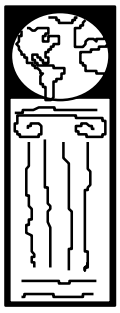
Reaching higher productivity growth in France and Germany

Sector case: Road freight



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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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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

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Road freight

EXECUTIVE SUMMARY

Road freight was a strong contributor to the labor productivity growth in France and Germany during 1992 to 2000. Although companies in this sector represented approximately 1.9 and 1.1 percent of private sector employment in 2000, they accounted for a more significant percentage of total private sector growth in both countries due to high growth in labor productivity.

Labor productivity performance

Labor productivity in road freight grew annually by an average 5.0 and 5.2 percent in France and Germany between 1992 to 2000. The sector's strong growth was for the most part due to a combination of deregulation of both tariffs and market access and the increasing demand for cross-border shipments. In addition, changing the output mix towards higher-value shipments also contributed positively to the productivity growth.

Drivers of labor productivity growth

The regulatory environment, structural conditions, and demand factors all have a major influence on labor productivity growth. In France and Germany specifically, the deregulation of tariffs and market access and the increased demand for cross-border shipments triggered operational improvements that drove labor productivity higher.

- *Firm-level factors* – With the liberalization of truck sizes, average truck capacity increased. At the same time, capacity utilization remained stable due to better practices and the use of some IT tools. This meant that real volumes increased. To put it more simply, each driver was transporting more goods. There was also an increase in expedited and time-definite shipments which had a positive, albeit small, effect on labor productivity.
- *Industry-level and external factors* – Deregulation had the biggest impact with the abolition of tariffs and the relaxation of market access allowing companies to be more price-competitive and cover greater geographical

areas. The heightened competitive intensity forced companies into operational improvements and consolidation. The benefits from consolidation are still waiting to be realized fully and will have a positive impact during this decade.

The European single market led to an increase in cross-border shipments, which allowed companies to benefit from economies of scale in terms of increased volumes, better capacity utilization, and faster average speeds.

Drivers of labor productivity level differences

Labor productivity levels in France and Germany were about 15 percent behind the US in 2000. The discrepancy can mainly be explained by structural differences in demand and differences in industry dynamics.

- *Firm-level factors* – Capacity utilization was the biggest difference between the US and France/Germany. To a great extent due to more advanced IT systems, US companies had a higher share of non-empty hauls than their French and German counterparts. Other factors such as a higher average speed also play a part.
- *Industry-level and external factors* – There are structural differences between the markets that favor the US, such as a higher average haul length and a more balanced flow of goods. But industry dynamics also play a very important role. Deregulation in the US market took place ten years before it did in Europe, so competitive pressure was felt earlier expediting consolidation and operational improvements.

The role of IT

During the 1990s, IT is estimated to have had a positive impact on productivity growth in France and Germany by 0.8 to 1.2 percent CAGR, mainly resulting from investments in network optimization and back-office automation. In the second half of the 1990s, major investments focused on increasing visibility of loads and capacities in the IT system and integrating IT systems from acquired companies, but their benefits had generally not been captured by 2000. During the present decade, as the returns for these investments are realized and the penetration of technologies advances in France and Germany, IT is expected to be a key driver of productivity growth in narrowing the gap between the two European countries and the US.

Outlook and recommendations

High productivity growth rates in France and Germany are not sustainable in the long term and are expected to slow down gradually during this decade as the effects of deregulation and the resulting industry consolidation take hold. The two European countries are expected to reduce the productivity gap with the US but, because of the structural advantages of the US, will not reach the same level. Between 2000 and 2010, the major drivers of growth in European road freight are expected to be IT impact, continuing industry consolidation, increasing demand for higher-value services, and the eastward expansion of the EU.

