Reaching higher productivity growth in France and Germany

Sector case: Automotive

McKinsey
Global
Institute

with assistance from our Advisory Committee

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October 2002

This document is an excerpt drawn from the report "Reaching higher productivity growth in France and Germany", published by the McKinsey Global Institute in October 2002.

The full report can be obtained from:

McKinsey Global Institute website:
http://www.mckinsey.com/knowledge/mgi/

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FOREWORD

For fifty years following the end of the Second World War, France and Germany continually narrowed the labor productivity gap with the US. In the mid-1990s, however, the trend reversed: France and Germany are no longer catching up. Weakening productivity performance should worry us given the current and projected demographic challenges: future living standards depend on high productivity growth. To develop effective solutions for dealing with these challenges, policy makers and business leaders in France and Germany need to base their decisions on a complete and nuanced understanding of the barriers to and drivers of higher productivity growth.

To contribute to such an understanding and derive actionable recommendations, the McKinsey Global Institute (MGI) performed an extensive in-depth analysis of the labor productivity performance of six sectors in France, Germany, and the US. The full report consists of an executive summary, seven chapters and an appendix. The first chapter, the Synthesis, provides an overview of our approach and conclusions, and can be read as a stand-alone summary of our work. The remaining chapters provide our case studies on Telecommunications, Retail banking, Automotive, Road freight, Retail trade and Utilities. Each of these cases has a brief summary in the beginning.

The MGI – McKinsey & Company's economic think tank – combines the firm's business experience with the rigor of academic thinking. This document reflects active dialogue between industry experts, experts from premier research institutions, and our own specialists, who work closely with executives of leading French and German businesses. This project was conducted under the direction of Heino Faßbender, Diana Farrell, Eric Labaye, and Vincent Palmade. Thomas Kneip and Stephan Kriesel were responsible for the management of the project. We are very grateful to the companies and individuals who supported our research by agreeing to provide data about their operations through interviews and surveys.

In addition, our work benefited tremendously from in-depth discussions with the academic board: Olivier Blanchard from the Massachusetts Institute of Technology in Boston, Martin Baily from the Institute for International Economics in Washington DC, Hans Gersbach from the University of Heidelberg, Monika Schnitzer from the University of Munich, Jean Tirole from the University of Toulouse, and Robert M. Solow, Nobel laureate and the "godfather" of growth discussions – all of whom contributed significantly to interpreting the results of our research. McKinsey & Company has the privilege of serving many of the leading companies in France and Germany. Through this work, we have observed the huge potential that can be tapped in order to boost productivity performance. We hope that our report will help policy makers and business leaders unlock this potential by providing them with an objective and fact-based perspective.

Before concluding, we would like to emphasize that this work is independent and has not been commissioned or sponsored in any way by any business, government, or other institution.

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MCKINSEY & COMPANY

McKinsey & Company is one of the largest and most influential global management consulting firms. Since our founding in 1926, McKinsey's primary mission has been to help our clients achieve substantial and lasting improvements in their performance. This is what we are committed to and what drives us.

With more than 6,500 consultants deployed from 82 offices in 44 countries, McKinsey advises leading companies on strategic, operational, organizational, and technological issues. We work for the largest and most prestigious companies in each market we serve. In addition, we advise a diverse group of governments, public sector institutions, and nonprofit organizations on management and policy challenges. McKinsey has had a permanent office in both France and Germany since 1964, where we have served many of the top blue-chip companies in the areas of financial services, telecommunications, high tech, automotive, basic materials, and consumer goods.

THE MCKINSEY GLOBAL INSTITUTE

The McKinsey Global Institute (MGI) is the internal economic research think tank of McKinsey & Company. Founded in 1990 and based in Washington, DC, its mission is to offer insights into global economic issues of relevance to our clients and international leaders, and to research the key barriers to faster growth in the world economy.

The MGI's methodology is a combination of two distinct disciplines: economics and management. Both of these disciplines are concerned with economic growth, but neither is positioned to understand it fully. Economists have scant access to the real-life problems facing business managers, while managers often lack the time and incentive to look beyond their own situation to the larger issues of productivity in their industry or the economy as a whole. McKinsey's economic research remedies this situation by combining the academic rigor and breadth of economics with the deep and practical industry knowledge and management understanding we use in our daily work with clients. The MGI's research is founded on a unique collection of facts and microeconomic analyses that is beyond the reach of most academic and government-sponsored research. Our teams have conducted in-depth analyses of fourteen countries covering all continents, ranging from the most advanced economies (e.g., the US, Japan, the UK, the Netherlands, France, and Germany) to the developing ones (e.g., India, Russia, and Brazil). In each country, a representative sample of economic sectors has been studied covering a broad spectrum of products and services. The result is a unique perspective on productivity and its contribution to economic growth.

ACKNOWLEDGEMENTS

The working team consisted of consultants from the McKinsey Global Institute and the French and German Offices: Olivia Antelmann, Mourtaza Asad-Syed, David Bergonzo, Alena Brunn, Carsten Dörfler, Hans-Marc Erkinger, Anne Gacon, Arne Germeyer, Marion Grote-Westrick, Moritz Gruber, Thomas Gutjahr-Löser, Marcus Kleinfeld, Jeanne Lubek, Harald Meilicke, Guntram Nöth, Michael Otremba, Baudouin Regout, Dirk Reiche, Vincent Rondot, Jack Sheu, and Bedii Can Yucaoglu.

The report benefited from the expertise of McKinsey Partners and Associate Principals: Tony Blanco, François Bouvard, Frank-Detlef Drake, François Glémet, Michael Kliger, François Lepicard, Peter Leukert, Christian Malorny, Jean-Christophe Mieszala, Eric Monnoyer, Carl-Stefan Neumann, Jürgen Schrader, Lothar Stein, Sandra Sultan, Jérôme Teissier, Tidjane Thiam, and Andreas E. Zielke.

Editing and production were performed by: Jörg Hanebrink, Ivan Hutnik, Marc-Daniel Kress, Catherine Leroy-Jay, Ginni Light, Christiane Özmen-Flor, Chantal Pommier, Naima Sboron, Ulrich Scholz, Jonathan Turton and Stéphane Veyer.

Automotive

EXECUTIVE SUMMARY

France, Germany, the US and Japan are the world's four largest automotive producing countries. The automotive sector is a major employer, contributor to GDP, and contributor to the value added in the national economies.

Labor productivity performance

From 1992 to 1999, France's labor productivity grew the fastest at an average of 7.8 percent annually. The other three countries all achieved annual growth rates of between 2 and 3 percent. From 1996 to 1999, the disparity was even more evident as France grew at a staggering 15 percent annually. In 1999, Japan and the US are still more productive than the two European countries, despite the rapid growth rates in France. Germany lags behind by 31 percentage points and France by 28.

Drivers of labor productivity growth

France caught up with the German productivity level due to operational factors that had their origins back in the early 1990s.

¶ *Firm-level factors* – French OEMs improved their product quality, catching up with the German manufacturers who have traditionally held the lead in quality. The introduction of lean manufacturing practices helped cut the hours worked per car dramatically, boosting labor productivity. New managers at the French companies also implemented workforce reduction programs, while their German counterparts were hiring. These managers cut costs elsewhere as well, especially in design simplifications. Finally, although German OEMs increased their outsourcing, this actually reduced productivity due to the extra integration and labor input needed.

¶ *External factors* – France was forced into making changes as it came under increased competition from both German, and particularly Japanese manufacturers. Germany reacted to the milder pressures it faced by developing attractive product portfolios. This meant using newer technologies which, in turn, triggered the increase in outsourcing.

Drivers of labor productivity level differences

France and Germany still lag the US and Japan. Four operational factors in particular account for the continued superiority of the US.

¶ *Firm-level factors* – The success of the light truck segment in the US has been a major boost for US manufacturers. These vehicles are cheap to make but expensive to buy. This product mix advantage accounts for over a third of the lead the US has over Germany. US OEMs also operate far simpler product programs offering far fewer variations of the core car. Lean manufacturing has a longer tradition in the US than in Europe, with German manufacturers taking 20 percent longer to make a car than their US counterparts. Finally, US firms have leaner R&D and administrative departments.

¶ *External factors* – The demand for light trucks comes from low fuel prices and wide streets – among other things. In addition, high import tariffs ensure that pickups, the largest segment of this market, are almost all made domestically. The US was exposed to Japanese lean manufacturing practices earlier as, unlike in the EU, Japanese OEMs were not restricted by quotas. Finally, corporate governance is more sophisticated in the US which means greater shareholder pressure on companies to deliver profits.

The role of IT

Although the extent of IT use had little effect on either growth or overall level differences, IT was an important enabler of growth. For example, it aided the development of lean manufacturing and helped reduce R&D and procurement costs.

Outlook and recommendations

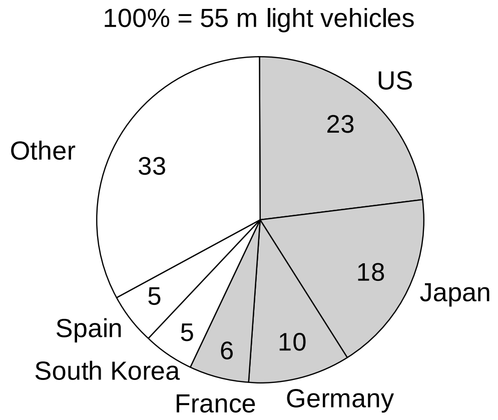
The automotive sector in Western Europe will remain stagnant but other markets are growing. Finding the right products for those markets will be critical. There is an important balance to be struck between increased customer-focused customization on the one hand, and improved process efficiency on the other. This is not a feat that the European OEMs, especially in Germany, have proved adept at achieving. A reduction in EU import tariffs might increase the pressure on the domestic manufacturers and force them to focus on high quality and high productivity simultaneously.

OVERVIEW OF THE SECTOR

French and German labor productivity in the automotive sectors was analyzed and compared to that in the US and Japan, with the main emphasis on the European markets. France, Germany, US and Japan are the four biggest car producers in the world and their automotive sectors contribute substantially to the national economies due to their share of gross value added (GVA) and employment (Exhibits 1 and 2).

Exhibit 1

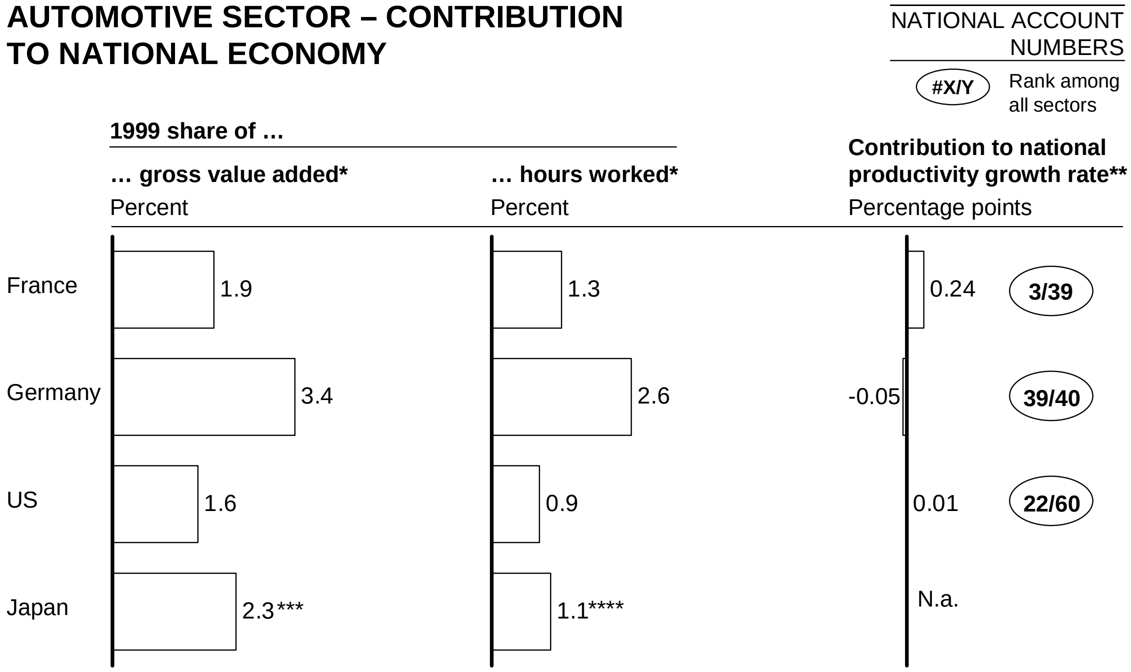
MARKET SHARE OF GLOBAL LIGHT VEHICLE PRODUCTION, 1999
Percent



Source: CCFA, VDA

Exhibit 2

AUTOMOTIVE SECTOR – CONTRIBUTION TO NATIONAL ECONOMY



* Share of total economy excluding Public Administration and Real Estate Rental sectors
** 1996 - 99 in France, Germany; 1995 - 99 in the US
*** Share of real GVA in prices of 1995
**** Share of number of employees

Source: INSEE, Statistisches Bundesamt, BEA, BLS, MGI analysis

Importance of the sector to the overall question

According to national account numbers, the automotive sector's share of GVA in Germany is 3.4 percent, higher than the 1.9 percent in France, while the share of employment stands at 2.6 percent and 1.3 percent, respectively.

