless, although some OEMs like GM or Ford are adopting ISO 9000 in substitution of their previous quality systems, there are still some OEMs that require suppliers to undergo their specific quality procedures even though they may have been certified under the ISO 9000. This creates unnecessary costs to both OEMs and suppliers in terms of time involved, personnel requirements, and related expenses.

Further efforts should be made to make use of the norm more widespread by:

- Having more OEMs adopt it not only for company quality certifications but also for products;
- Having more second tier suppliers certified under the ISO 9000;
- Pushing the rigour of the standards so that it meets more of the requirements from OEMs.

An industry group of OEM and component industry representatives should be set up in order to decide whether a next generation of stricter quality standards should be defined, and which are the parameters or criteria to be included so that it conforms to the widest set of different OEM requirements.

In the previous BCG report it was pointed out that one obstacle to the implementation of JIT logistics and manufacturing within the EC automotive industry was the low penetration of **Electronic Data Interchange** (EDI) systems. This has changed and currently EDI

systems are used by virtually all first tier suppliers and OEMs and a majority of the second and third tier ones.

Unfortunately two major systems coexist: **Odette** which has been adopted by the majority of OEMs, with its French variation GALIA and FORDNET implemented by Ford. This creates unnecessary extra costs in terms of equipment and training needs for component producers according to the interviews.

CLEPA and the EC should promote the further use of EDI systems by the industry, pushing for the widening of the information exchanged. Different OEMs and suppliers are experimenting with new kinds of data to be interchanged, like electronic invoicing, packaging standards and design drawings.

Monitoring by the EC and CLEPA may help prevent the uncontrolled proliferation of other types of standards. Improved Electronic Data Interchange will help cycle time reduction and improvement of the cost position of both OEMs and suppliers by reducing administrative overheads.

The harmonisation of **CAD-CAM systems** among OEMs is also needed, but is very difficult to implement. As the R&D director of a component manufacturer said "we have to deal with seventeen different CAD systems, which forces us to allocate time, software, equipment and people away from more efficient activities".

This is the area where the diversity of systems is greatest in Europe, particularly when compared with Japan, where as a result of the existence of close links between individual OEMs and their respective suppliers, each supplier only uses one CAD-CAM system.

OEM	CAD/CAM System
Ford	PDGS/Computer Vision
Mercedes	CATIA
Renault	Euclide
PSA	Computer Vision
Nissan	Alpha Cad
Seat-VW	ICEM (CAD), CATIA (CAM)

Moreover, this complexity is increased by the fact that in many cases second tier suppliers or external designers use other systems.

At the same time, suppliers are forced by vehicle manufacturers to use different CAD-CAM stations for each system. This is specially onerous in those countries where several OEMs are based.

Although from the point of view of the suppliers there is a strong need for harmonisation, the issue is very controversial at OEM level due to:

- High current investments in CAD-CAM systems and the training of personnel in their use that represent a financial barrier to change;
- Risk of design leaks to other OEMs. Design is an area where OEMs are increasingly basing their competitive advantage.

Given the substantial potential benefits of harmonisation, it is appropriate that very serious efforts are made by OEMs, suppliers and equipment manufacturers to analyse different possibilities to increase the harmonisation of CAD-CAM systems like:

- Improving the interfaces between the current systems;
- Developing a new generation of CAD-CAM that can be adopted by the whole industry over the next several years.

The EC should use its persuasion efforts in this area due to the high impact in the cost competitiveness of the industry not only directly: CAD-CAM investments and training requirements will be lower, but also indirectly: it will bring a greater commonality of component designs and will allow earlier strategic alliances for design and exchange of components.

More generally, the EC should continue to push the harmonisation of regulations that affect the automotive industry, like **environmental requirements** (e.g. the use of asbestos in brakes is forbidden only in certain countries, use of nitrosamine and PVC, definition of common criteria on emissions control), **safety standards** (e.g. certification processes for different components varies through the EC). It is specially important to set a clear definition of what are considered to be recyclable materials because current national regulations adopt different criteria.

Another area where action from the EC may be helpful are the legislative and regulatory constraints affecting manufacturing sites both in relation to the external environment (environment protection, energy consumption, waste management, recycling, etc.) and to conditions inside the sites (safety, accidents, etc.).

When harmonising or issuing directives in relation with such areas, it would be useful for the Commission to take into account the current situation in other countries like the US and Japan, in order to analyse the cost and competitive implications of the different requirements set by regulation.