OVERVIEW OF THE SECTOR

Importance of the sector to the overall question

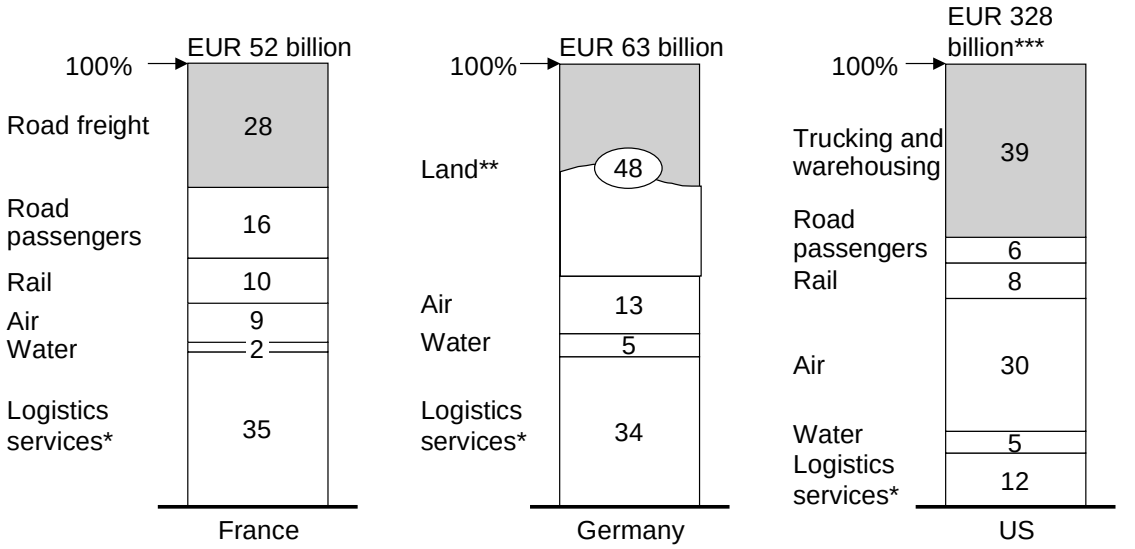
Through the 1990s, according to the national account numbers, transportation services in Germany and France were the fourth and fifth largest contributors to overall productivity growth with 0.18 and 0.17 percentage points, respectively. The industry is comprised of six subsectors: Road freight, road passenger, rail, air, and water transportation as well as logistics services.

In this study, MGI analysis focused on road freight because of its contribution to national growth, the importance of deregulation during the 90s, as well as the importance of IT:

- Road freight is the largest subsector, accounting for about one third of total value-added and employment in transportation services. Because labor productivity growth outstripped national productivity growth, road freight made a disproportionately stronger contribution to overall private sector productivity growth in both France and Germany (Exhibit 1).

Exhibit 1

TRANSPORTATION SECTOR OVERVIEW – SUBSECTOR SPLIT
Share of total GVA, 2000



* Including handling, warehousing, infrastructure management, travel agencies, affreightment, and pipelines in the US
** Including passengers and freight for rail and road, and pipelines
*** US GVA figures converted using 2000 average interbank exchange rate

Source: INSET, Statistisches Bundesamt, BEA, Oanda, MGI analysis

- Between 1992 and 2000, significant changes took place in European road freight such as deregulation, increasing consolidation, and the creation of the European single market. MGI analysis will help establish the link between these changes and the growth in labor productivity.
- New IT tools as well as growing penetration rates play an increasing role in road freight. MGI analysis will help understand the impact of IT on labor productivity growth.

Industry profile

The MGI definition of the subsector includes all for-hire road freight services at the local, intercity, and long-distance levels, including cross-border operations. This encompasses all services ranging from Less-than-Truck-Load (LTL) shipments to Full-Truck-Load (FTL) shipments that are transported by trucks registered in the respective country. Based on this definition, the road freight subsector represents approximately 1.9 and 1.1 percent of private sector employment and 1.5 and 1.0 percent of value-added (GDP) in the French and German economies, respectively.

Although the competitive nature of the road freight industry is similar in France, Germany, and the US, significant differences exist in the level of industry consolidation, the structure and focus of companies, the nature of demand, and the competition between different modes of transportation, e.g., road and rail.

Consolidation. Consolidation in the US road freight industry started on the back of the deregulation that occurred in 1980. By 2000, the top six companies held 14 to 15 percent of the market in FTL and 43 percent in LTL. However, in France and Germany, despite the consolidation during the 1990s, the road freight industry has remained more fragmented with the top six companies only accounting for 8 to 9 percent of total 2000 revenues. Despite consolidation, thousands of truck operators still dot the competitive landscape in both markets.

Industry players in France and Germany. The "typical trucking company" is an asset-light forwarder. Although these forwarders own the customer relationship and the network, they do not own many trucks; instead they manage subcontractors that do the actual transportation. Small and medium-sized transportation companies, as well as owner-operators, either work as subcontractors to the network and customer managing forwarder or specialize in niche segments.