Furthermore, the automotive sectors are also very important for the national and global economies in general because of their tight links with many other up- and downstream industry sectors. In fact, the production process involves nearly all sectors of the economy. In Germany, for example, every seventh employee has a direct or indirect link to automobile production, whether it is in retail, gas stations, transportation or automotive-related financial services in insurance or banking.

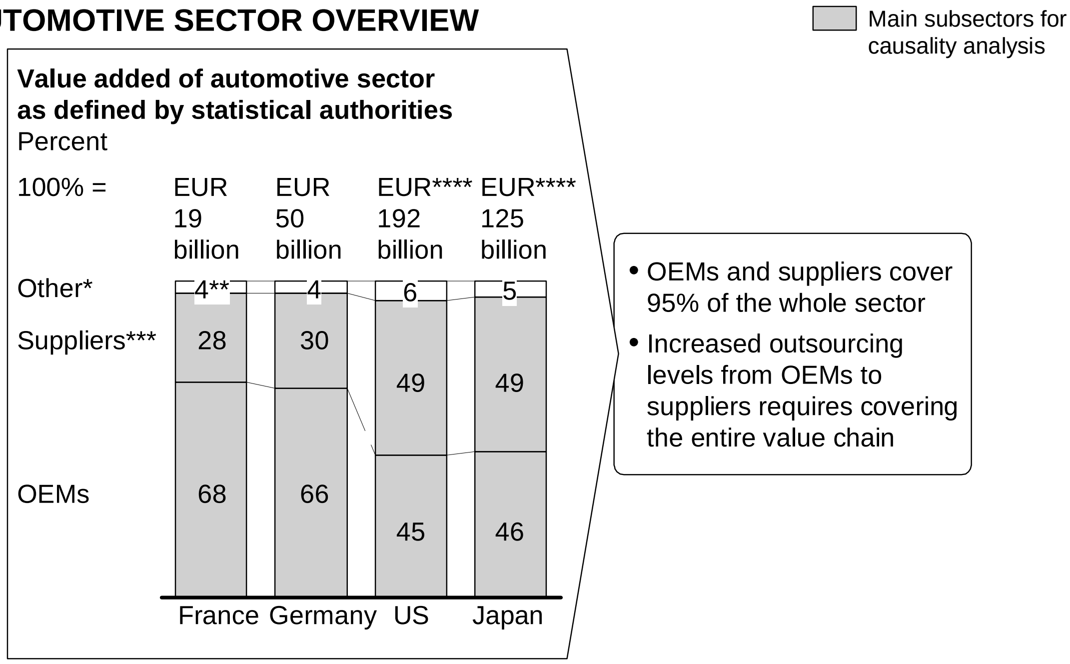
However, although the sector contributes more to the GDP in Germany than in France, the picture is very different in terms of contribution to productivity growth. According to national account numbers, in France, automotive ranks third out of 39 sectors, whereas in Germany it lags behind coming only 39th out of 40 sectors. The following report analyzes the root causes of the different performances of the French and German automotive sectors.

Industry profile

The MGI definition of the automotive sector follows that of the statistical authorities in the countries analyzed. It includes the domestic activities and revenues of OEMs and suppliers located in the country which together account for approximately 95 percent of the sector (Exhibit 3). Other contributions come, for example, from trailer manufacturers. Suppliers' contribution is approximately 30 percent in terms of value added (and employees) in France and Germany. Due to the increase in outsourcing from OEMs to suppliers over time and the different levels of outsourcing between countries, it is important to include the suppliers in the analysis. Besides manufacturing, a wide range of functions performed at the OEMs or suppliers is also covered by the sector including product development, assembly, purchasing and administration. Retail, other than the sales departments of the OEMs, is not included in the sector analysis.

Exhibit 3

AUTOMOTIVE SECTOR OVERVIEW



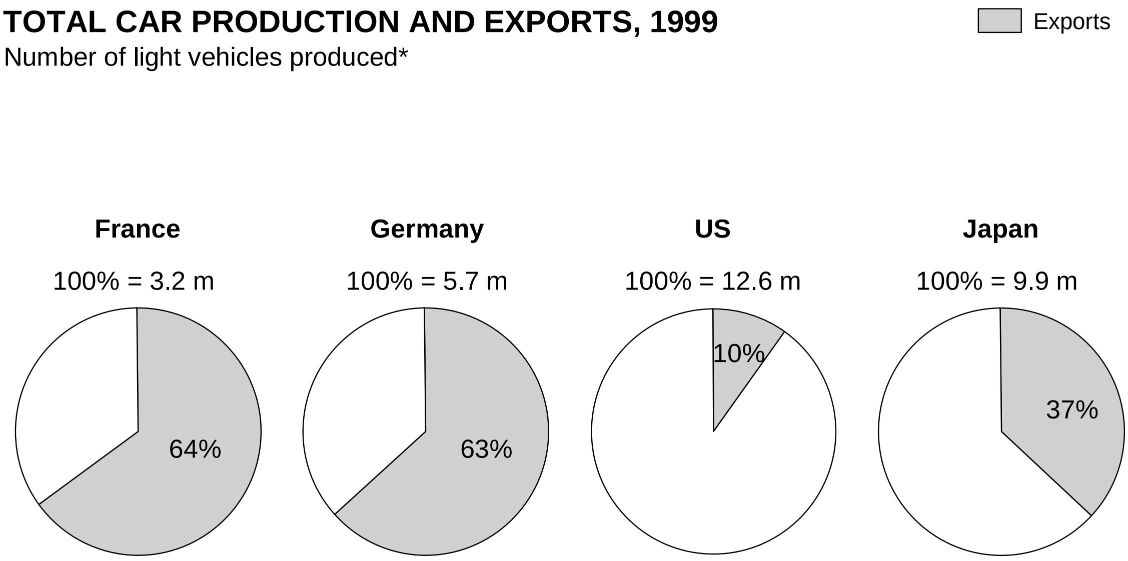
* Especially trailer manufacturers; included in sector analysis, but subsector causality analysis only performed for OEMs and suppliers
** McKinsey estimate
*** In France and Germany electronics suppliers are not included in the automotive sector
**** Converted at average exchange rate in 2000
Source: INSEE, Sessi, Statistisches Bundesamt, US Census Bureau, Census of Manufacturers Japan

The French and German automotive sectors include the domestic operations of the highly consolidated European OEMs, including mass and premium brand manufacturers (PSA, Renault, BMW, DaimlerChrysler, Porsche, Volkswagen Group) and the German subsidiaries of the world's largest two automotive companies (Adam Opel (GM) and Ford Werke (Ford)). European OEMs remain export-oriented compared to US companies, with France and Germany both exporting almost two thirds of cars produced in 1999, compared to an export level of just 10 percent in the US (Exhibit 4). The supplier landscape, however, is very fragmented, consisting of many small and medium-sized enterprises that mainly serve domestic markets.

Exhibit 4

TOTAL CAR PRODUCTION AND EXPORTS, 1999

Number of light vehicles produced*



* Exports as percentage of total sales

Source: CCFA, VDA

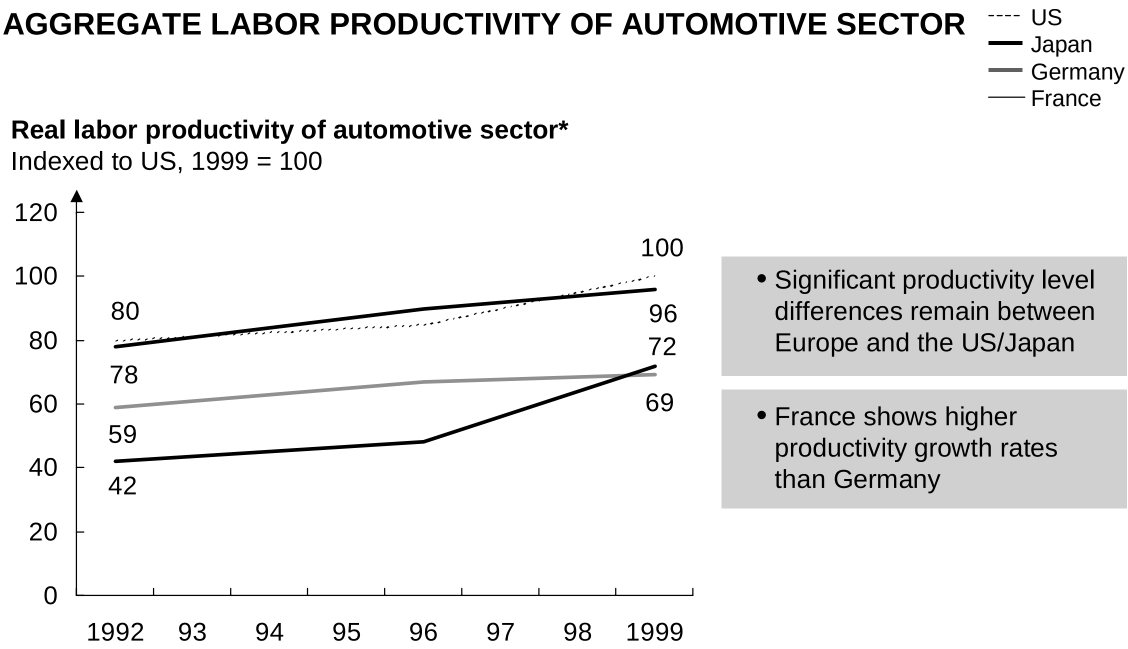
LABOR PRODUCTIVITY PERFORMANCE

From 1992 to 1999, France showed the highest annual productivity growth rate of the four countries with a 7.8 percent CAGR while the other three only managed 2 to 3 percent CAGR. This disparity was most evident from 1996 to 1999 when France grew at almost 15 percent annually, compared to 5 percent in the US and less than 2 percent in Germany and Japan. Japan and the US have followed similar productivity level trajectories, rising from 80 percent in 1992 to 100 percent in 1999 (Exhibit 5). German levels increased from 59 to 69 percent, whereas France jumped from just 42 to 72 percent of the US level in 1999 over the same time period.

Exhibit 5

AGGREGATE LABOR PRODUCTIVITY OF AUTOMOTIVE SECTOR

Real labor productivity of automotive sector*
Indexed to US, 1999 = 100



- Significant productivity level differences remain between Europe and the US/Japan
- France shows higher productivity growth rates than Germany

* Years between 1992, 1996, and 1999 interpolated
Source: INSEE, Statistisches Bundesamt, US Census Bureau, Census of Manufacturers Japan

Given these figures, two questions arise:

¶ Why has labor productivity grown so much faster in France than it has in Germany, especially since 1996?

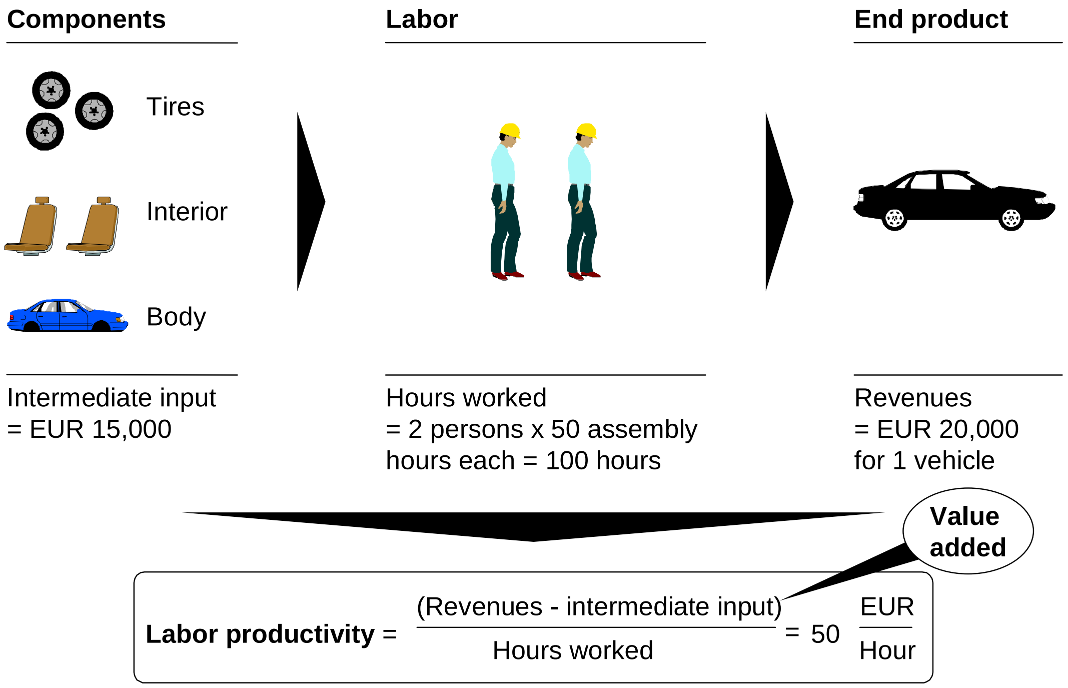
¶ Why is labor productivity at the end of the 1990s still so much higher in the US and Japan than in Germany and France?

Value added per hour worked was used as the labor productivity measure. The value added is calculated from the revenues minus the intermediate input, which comprises the services and goods bought from all kinds of suppliers. Therefore it includes components bought from suppliers, R&D services from engineering providers, as well as operating costs, for example, for electricity (Exhibit 6).