7.4. Research and Development and Technology Policy

The overall level of spending on R&D in the European automotive industry, both at OEM and components levels, is comparable to that in Japan and the US. Basic technology remains one of the strengths of the EC industry, and many of the most innovative component companies in the world are in Europe. Continued investment in basic research and development will be necessary to maintain the EC industry's competitive position in this area, and to meet the new requirements imposed by environmental and safety concerns, traffic congestion, different forms/fuels for propulsion, use of new and recyclable materials, etc.

Even though there are a variety of EC programmes to fund R&D, like BRITE-EURAM, both the industry associations and the companies claim that the access procedures are difficult, especially for small companies (the ones that need it more) and do not take into account product-process interaction. The fact that the funding is "pre-competitive" also inhibits most small and medium-sized companies. As a result, data from some member countries shows that the component industry has received proportionally less funds than other sectors in relation to its economic importance.

Due to the increase in black-box design, the EC should foster and encourage the development of partnerships between OEMs and component suppliers by supporting common R&D projects. Moreover, if these projects involve more than one OEM, the objective of greater commonality of parts will be attained, thus helping reduction in the cost of the parts. This is a typical pattern in Japan, where a greater proportion of R&D is carried out by groups of companies rather than by individual ones. In Europe the number of joint development programmes is still small. The Commission might assume a catalytic role here.

This kind of agreements should, in many cases, involve partners from related industries like electronics, aluminum, specialty steel,... This cooperation will make it possible to develop those aspects of generic technologies which are relevant to the automotive and components industry.

Our previous analysis indicates the growing importance for first tier system suppliers, and other component makers with products requiring development efforts in close collaboration with the OEM, to colocate engineering/development support next to the OEMs main R&D centre, or at least provide "guest engineers" available to work in the OEMs premises. Increasingly, this will be a requirement to continue to sell to the OEM in a long-term partnership relationship.

One possible initiative for the EC to consider promoting/assisting is for cross-border efforts, ie, where a component manufacturer in one EC member country locates a design/engineering/technical support team at the site of an OEM located in another EC country. The EC might consider partial funding of the initial start-up costs of component producers (especially medium-sized and small ones) for establishing such technical support operations.

In general the EC should shift emphasis to the improvement of process technology as opposed to basic R&D. The major problem faced by European component suppliers in relation with their Japanese counterparts is the gap in process efficiency and productivity. The EC Commission should not limit the funding to "pre-competitive projects" as they tend to discriminate against small companies and also because the benefits of this R&D are long term whereas the need to increase competitiveness is urgent. There is a need to move faster from technological breakthroughs to the production of components and parts with higher performance and lower costs.

7.5. Competition Policy

The components industry will undergo a fundamental restructuring over the next several years. The concentration at a European level of the first tier suppliers in different component systems/subsystems is both an inevitable outcome of the reduction of the number of suppliers by the OEMs and a desirable outcome in terms of increasing the overall competitiveness of the European automotive industry. By the end of the 1990s there should be a more equal balance of power between the remaining strong first tier suppliers and the vehicle manufacturers.

As CLEPA has pointed out, there is a need to clarify the concept of "relevant market" in EC competition rules to allow such necessary concentration to occur. Competitive situations should be regarded more broadly in terms of:

- Product or subsector definition: systems purchasing is increasing in importance; and
- Geographical scope: country market bases are not as relevant in an European regional context and in the global market.

Increased collaboration between OEMs and component makers, as discussed throughout this report, is a key to improving the competitiveness of the European industry. The "open book" philosophy of access to costs and joint targets for price/cost reductions, sharing of best practices among the component suppliers of a given OEM, etc, should be encouraged. Competition policy should support these cooperative efforts as far as possible, rather than impose obstacles to their realisation.

* * * * *

8. CONCLUSIONS

Over the last few years there has been a fundamental change in attitudes in the European automotive industry at both the OEM and component level regarding the imperatives for change. There is an emerging consensus regarding the needs to:

- Radically reduce the number of direct suppliers and introduce a tiered supply chain structure;
- Outsource more to component suppliers;
- Involve first tier suppliers in design and shift to systems purchasing;
- Improve productivity and stock turns by adopting lean production processes.

Steps have been taken in all these directions but the real challenge lies ahead as implementation begins in earnest .