Industry players in the US. With some exceptions, e.g., Landstar, the "typical trucking company" in the US is usually asset-heavy, that is, it owns and manages its own fleet. Truck brokers and load-matching services in the US have developed as intermediaries to connect the thousands of shippers with the thousands of truck operators. These services play a matchmaker role, but they have less of a role in customer relationship management and network management than their French

and German truck forwarder counterparts. US intermediaries do not typically sell freight services under their own brand, but rather refer shippers to a suitable carrier. Furthermore, US intermediaries do not take responsibility with the customer for the shipment. In practice, US carriers are typically more independent of their brokers than French and German carriers are of their forwarders. Once shippers have established a relationship with a regular carrier, they will typically work directly with that carrier.

Product scope. Another difference between the two European countries and US companies lies in product scope. Key French and German forwarders offer customers both FTL and LTL services. Although the networks are naturally distinct in terms of the need for terminals, forwarders manage and sell both products simultaneously. In the US, however, major players clearly focus on FTL, LTL, or specialized (i.e., liquid bulk, refrigerated, automotive) services. Some large carriers do offer some FTL and LTL, and perhaps also some specialized services, but most still have a focus on one or the other. US Freightways, for example, operates several regional LTL subsidiaries while also operating a FTL subsidiary, but is nevertheless predominantly an LTL carrier.

Demand. Historically, the very nature of demand has been different between the two markets. Until recently, European national economies were much more independent of one another than the various US states were. This long-standing US single market, together with a more uniform culture, language, and regulations, led to a higher long-distance demand that was more reliant on interstate traffic. Thus, it has been more feasible in the US for trucking companies to cover a larger geographical area. As Europe continues along the path to greater economic integration, international commerce will redefine trucking service areas and geographic coverage.

Competition with railroads. Competition in the two markets also differs substantially. In the US, the four big railroads have large coverage areas that can serve the needs of many shipments with highly developed, dedicated freight railroads and rail networks. They offer a much lower-priced service, competing with road freight, especially over longer distances and higher volumes, despite issues with service reliability, timing, and smooth interchanges between railroads for transcontinental passage. By contrast, French and German railroads are less focused on providing smooth freight services, and interchange problems at borders have made rail a less attractive option for shippers.

Differences aside, US, French, and German trucking companies ultimately share the same goal: To provide efficient truck transportation services. Driver, truck and fuel costs are significant on both sides of the Atlantic, and the margins are low. Meanwhile, carriers and owner-operators are under pressure from external factors and industry dynamics to improve productivity. In this study, we analyze these external factors and industry dynamics to get a macroeconomic perspective

and assess their effects on operational indicators to develop an understanding at the company level.

LABOR PRODUCTIVITY PERFORMANCE

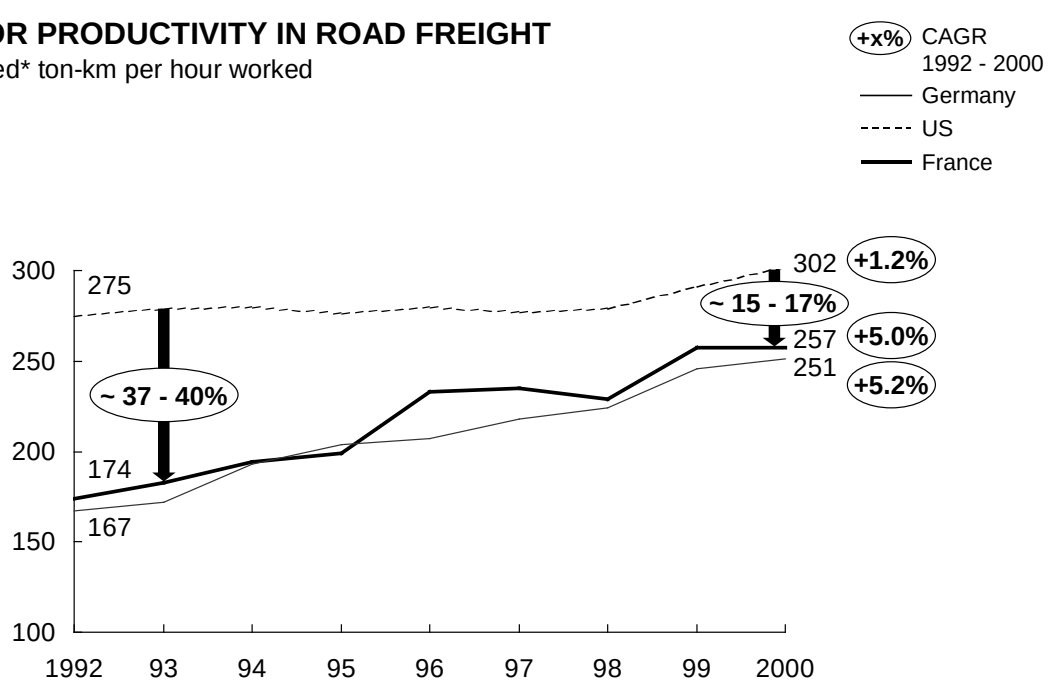
We measured labor productivity with ton-km per hours worked. Ton-km is an appropriate physical output measure, especially for cross-country comparisons, where comparable value-added data for our timeframe is not available. However, to consider the different service levels in the output measurement we adjusted the ton-km thereby accounting for the higher-valued time-definite and expedited shipments based on their share and price premium (appendix, Exhibit 24).