Exhibit 6

LABOR PRODUCTIVITY MEASUREMENT

EXAMPLE: OEM

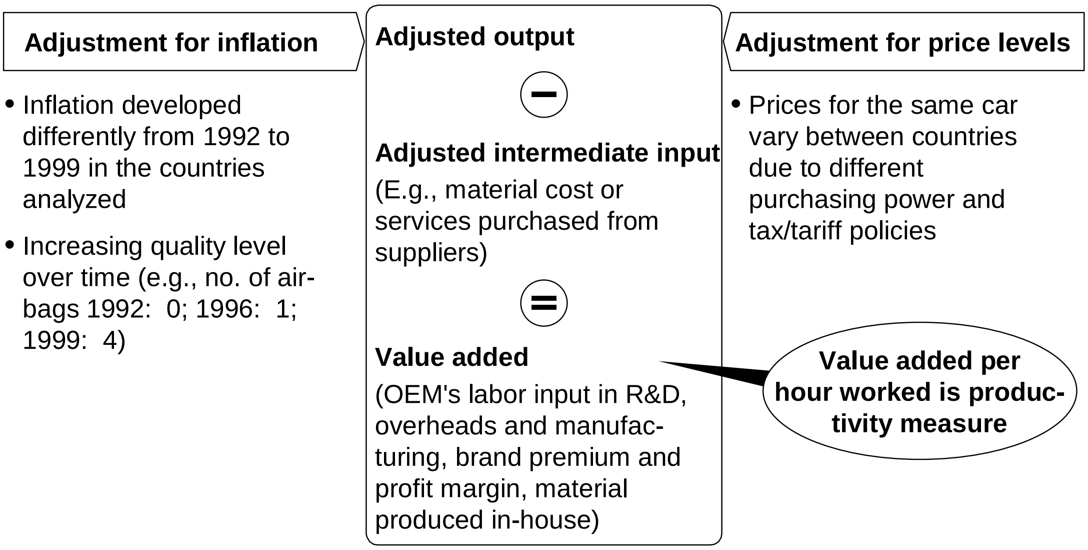


Source: MGI analysis

The value-added measure has two advantages over vehicles produced per employee or a similar physical output productivity measure: It gives a holistic view of productivity beyond manufacturing and enables an adjustment for all out-of-sector interdependencies which is not possible when physical output measures are used, such as the number of vehicles produced. To provide comparable results for productivity performance over time and across countries, adjustments to the raw data, i.e., the official national statistics, have been made (Exhibit 7). Nominal time series of revenues and intermediate input were deflated so that the real changes of monetary values reflect only quality improvements over time independent of inflationary price changes. A vehicle's quality is defined as the level of customer satisfaction along various dimensions such as performance, fuel efficiency, active/passive safety, etc. As the deflators provided by the national statistical agencies do not reflect product quality changes at a satisfactory level over time, the MGI devised its own quality-adjusted deflator for France and Germany. Furthermore, varying net price levels in the countries due to different purchasing power and different consumption tax policies were taken into account, using producer-based purchasing power parity (PPP). More details concerning the methodology can be found in the appendix.

Exhibit 7

APPLIED DATA ADJUSTMENTS



Source: MGI analysis

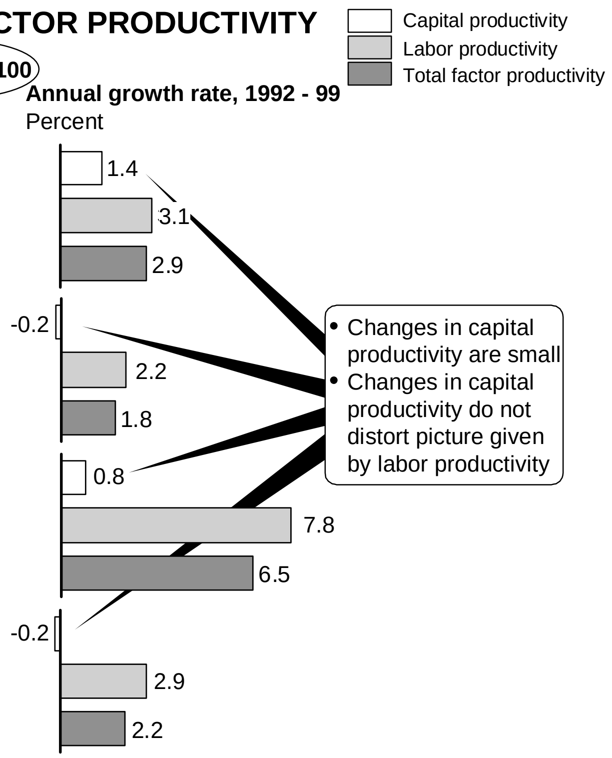
Changes in labor productivity might come at the cost of capital productivity. However, for the period under analysis, capital productivity changed only marginally and had minimal impact on total factor productivity (TFP), as capital inputs account for 20 percent of the total factor costs (labor and capital). As a consequence, TFP growth rates follow labor productivity growth rates. Labor productivity is therefore a good proxy for the overall productivity development of the sector (Exhibit 8).

Exhibit 8

CAPITAL, LABOR, AND TOTAL FACTOR PRODUCTIVITY

Index 100 = US level 1999

	Productivity	Levels 1992	Levels 1999 (US, 1999 = 100)	Annual growth rate, 1992 - 99 Percent
US	Capital	91	100	1.4
	Labor	80	100	3.1
	Total factor*	82	100	2.9
Germany	Capital	59	58	-0.2
	Labor	59	69	2.2
	Total factor*	59	67	1.8
France	Capital	41	43	0.8
	Labor	42	72	7.8
	Total factor*	42	65	6.5
Japan	Capital	76	70	-0.2
	Labor	78	96	2.9
	Total factor*	78	90	2.2



* Total factor productivity (TFP) = Capital productivity$^{(1-\alpha)}$ x Labor productivity$^{\alpha}$; $\alpha = 0.8$

Source: INSEE, Statistisches Bundesamt, US Census Bureau, Census of Manufacturers Japan, MGI analysis

DRIVERS OF LABOR PRODUCTIVITY GROWTH

From 1996 to 1999, the French automotive industry was able to increase its labor productivity by almost 15 percent a year while in Germany the annual labor productivity growth rate was only 1.5 percent.

Firm-level factors

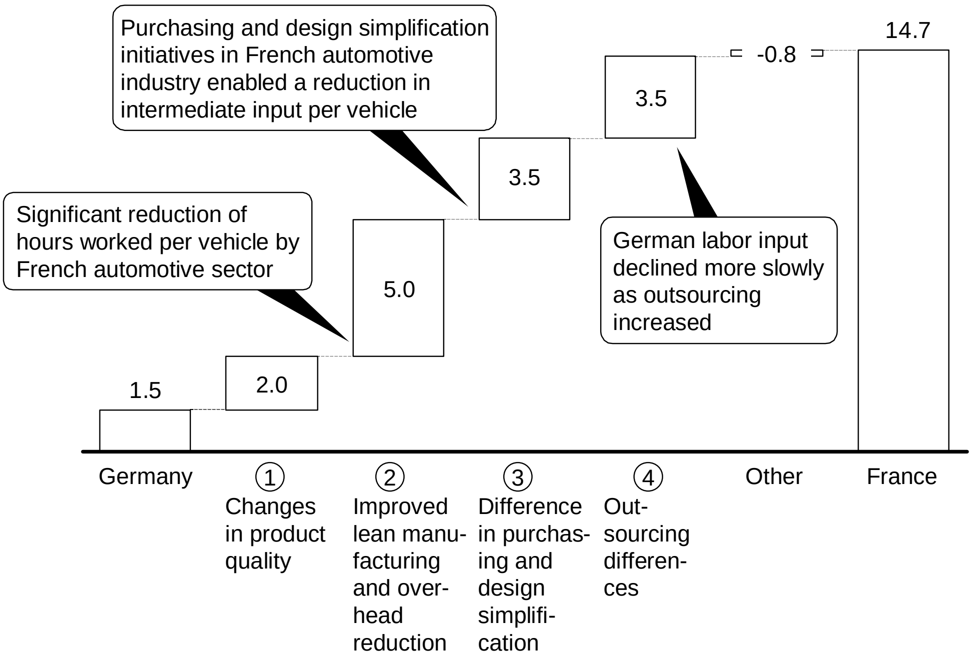
France's rapid growth of 14.7 percent annually from 1996 to 1999 can be attributed to developments in four particular operational areas with interesting comparisons to be made with German growth over the same period. The four areas are product quality, lean manufacturing and overhead reduction, purchasing and design simplification, and outsourcing behavior (Exhibit 9).

Exhibit 9

LABOR PRODUCTIVITY GROWTH DIFFERENCES FRANCE vs. GERMANY, 1996 - 99

ESTIMATE

Percent CAGR

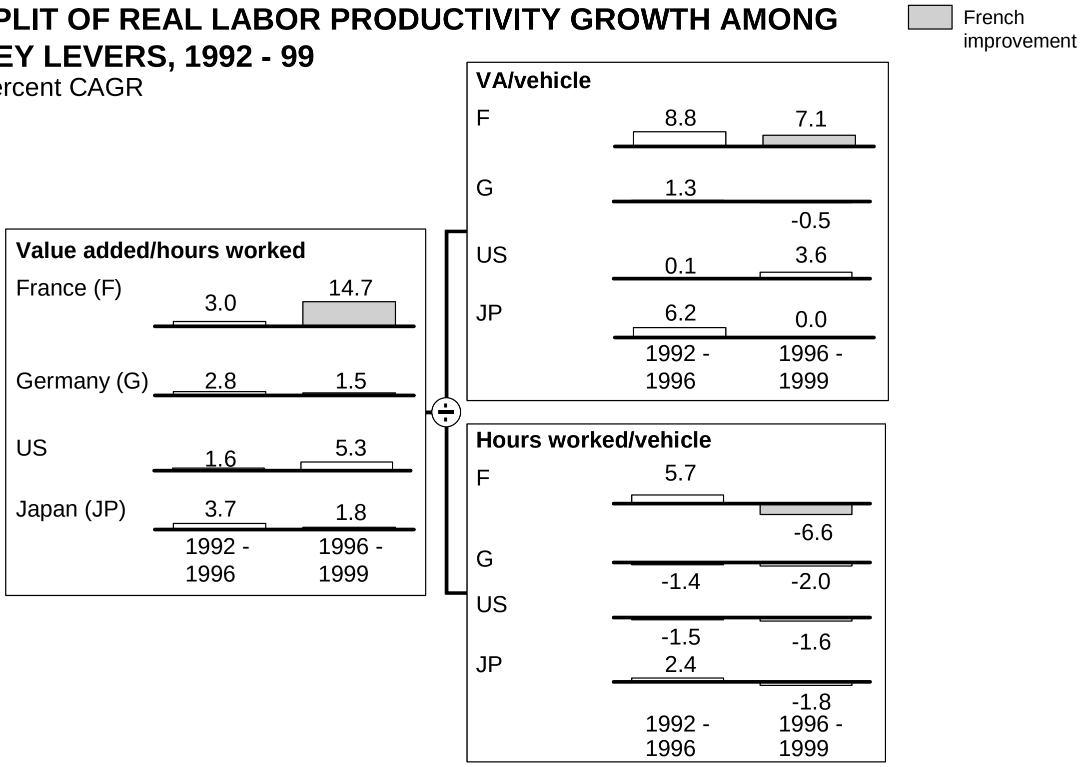


Source: INSEE, Statistisches Bundesamt, MGI analysis

As a result of developments in these areas, the French automotive sector has been able to reduce its labor input per vehicle substantially while increasing the value added per vehicle (Exhibit 10). The German automotive sector has not been as successful in achieving this and lags France's growth by 13 to 14 percentage points.

Exhibit 10

SPLIT OF REAL LABOR PRODUCTIVITY GROWTH AMONG KEY LEVERS, 1992 - 99
Percent CAGR



Source: INSEE, Statistisches Bundesamt, US Census Bureau, Census of Manufacturers Japan, MGI analysis

Product quality. France was able to partially catch up with Germany in terms of product quality. French cars benefited from the increasing penetration of new safety and comfort features compared to German cars where the penetration level was already advanced in 1996. For example, in 1999 ABS was standard equipment for compact class cars in both countries (e.g., Renault Megane, Audi A3). In 1996, however, it was generally an optional extra in French compact cars while German OEMs were already offering it as standard equipment.