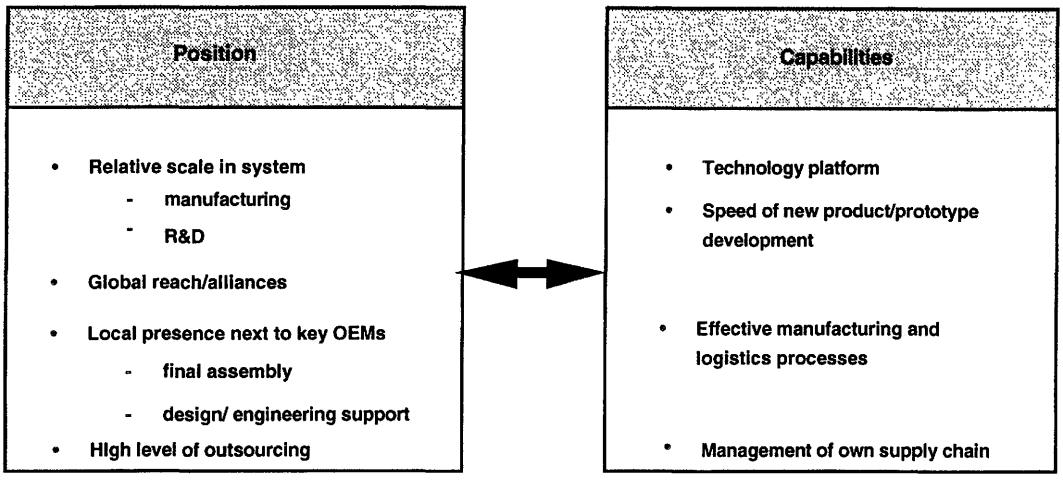
The current downturn in consumer demand across Europe, the pressures on profitability in the OEMs and their demands for large price reductions from their suppliers, and the rapid build-up of Japanese transplant production will accelerate the process of restructuring. A radical change in structure of the industry is likely. The most important changes are outlined below:

- Likely concentration at the OEM level, in terms of demands for components, through mergers and/or shared component production;
- Radical reduction in number of direct suppliers to OEMs to around 500 principal first tier suppliers;
- Reduction in the number of remaining supplier companies by up to one-third;
- Reduction in total employment in the independent components sector from just below 1 million to around 500,000 by 1999, as productivity increases required outstrip growth caused by further outsourcing by OEMs.

For **first tier suppliers** competitiveness will be a function of both their *structural positions* and *capabilities*:

Positional advantages will be important for the competitiveness of first tier suppliers. The scale advantages in research and development and manufacturing on a regional (European) and global basis are likely to lead to increased concentration to say 3-5 European first tier companies in any given component system or type. Most of these producers will also need to form global alliances or investments in the US and Japan to maintain their technology lead in an increasingly global business.

At the same time that scale advantages argue for centralisation of their R&D and critical manufacturing steps, it will be important for successful first tier suppliers to establish local presence next to key OEMs in the different EC countries, often by establishing a final assembly step for a system next to the OEMs plant and by establishing design/engineering support near the R&D centre of the vehicle manufacturer. Like OEMs, first tier suppliers will seek to improve their competitiveness by concentrating only on core activities, outsourcing a greater proportion of their value-added to competitive second tier suppliers.



Capabilities will also be key to the competitiveness of first tier suppliers. Their technology "platform" or set of core technologies that are applied in satisfying the product development requirements of their key OEM customers will need to be continually improved. Their effectiveness at the process of applying their technologies in rapid new product/prototype development in line with the OEMs requirements will be critical. An effective "lean" manufacturing process is also crucial.

A key capability for the future will be their own supply chain management. They will need to select their own strategic suppliers, outsource more to them, manage the logistics process, and very importantly, work with these second tier suppliers to improve their competitiveness. *Their effectiveness at this largely new role of supply chain management will be critical for the overall competitiveness of the European automotive industry.* The second tier suppliers are arguably the part of the overall chain where the greatest challenge to improve productivity exists and where awareness of the challenge and means to improve competitiveness is least advanced.

For **second tier suppliers** the key challenge will be operational effectiveness:

- High productivity;
- Lean manufacturing process;
- High quality;
- Logistics capability;
- Good interface with their customers and closer relationship.

For many product areas their R&D and product development capabilities will also be important.

EC support in training, employment measures, harmonisation of standards (for quality certification, EDI, and, if possible, CAD/CAM), support for R&D and new product development processes, and making the industry fully aware of the nature of the challenge ahead and possible directions forward, can all play an important role in assisting the industry to enhance its competitiveness.

However, it is becoming increasingly clear that the restructuring and improvements of the relationship *between* the levels of the value chain in the industry will be equally important to the efforts of the individual companies themselves. *The realisation of true partnership relationships along the value chain is perhaps the critical challenge to create a viable and strong European automotive industry by the end of the decade.*

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