Based on this output indicator, France and Germany grew at 5.0 and 5.2 percent annually in labor productivity in road freight during the 1990s, while the US growth was 1.2 percent annually. Through this higher growth France and Germany could reduce their initial productivity gap with the US from 37 to 40 percent in 1992 to 15 to 17 percent in 2000 (Exhibit 2).

Exhibit 2

LABOR PRODUCTIVITY IN ROAD FREIGHT

Adjusted* ton-km per hour worked



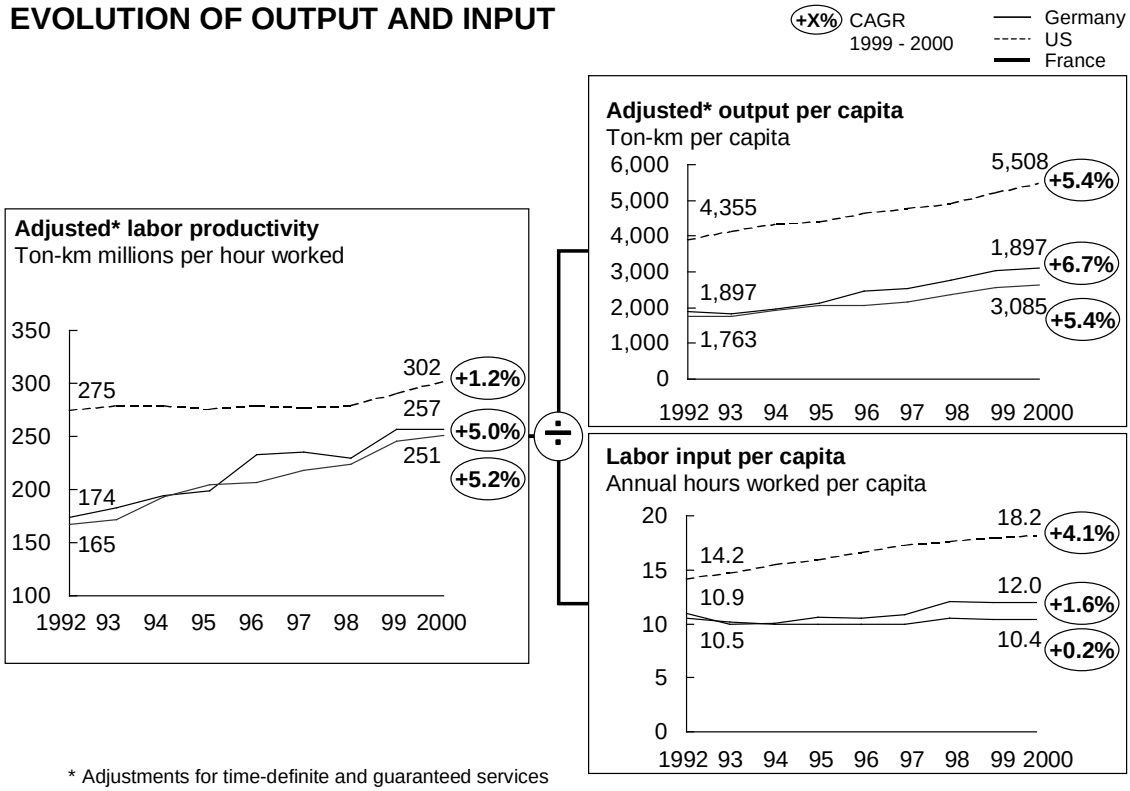
* Adjustments for time-definite and guaranteed services based on price difference