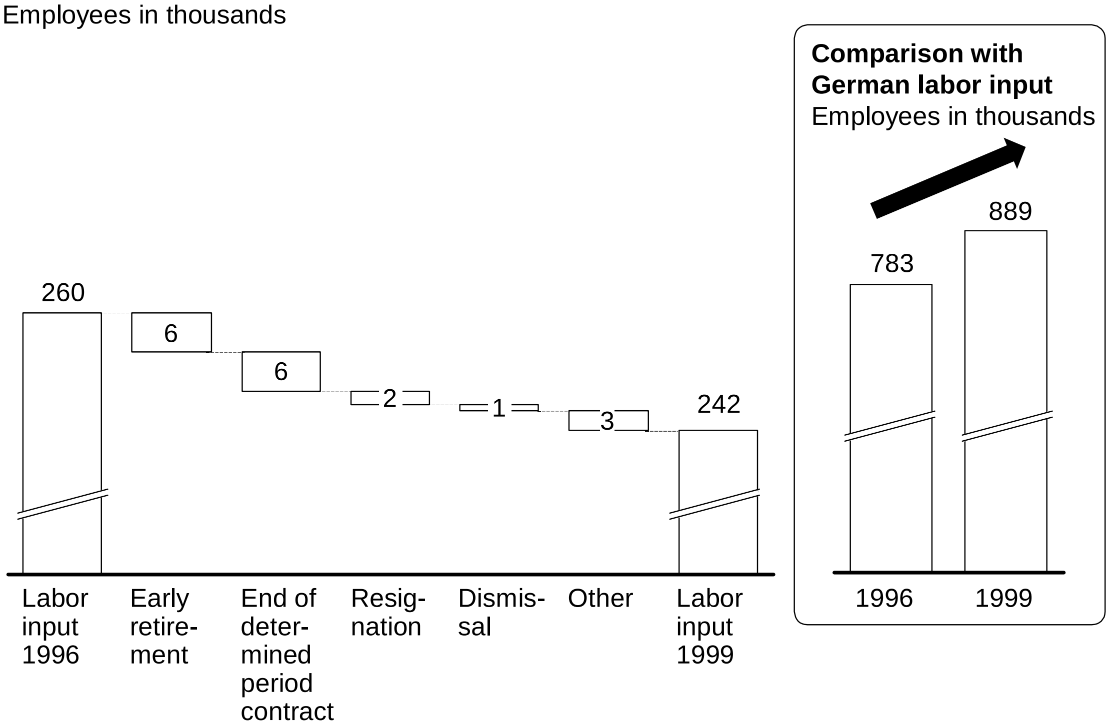
Lean manufacturing and overhead reduction. French OEMs and suppliers introduced lean manufacturing practices to their production and assembly plants during this period. PSA, for example, started to reorganize its plants by platforms; so one plant is dedicated to one platform only. Labor hours worked per car in France fell from 152 in 1996 to 124 in 1999 – a 6.6 percent annual decline compared to a mere 2 percent decline in Germany. The relatively small German decline was triggered by increased outsourcing while French outsourcing levels remained constant, as is discussed below.

In France, the managerial influence of new senior managers and CEOs of the two OEMs was very important in this context. The total reduction in labor force amounted to about 20,000 people (7 percent), even though the sector's output rose during that time. The labor reduction was implemented by introducing large-scale early retirement plans and ending fixed-term contracts. Meanwhile, in Germany, the sector grew by more than 100,000 people or 14 percent (Exhibit 11).

Exhibit 11

FRENCH AUTOMOTIVE LABOR INPUT REDUCTIONS, 1996 - 1999 ESTIMATE

Employees in thousands



Source: INSEE, Ministère de l'Emploi, Statistisches Bundesamt, annual reports

Purchasing and design simplification. France has moved further than Germany in reducing the intermediate input per vehicle. French OEMs have undertaken heavy cost-cutting programs over recent years and achieved savings of up to 8 percent per year. Material costs fell due to lower prices that do not affect productivity, but also thanks to design simplification (in-house and with their suppliers) affecting labor productivity positively. This category explains 3.5 percentage points of the growth difference between France and Germany.

Outsourcing differences. In France, there was no significant change in outsourcing levels between 1996 and 1999 but in Germany there was an increasing trend to outsource, thereby reducing the extent of vertical integration. This can be seen from the fall in value added per revenues to 87 percent of the 1996 level by 1999. However, labor input did not fall by the same level, dropping to just 94 percent of 1996 levels. The problem facing the German automotive industry was that the increase in outsourcing increased the need for coordination and, therefore, the industry could not reduce its labor in line with the decline of vertical integration. Therefore, the German outsourcing strategy was actually at the expense of productivity growth and the resulting disadvantage is 3.5 percent of annual productivity growth.

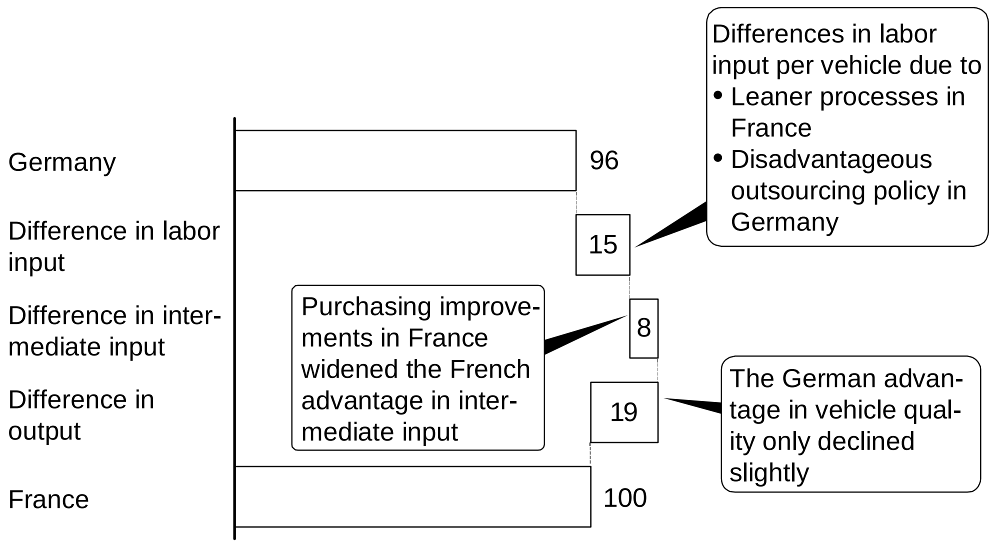
Level comparison. Comparing the productivity levels of the two European countries shows that France has not only grown fast but by 1999 it reached a productivity level 4 percent above the German level. To a large extent, this was a catch-up process, but France has a definite performance advantage in labor input and cost structure in general, while the German strength is on the output side with increasing vehicle sales (Exhibit 12).

Exhibit 12

LABOR PRODUCTIVITY LEVEL DIFFERENCES, FRANCE vs. GERMANY, 1999

Index 100 = French level 1999

ESTIMATE



Source: MGI analysis

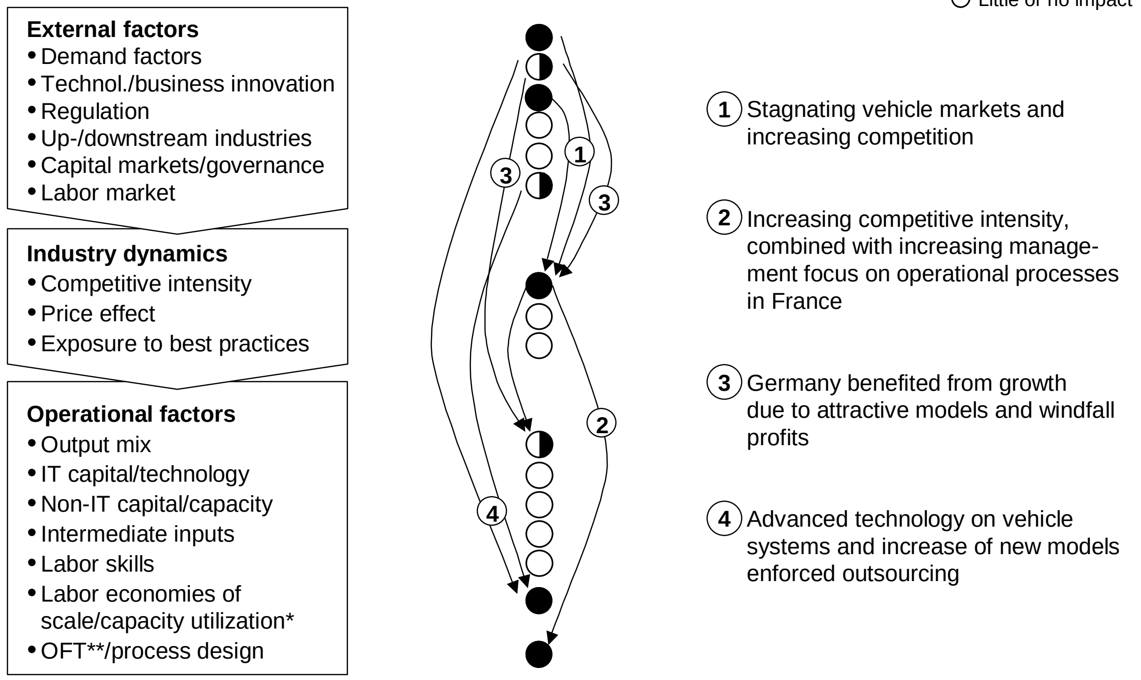
Industry-level and external factors

The automotive industry has business cycles of about five years, so the external factors prompting these differences in operational factors date back to the beginning of the 1990s. At this time, the Japanese OEMs were posing a strong threat to the automotive industry in other countries. Their lead in productivity of 30 percent, their gain of market share over the Germans in the US – even in upscale markets –, and the discussions underway in the EU concerning the lifting of import limitations for Japanese cars all stimulated the French and German automotive industries to improve their competitive position. However, the strategic direction was quite different in the two countries (Exhibit 13).

Exhibit 13

CAUSALITY OVERVIEW FOR PRODUCTIVITY GROWTH DIFFERENCES – COMPARISON OF FRANCE AND GERMANY

● High impact
◑ Moderate impact
○ Little or no impact

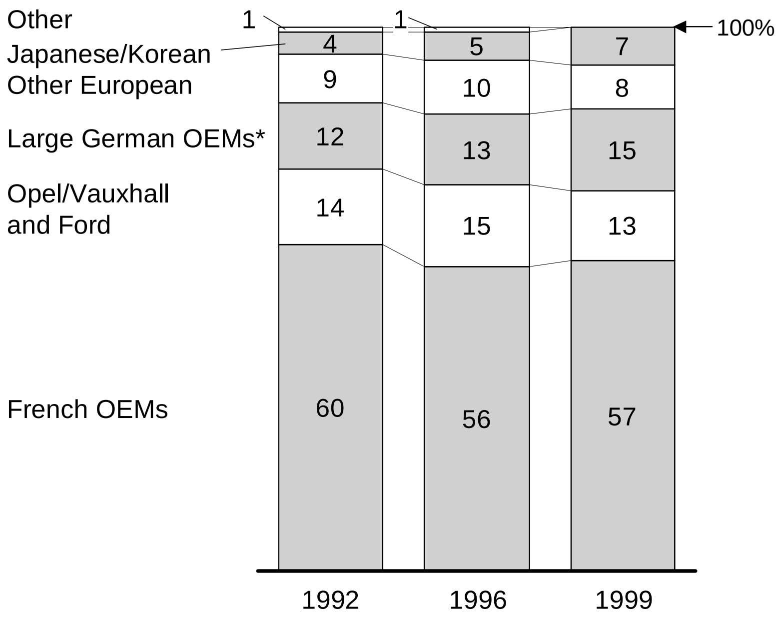


* Various effects cancel each other out
** Organization of functions and tasks
Source: MGI analysis

France. The French automotive industry was facing dwindling market shares, especially in its most important markets: France and Spain. In France, for example, PSA and Renault lost 3 percentage points of their market share, while German OEMs (Volkswagen Group, Mercedes-Benz/Smart, BMW) increased theirs from 12 to 15 percent and Japanese/Korean OEMs from 4 to 7 percent. Even if Japanese OEMs could not use their full allotment of import quotas before the expiry of import limits in 1999, they gained significant market share in markets traditionally dominated by the French (Exhibit 14). Similarly, in Spain, French OEMs' market share declined from 39 percent in 1992 to 35 percent in 1999.

Exhibit 14

MARKET SHARE OF OEMs IN FRANCE
Percent



* Mercedes-Benz/Smart, VW Group, BMW
Source: Marketing Systems

As a result of this intense competition, French vehicle production declined by 2.5 percent per year over the whole period from 1992 to 1999. This led to a fall in the profitability of French OEMs, in fact, Renault made a loss in 1995 and 1996. The industry had to react if it was to stay in business and was forced to introduce process efficiency improvements. This was strongly supported by a change of management at both French OEMs. The partial privatization of Renault also helped encourage leaner processes.

Germany. German OEMs, meanwhile, expanded their product portfolio and successfully released new models. This product strategy helped German OEMs increase their share in a stagnating European market. Outside Europe, Germany also benefited from windfall profits due to the advantageous exchange rate. The combination of an attractive product portfolio and a weakening German Mark enabled the strong growth of exports to the US and other markets.

The expansion of the product portfolio triggered an increase in outsourcing. In-house resources were scarce due to the product portfolio expansion and the need for more advanced technology forced OEMs and suppliers to draw on the knowledge of specialized companies. German OEMs are technology leaders to a greater extent than French OEMs and, therefore, this technology-driven outsourcing effect was more prominent in Germany. Furthermore, the pressure to release more models more quickly led to an increase in the outsourcing of engineering services and systems' production to suppliers. This outsourcing required an increase in the coordination between all the parties involved in R&D and production and, thus, did not lead to an adequate reduction of labor input.

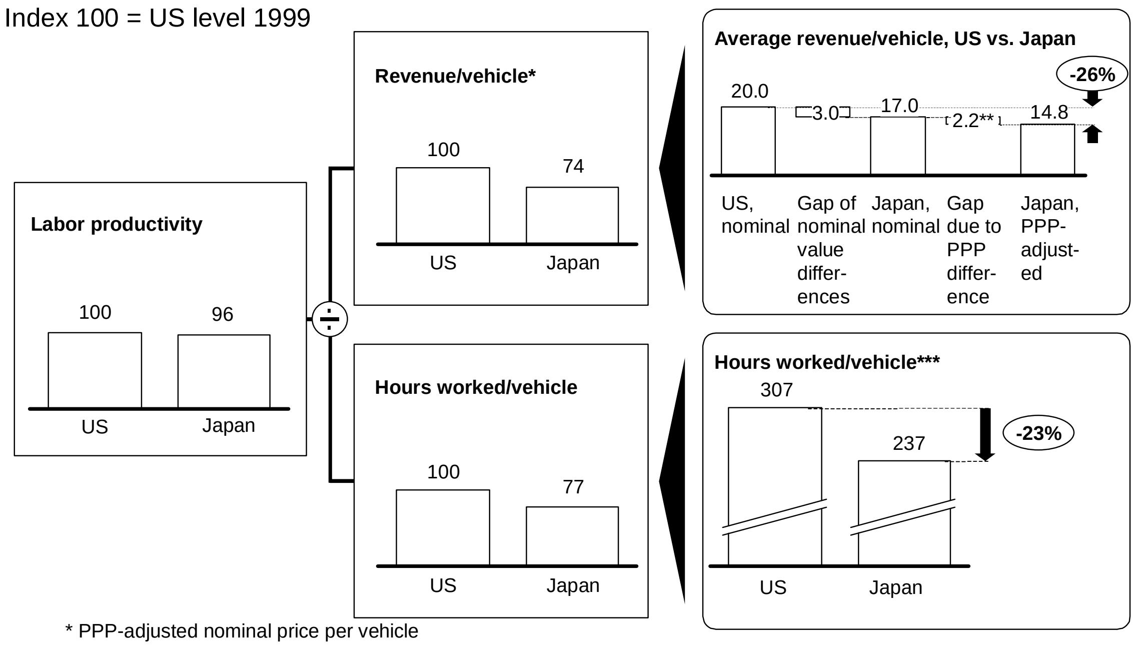
DRIVERS OF LABOR PRODUCTIVITY LEVEL DIFFERENCES

Even with France's strong productivity growth, French and German labor productivity in this sector is still far behind the benchmarks set by the US and Japan.

The fact that the US is slightly ahead (by 4 percent) of the Japanese "kings of operational excellence" in terms of productivity levels is – contrary to popular belief – not surprising. The US advantage comes from its more favorable product mix. While 50 percent of the US vehicles are high value-added and easy-to-manufacture light trucks, Japanese production focuses mainly on small cars that add less value. This difference in product mix meant that in 1999 the Japanese worked 23 percent fewer hours per vehicle but also created 26 percent less value per vehicle than the US. Overall, it leads to a 4 percent productivity disadvantage for Japan compared to the US (Exhibit 15).

Exhibit 15

IMPACT OF DIFFERENCES IN VEHICLE VALUE AND HOURS WORKED ON OVERALL LABOR PRODUCTIVITY DIFFERENCES, US vs. JAPAN, 1999



* PPP-adjusted nominal price per vehicle
** 15% price level difference between US and Japanese output
*** To create 100% of the vehicle value; assuming that industries supplying the automotive sector have same level of labor productivity

Source: US Census Bureau, Census of Manufacturers Japan, Japan Productivity Center, MGI analysis

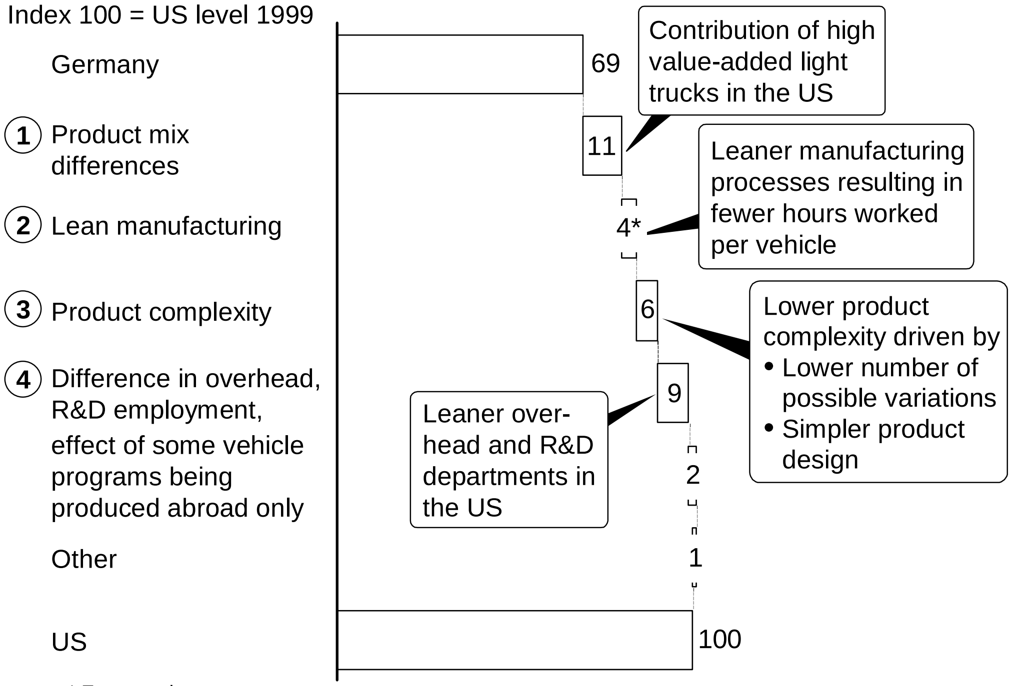
The analysis of Germany's 31 percentage point lag to the US suggests that the main causes lie in four operational areas: Product mix, lean manufacturing, product complexity, and leaner overhead and R&D departments (Exhibit 16). The situation in France is similar with a gap of 28 percentage points and similar root causes for the difference.

Exhibit 16

LABOR PRODUCTIVITY LEVEL DIFFERENCES – US vs. GERMANY, 1999

ESTIMATE

Index 100 = US level 1999



* Expert estimate

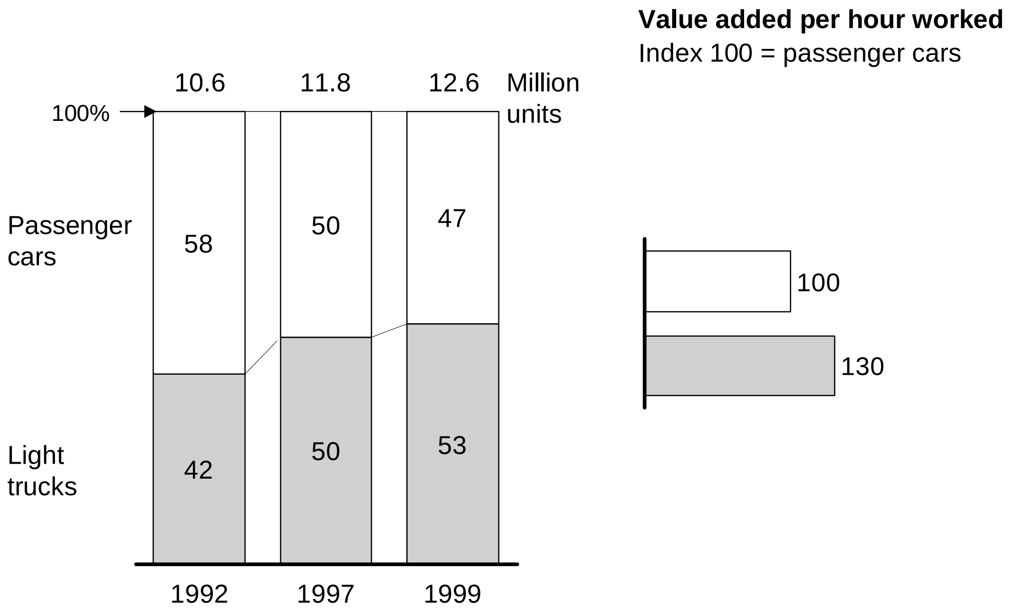
Source: Statistisches Bundesamt, US Census Bureau, MGI analysis

Firm-level factors

Product mix. The higher share of the light truck segment, especially sports utility vehicles (SUVs), means that US manufacturers can allocate more than half their vehicle output to this attractive segment of high value-added and easy-to-manu-facture products (Exhibit 17). European production, on the other hand, is focused on small and mid-sized vehicles that create significantly less value per car and are no easier to produce. This difference in product mix explains about 11 percentage points of the productivity level differences.

Exhibit 17

US LIGHT VEHICLE PRODUCTION, 1992 - 99
Percent



Source: DRI-WEFA, New York Times, VDA International Auto Statistics, MGI analysis

Product complexity. Vehicle programs in the US show less variety and less product complexity than in Germany. For example, if we count all feasible combinations of body variants, engines, colors, and optional equipment the Opel Vectra – a typical German mid-sized car – is offered in 5.8 million different variants, while the Ford Contour is offered in only 170,000 different variants. The impact of this is felt directly in the manufacturing labor input required and explains 6 percentage points of the productivity level difference.

Lean manufacturing. The US automotive industry has a long tradition of high competitive intensity and of broad exposure to Japanese manufacturing excellence which has led to leaner processes than in Europe. This can be seen in the shorter assembly times per vehicle. A US mid-sized car is assembled in about 25 hours, while a German car of similar size and quality needs 30 hours. Lean manufacturing explains 4 percentage points of the labor productivity difference between Germany and the US.

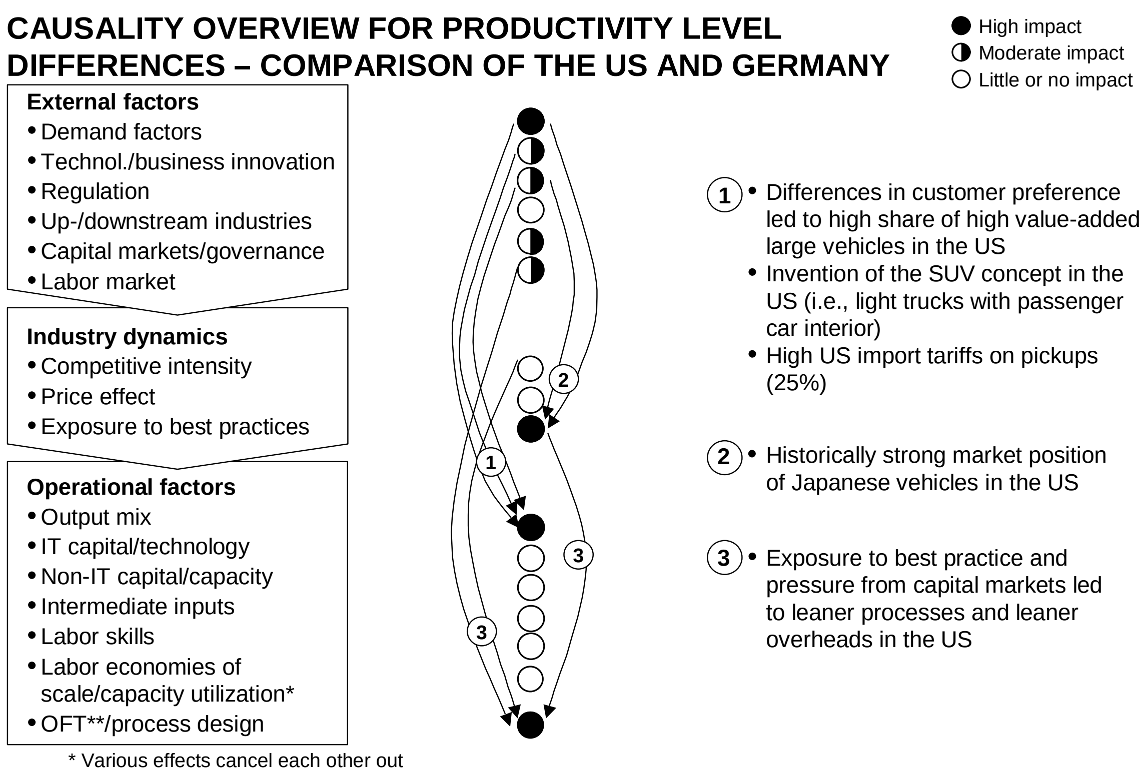
R&D and overhead employment. What holds true for lean manufacturing also holds for the R&D and overhead departments. The US has roughly twice as many shop-floor workers as Germany per white-collar employee. The leaner R&D and overhead explains about 9 percentage points of the level differences between the US and Germany.

In addition, many group functions of German-based OEMs are located domestically whereas the value is added in foreign markets. For example, Mercedes-Benz's M-class or the Smart are produced in the US and France, respectively, but large parts of the R&D, purchasing, marketing, and administration activities are based in Germany. So, while the value added contributes to US and French productivity, the labor input in Germany dampens the productivity level there. However, this effect explains only 2 percentage points of the productivity gap between Germany and the US.

Industry-level and external factors

These operational-level productivity differences between Germany and the US can be traced back to external factors and industry dynamics (Exhibit 18).

Exhibit 18



* Various effects cancel each other out
** Organization of functions and tasks
Source: MGI analysis

Demand. The boom in the light truck segment in the US was triggered by domestic OEMs developing new vehicle concepts that closely match US customer tastes (e.g., SUVs, mini-vans). External factors such as wide streets, low speed limits and affordable gasoline prices encourage consumers to drive large vehicles with a low level of technical sophistication. This is favorable for manufacturers as it means high revenues per vehicle while inputs remain low. Furthermore, the high

US import tariffs on pickup trucks (25 percent), which is the main group within the light trucks segment (39 percent of light truck sales in 1999), mean that the majority of light trucks are produced locally and, therefore, by definition contribute only to the US productivity figures.

Competitive pressure. The lean operational factors date back to the traditionally higher competitive intensity in the US. During the 1970s, the energy crisis, the low fuel efficiency of US cars, and an absence of import quotas helped the Japanese establish a strong position in the US market – they hold about 30 percent of the US market but only 11 percent in the EU – and exert pressure on the domestic OEMs.

The Japanese automotive industry could not penetrate the European market as deeply as the US market. This was linked to the strict import quotas, the similar positioning of Japanese and European cars, and similar levels of fuel efficiency. Furthermore, Japanese OEMs did not respond quickly to the increasing European demand for direct-injection diesel engines and advanced safety features. As a consequence, their market position in Europe and their pressure on European OEMs remains much lower.

Capital markets. The markets pay more attention to automotive operational excellence in the US than in Europe which, in turn, pushes lean overhead more forcefully in the US. The greater capital markets' pressure can also be seen in the differences in profitability levels. Some German OEMs, for example, have underperformed for years with only minimal pressure coming from shareholders. This is a result of the German stakeholder model, in which half of the seats in the supervisory board are under the control of unions and employees. As a consequence, no German board member can be elected without the approval of the employees, suggesting that managers who might seek to reduce the workforce will struggle to be elected.

In 1997, US domestic automotive operations showed an operating profit of 11 percent while the equivalent in Germany was just 2 percent[1] (Exhibit 19). Labor costs account for the majority of this difference, with the US enjoying labor costs 4 percentage points lower than Germany. This is due to both lower hourly labor costs in the US and higher labor productivity.

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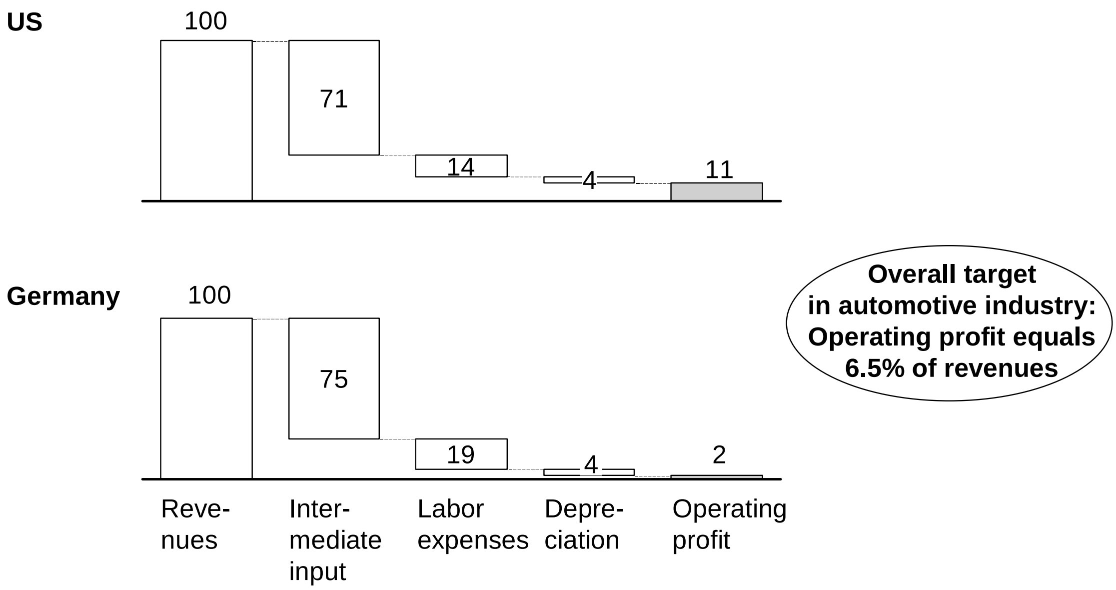
[1] The figures for operating profit are country averages for OEMs operating in the US and Germany, respectively. In general, there is a difference between the profits of mass and premium manufacturers, the latter being more profitable.

Exhibit 19

REVENUE BREAKDOWN OF AVERAGE GERMAN AND US OEMs ESTIMATE*

Percent



* Based on 1997 financial figures of German and US OEMs

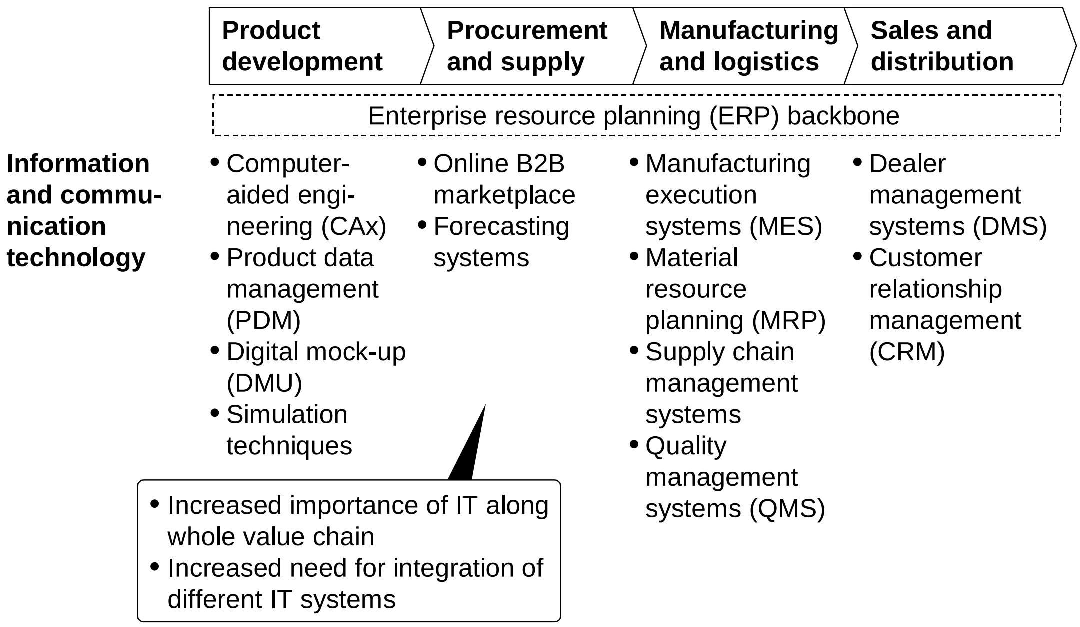
Source: German/US OEM financial reports, national accounts, MGI analysis

THE ROLE OF IT

For the purposes of this report, IT in the automotive sector refers to techniques to process or generate information, i.e., computer-aided engineering in product development, online marketplaces in procurement, quality management systems in manufacturing, and dealer management systems in distribution. Automation equipment in R&D, manufacturing and assembly is excluded (Exhibit 20).

Exhibit 20

APPLICATIONS OF IT ALONG THE AUTOMOTIVE PROCESS CHAIN



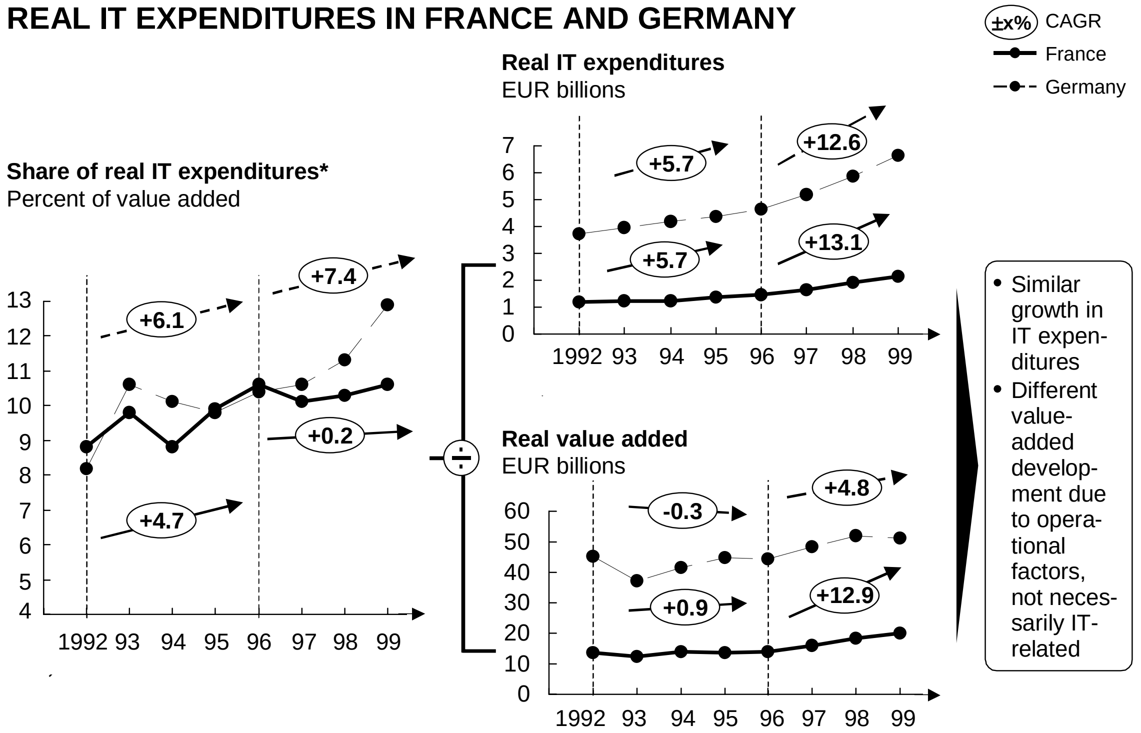
Source: MGI analysis

There was no evidence that cross-country productivity differences were caused by varying degrees of IT diffusion. Neither the growth differences between France and Germany nor the level differences between Germany and the US can be explained by significant differences in IT investments or use. However, IT was important for the growth and enabled some of the changes, such as those driven by lean manufacturing, improved processes in R&D, and reduction of procurement costs. The introduction of crash tests or engine calibration in R&D is an example of how physical tests could partly be replaced, reducing testing time as well as test material.

French and German IT expenditures show similar developments, with annual growth of 13 percent from 1996 to 1999 (Exhibit 21).

Exhibit 21

REAL IT EXPENDITURES IN FRANCE AND GERMANY



* Real (geometric average using real numbers with base years 1992 and 1999, resp.), not PPP-adjusted

Source: PAC, INSEE, Statistisches Bundesamt, MGI analysis

The main focus of IT investments was not on productivity growth, although they can still make an impact. For example, IT that helps material resource planning or scheduling also helps improve capital productivity. Furthermore, online car-configurators, build-to-order initiatives or expansion of after-sales services are IT investments not intended to raise labor productivity but rather to stabilize or increase profitability (Exhibit 22).

Exhibit 22

GOALS AND OBSERVED IMPACT OF IT IN AUTOMOTIVE

● High impact
○ No impact

Main goals	IT initiatives	Increase in productivity*: Labor	Increase in productivity*: Capital	Increase or stabilization of profitability*	Evaluation of possible overinvestment and future potential
Operational excellence	• E-procurement	◔		◑	• Only small overinvestment as labor savings not always realized and processes partly unchanged, especially for PDM. Future potential remaining
	• Simulation techniques in R&D	●	◕	◑	
	• CAx	●	◕	◑	
	• PDM for data exchange	◑	◔	◔	
	• ERP	◔	◔	◔	
	• MRP	◑	◑	◕	
	• Scheduling software/systems	◑	◑	◕	
Effective-ness of marketing/ sales force	• Online presence for marketing			◔	
	• Online car configurator	○		◔	• Future potential if linked with other initiatives (e.g., build-to-order)
	• CRM	◔		○	
New prod-ucts, ser-vices and business	• Build-to-order (network marketing, manufacturing and sales)	◔	◔	◑	• Only a few OEMs have implemented high future potential with synergies for different process steps
	• Expansion of after-sales services	○	○	◕	
Renovation	• PC upgrade	◔		◔	• Medium overinvestment for PC upgrades probable as benefits not quantified
	• Software upgrades (CAx)	◑	◑	◑	• Only minor overinvestments possible at CAx upgrades as new releases in-troduced valuable new functionalities
Regulatory require-ments	• Y2K				• Overinvestment possible as scope not carefully managed, requirements could be fulfilled with less effort, no future potential

* Cost of IT investment not included
Source: Expert interviews, MGI analysis

The effects of IT in the automotive industry will be noticed more clearly in the future, because some investments have yet to pay off completely. For example, in e-procurement, most companies introduced catalog transactions and some of them use transaction support such as auctions. But implementation in terms of strategic decision support, e.g., by multi-supplier benchmarking, is still to come. These measures will have a high impact on the reduction of product costs and require organizational changes. However, one objective in e-procurement, the price reduction for parts will not influence labor productivity as pure price changes are taken out by the deflator. Today, different companies in the automotive sector have quite different IT investment and deployment strategies, which was beyond the scope of this study. The differentiation between corporate strategies is, in fact, sharper than between countries.

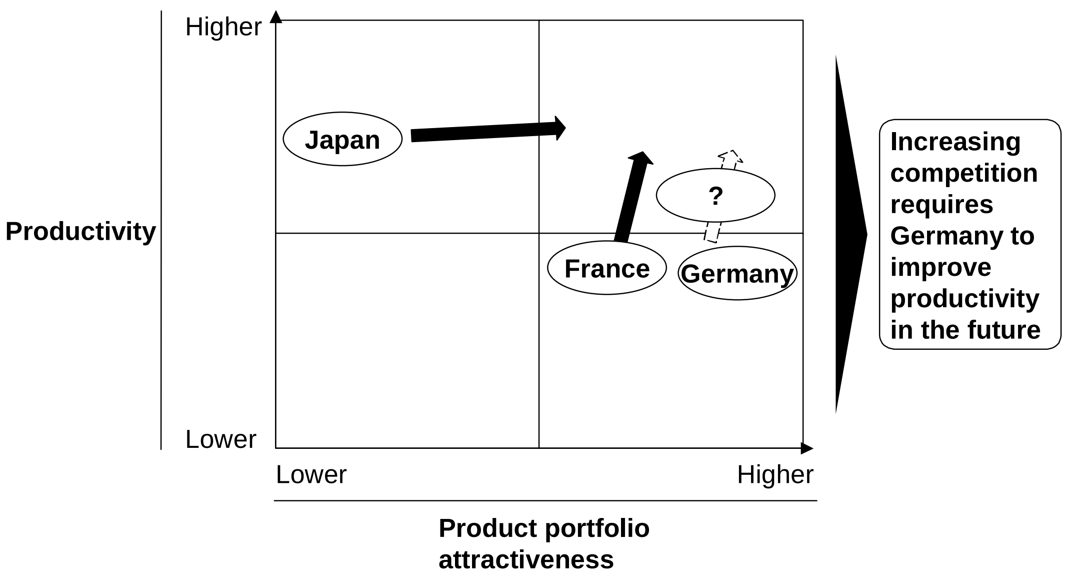
OUTLOOK AND RECOMMENDATIONS

During the 1990s, the German automotive industry's product-oriented growth strategy was quite successful and it regained market share from the Japanese. However, Japanese OEMs learned from the past and are catching up in technologies that they once lagged behind in. In addition, they are investing in new plants in Europe (like the new Toyota Yaris plant in Valenciennes) and designing vehicles more suited to European taste – not only in size but also in design and technology.

But the increased competition for the German automotive industry is not just coming from outside Europe. Next door in France, PSA announced it would increase its product efficiency further by reducing the number of platforms down to just three, and Renault is trying to move into higher-value segments with the new Vel Satis and Avantime models. Supported by an attractive, fresh product line, French OEMs have gained market share since 2000. Therefore, German OEMs will no longer be able to focus only on product attractiveness. Instead, they will have to work on significant productivity improvements (Exhibit 23).

Exhibit 23

OUTLOOK



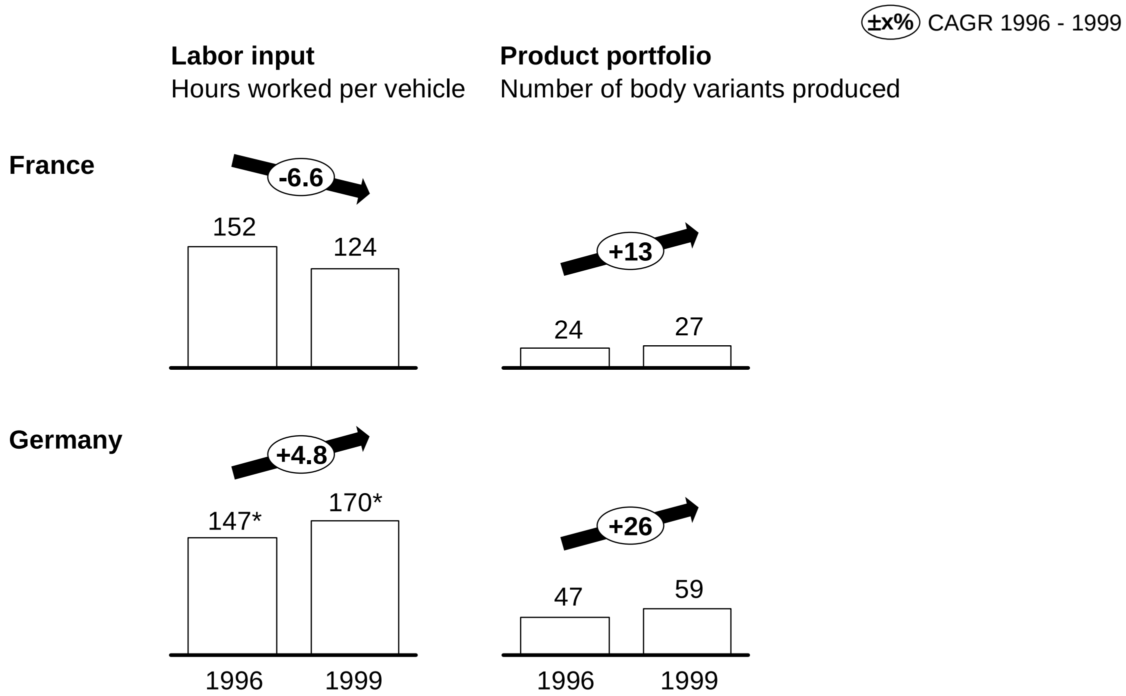
Source: Press clippings, MGI analysis

Not that the French can sit back and relax after a decade of rapid growth. They face a challenge if they are to continue on the steep trajectory of the late 1990s. They still have a 30 percent productivity gap to US or Japanese levels in both operational effectiveness and product attractiveness but they are on the right path with the new models released recently, like the Peugeot 307.

The automotive market in Western Europe will remain stagnant, but growth will be possible in emerging markets. To gain market share and squeeze out competitors, automotive companies need to find a compromise between a highly customer-focused approach and the increased standardization of platforms, modules, and parts that helps ensure efficient processes. The success of the SUV segment and other new vehicle concepts demonstrates the importance of developing new product categories that can kickstart demand even in the stagnant markets. Measures such as build-to-order (BTO) will also gain importance. However, German OEMs in particular should be cautious not to overstress such concepts at the cost of process efficiency as they have done in the past (Exhibit 24). Increasing the number of shared modules and components between different models and introducing more efficient processes for collaborating with suppliers will enable them to be profitable even with small-scale niche models and to increase labor productivity. Another jump in labor productivity can be accomplished if innovative labor models evolve that allow OEMs to match demand fluctuations through the flexible use of labor.

Exhibit 24

DECREASE IN LABOR INPUT vs. INCREASE OF PRODUCT PORTFOLIO



* Adjusted for same outsourcing ratio as in France

Source: INSEE, Statistisches Bundesamt, MGI analysis

IT will play an increasingly important role and may lead to differentiating effects between countries in terms of productivity growth. For example, only European OEMs have started to implement measures to produce BTO cars. They can integrate BTO with other IT systems such as an online car-configurator and combine them with radical process changes, which will significantly reduce lead times between order entry and delivery to the customer and will, therefore, have a positive impact on productivity.

It is not yet clear whether Europe will be able to get closer to US and Japanese productivity levels. The importance of productivity will certainly increase due to the stagnating or low-growth world market and as less room is available for further growth through niche models or categories.

Furthermore, the EU market is still protected by a 10 percent tariff on vehicles imported from the US or Japan, which partly compensates European OEMs for their productivity shortcomings. Reducing these tariffs would certainly put more pressure on German and French OEMs to catch up with US and Japanese productivity. But even if Europeans put more effort into productivity improvement, some gaps to the US will remain due to structural differences in the market.

US manufacturers, however, provide another lesson. Even though they accomplish high productivity levels domestically, labor productivity at their German plants is below the level achieved by German OEMs. One problem is that the US manufacturers' products are perceived as less attractive in Europe, leading to a declining market share and, therefore, increasing overcapacity. This shows that a focus on process improvements *and* high quality products is needed. The French and German automotive sectors have the capacity to achieve both.

APPENDIX: METHODOLOGY

The advantage of the value-added concept is that, unlike physical output measures, only a few data adjustments have to be made. The value added automatically accounts for different degrees of vertical integration, for OEMs' and suppliers' output, and for all categories of flows of goods.

Nevertheless, the value-added measure still needs to be deflated in a dynamic analysis to make figures from different years comparable. The official deflators, especially the German one, are unsatisfactory because they do not account for quality improvement over time. Therefore, MGI developed a quality-adjusted deflator. For Japan and the US, the official deflators were used. After deflating the data, they were adjusted for purchasing power parity to eliminate the effect of different factory-gate price levels for different countries of sales and to standardize the price ratios between two vehicles in different markets (Exhibit 25).

Exhibit 25

METHODOLOGICAL APPROACH – AUTOMOTIVE

		Suggested approach	Rationale
Output	**Basis for output measure**	• Value added	• Adjustment of physical output measures for all interdependencies with industries outside the sector not possible
	Definition of products and services in output measure	• Value added of OEMs and suppliers	• OEMs and suppliers cover 95% of the total automotive sector GVA • Due to increased outsourcing, the whole value chain has to be analyzed
	Applied adjustments	• Deflating of VA for France and Germany by own quality-adjusted deflator developed by McKinsey team	• Quality improvement of vehicles over time taken into account in different ways between France and Germany
	Applied PPPs*	• Calculation of factory-gate price level, assuming that total output is sold in base country** • Aggregation of relative factory-gate prices between different base countries	• Elimination of different sales split effect • Minimization of effect that price ratios between different categories vary in different countries of sale
Input	**Basis for labor input**	• Total hours worked for OEMs and suppliers	• Detailed labor input data available

* Purchasing power parity
** Country to which factory-gate prices are indexed
Source: MGI analysis

Deflator

The deflator is based on criteria that measure customer satisfaction. Customer satisfaction is measured along seven dimensions, and for each one an easy-to-measure criterion quantifies that satisfaction. For example, the level of customer satisfaction in terms of passive safety is measured by the number of airbags per car; average fuel consumption is used to measure satisfaction in terms of environmental impact/running cost, while horsepower measures performance. Prices were used to assign relative weights to the criteria. This approach was then applied to up to five reference models per vehicle category (six categories in total), and weighted according to the production volume. The deflator was built using 1999 as base year (Exhibit 26).

Exhibit 26

HEDONIC DEFLATOR FOR LIGHT VEHICLES IN EUROPE

Customer value	Vehicle criteria	Price used[1]
Passive safety	• No. of airbags per car	• Market price airbag[2]
Active safety	• Percentage of new cars with ABS	• Market price ABS
Environment/ running costs	• Average fuel consumption	• Savings of gasoline over vehicle lifetime if vehicle consumes less fuel
Performance	• Horsepower	• Price increment per horsepower[3]
Comfort	• Percentage of new cars with air conditioning system	• Market-price air conditioning system[4]
Space	• Wheelbase	• Price of space estimated based on price and wheelbase differences between adjacent vehicle classes[5]
Level of individualization	• Percentage of niche models	• Price premium of niche model

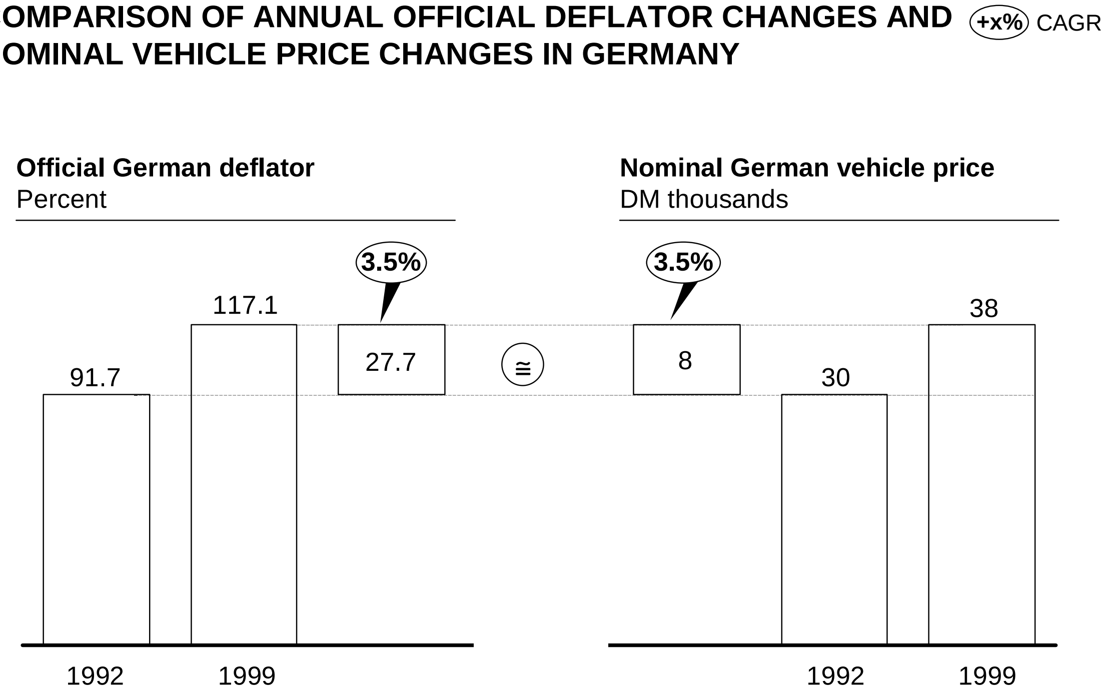
1 To assign relative weights to vehicle criteria
2 Average price neglecting the price differences between frontal, side, and head airbags
3 Measured as price difference between two different engine versions of the same model with identical equipment
4 Neglecting differences between manual and automatic air conditioning systems
5 Assuming that price differences between adjacent vehicle classes are only due to more advanced equipment and additional space availability

Source: MGI analysis

For France, this deflator is in line with the official deflator, which is not the case for Germany. In Germany, price and changes in quality negate each other and the result is a similar real price for a 1999 and 1992 car. But the official German deflator incorporates only price changes and completely neglects the quality effects that have had a major impact over the time span analyzed. The official deflator shows a 1999 car as 27 percent more valuable than in 1992, which represents only the difference in nominal prices (Exhibit 27).

Exhibit 27

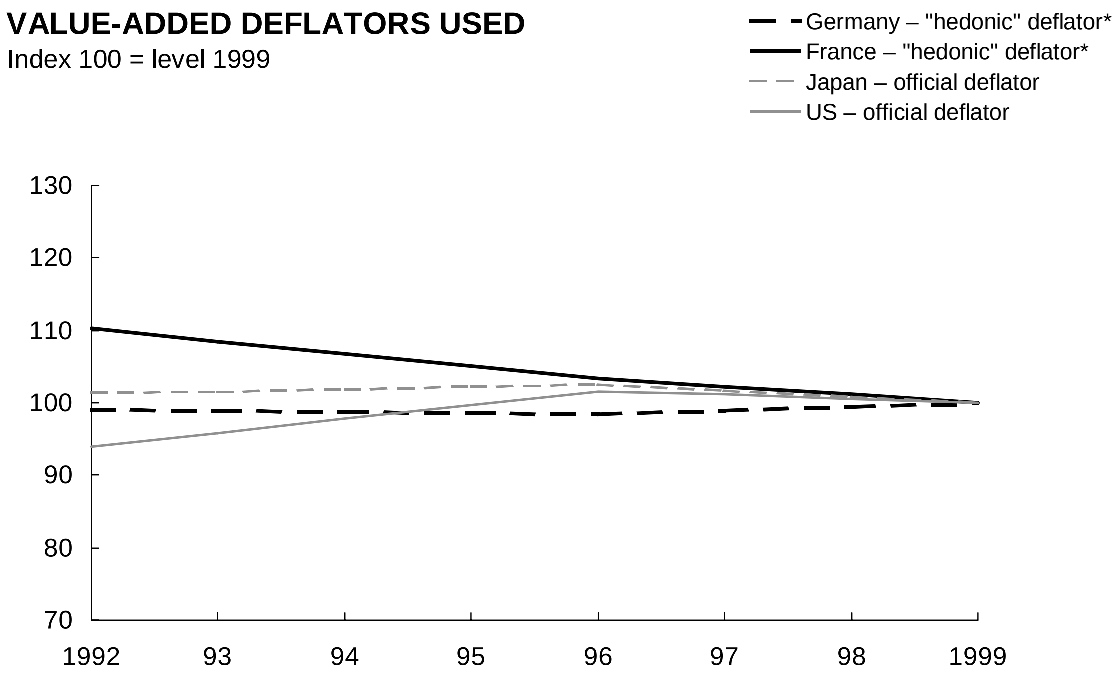
COMPARISON OF ANNUAL OFFICIAL DEFLATOR CHANGES AND NOMINAL VEHICLE PRICE CHANGES IN GERMANY



Source: Statistisches Bundesamt, Auto-Katalog, DRI, MGI analysis

The MGI deflator for Germany shows a similar trend to the official deflators for Japan and the US. For France, the trend of the MGI deflator is different but in line with the official French deflator (Exhibit 28).

Exhibit 28



* Calculated for the years 1992, 1996, and 1999; interpolated for other years

Source: INSEE, Statistisches Bundesamt, US Census, Census of Manufacturers Japan, MGI analysis

Purchasing Power Parity (PPP)

The objective of the PPP adjustment was to make the output of different countries comparable, as German, French, Japanese and US production is sold at different price levels. For example, the Mercedes C280 was sold in Germany at EUR 25,600 in 1999 but at EUR 24,900 in the US. Furthermore, the relative price differences between cars vary: In Germany, the Mercedes C280 is 27 percent more expensive than the Chrysler Voyager 3.3V6SE; the difference is 50 percent in the US.

Therefore, a producer perspective needs to be taken and the most relevant measure is factory-gate price in the country of sale because OEMs adjust their prices based on local conditions such as taxes, tariffs, and average salaries. This means that the factory-gate price in country A with high taxes or import tariffs is lower than in country B with low taxes or no tariffs. The sales in country A should then be valued upwards to make them comparable to the sales in country B.

The MGI-developed PPP methodology eliminates the differences in factory-gate price levels between different countries of sales and then converts them into factory-gate price levels of a commonly selected reference country (Exhibits 29 and 30). The factory-gate price obviously depends on the reference country selected.

Therefore, a weighted average for the factory-gate prices in all reference countries (France, Germany, Japan, US) was calculated according to the market size (in terms of numbers of units sold).

Exhibit 29

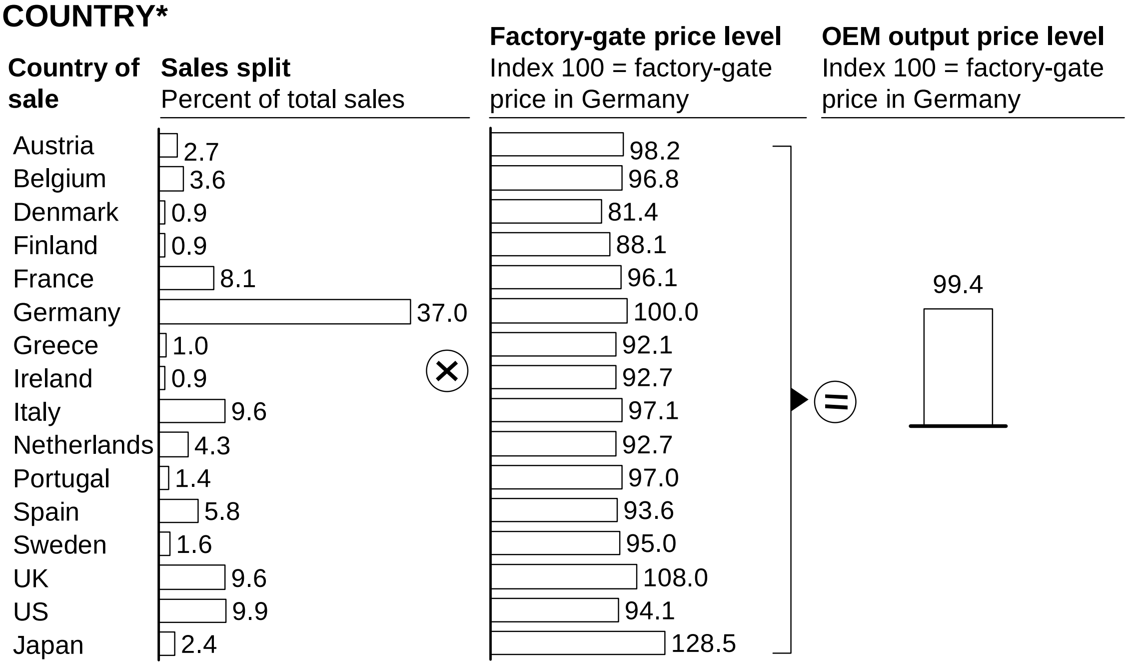
ADJUSTMENT FOR PPP USING RELATIVE PRICE-LEVEL METHOD

	Nominal output per country (in monetary units)	Elimination of different sales split effect	Nominal output adjusted as if total production were sold in one base country	Aggregation of relative factory-gate prices using various base countries	Producer-PPP-adjusted nominal output
Issue addressed		• International sales		• Price comparison of different models	
End product		• Factory-gate price level assuming that total output is sold in base country • Analysis repeated for different base countries		• Fully adjusted producer-based PPP	
Key tasks		• For each country of sale, calculation of factory-gate price level relative to sale in base country • Calculation of overall factory-gate price level as weighted average of country-specific relative factory gate price using sales split as weight		• Aggregation of relative factory-gate prices between different base countries, since price ratios between vehicles of different countries vary in different countries of sale • Weight relative factory-gate prices of different base countries by their particular market size	

Source: MGI analysis

Exhibit 30

PRICE-LEVEL CALCULATION USING A BASE COUNTRY – EXAMPLE PRICE LEVEL OF GERMAN OUTPUT USING GERMANY AS BASE COUNTRY*



* Using 1999 data
Source: MGI analysis

The resulting PPP for the comparison with Germany are EUR 1 for France, USD 1.04 for the US and Yen 136 for Japan (Exhibit 31).

Exhibit 31

RESULTS OF PPP CALCULATION

Factory-gate price level in relation to price level in base country
Index 100 = factory-gate price level from country of production to sale in base country

Country of production	**Base country** France/ Germany	US	Japan	**Weighted average**	**Weighted average** Index 100 = German level	**Implied PPP** 1 EUR =
France	97.0	103.2	75.5	96.4	99.8	
Germany	99.4	105.6	66.5	96.6	100.0	
US	92.1	100.0	81.6	94.6	98.0	1.04 USD
Japan	94.7	118.9	95.2	108.8	112.7	136 Yen
Weight of base country (market size, 1999) (million units)	6.7*	17.4	5.9			

* Market size of France and Germany
Source: MGI analysis

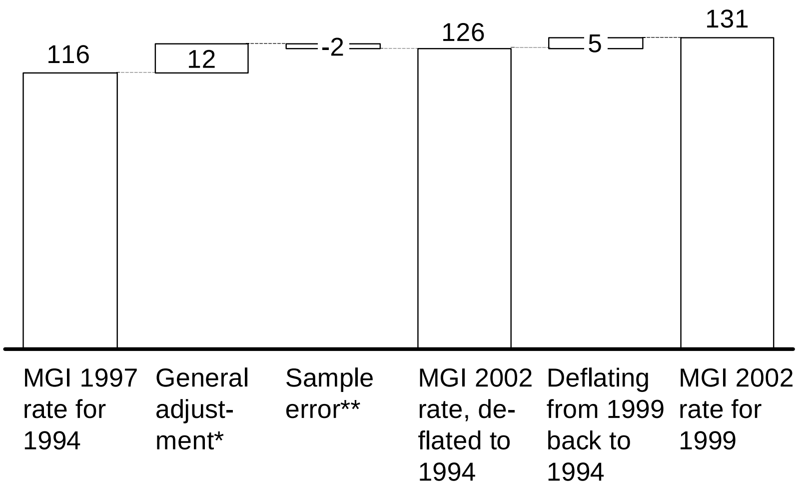
The proposed calculation is quite complex but existing PPPs do not cover the fact that price level differences are driven by the country of sale, not by the country of production. For example, the OECD PPP is not producer- but consumer-based, whereas the CEPII PPP is more comprehensive but uses only home country prices to identify price levels. Furthermore, it captures quality differences by just two debatable criteria: Vehicle length and engine power.

Comparison to methodology MGI 1997

The conversion rate for Yen into Euros or US dollars is higher in this study than it was in the previous study of 1997 (which looked at 1994), even if it is deflated back to 1994. This is primarily because, in the previous study, it was assumed that Japanese cars were 10 percent better quality than US cars. This assumption is not necessarily true for 1999 cars but is tackled in a more precise way in this study by using the individual value of each car and applying deflators to tackle quality changes over time. Furthermore, the previous study assumed that all vehicles within a certain class were of identical value. In this study, each vehicle's value is measured individually, regardless of the vehicle class it has been assigned to. This effect, and sample differences between the previous study and this one, explains the remaining minor gap (Exhibit 32).

Exhibit 32

USD vs. YEN CONVERSION RATE – PPP METHODOLOGY
MGI 1997 AND 2000
Conversion of 1 USD into Yen



* In 1997 due to the assumption that Japanese cars are of 10% higher quality than US cars
** Includes removing the assumption that all vehicles within the same vehicle class are of the same quality
Source: MGI analysis

Capital productivity

To estimate the total factor productivity, capital productivity has to be calculated and weighted with the labor productivity according to the labor cost share of the sector.

To calculate capital productivity, the value added was divided by the capital services of the different countries' automotive sectors. Capital services comprise investments in new structures, machinery and equipment, listed in the national accounts. They were averaged over 12 years of service life and PPP-adjusted according to the 1996 OECD PPPs for capital services. Furthermore, deflation was applied, using a specific deflator if one was available or the GDP deflator.

The labor cost share was estimated from the German example and taken for the other countries as well, as TFP calculation requires a common factor for all countries investigated and no big differences between the four countries were identified. According to official German numbers for 1996, the labor cost share in the automotive sector was 80 percent.