Source: DAEI-SES, DIW, BAG, ENO, VIUS, CFS, MGI analysis

This growth was a result of a strong and continuous increase in output of 6.7, 5.4 and 5.4 percent CAGR in France, Germany and the US, and a slower input growth of 1.6, 0.2 and 4.1 percent CAGR, respectively (Exhibit 3).

Exhibit 3

EVOLUTION OF OUTPUT AND INPUT



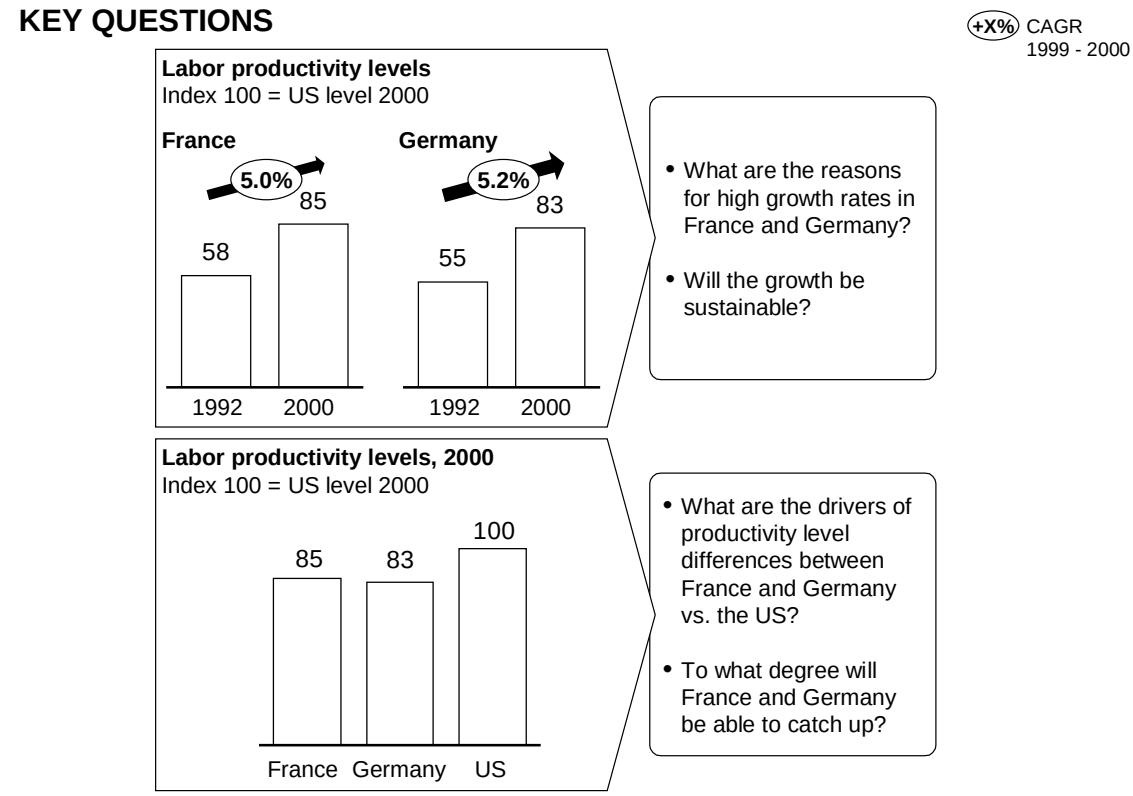
* Adjustments for time-definite and guaranteed services

Source: DAEI-SES, DIW, BAG, ENO, VIUS, CFS, MGI analysis

High growth rates and remaining level differences trigger the key questions on which we focused our investigation.

- What were the reasons for the high labor productivity growth rates in France and Germany? Will the high growth rate in these countries be sustainable?
- What explains the remaining differences between France and Germany on the one hand and the US on the other? To what degree will France and Germany be able to catch up with the US (Exhibit 4)?

Exhibit 4



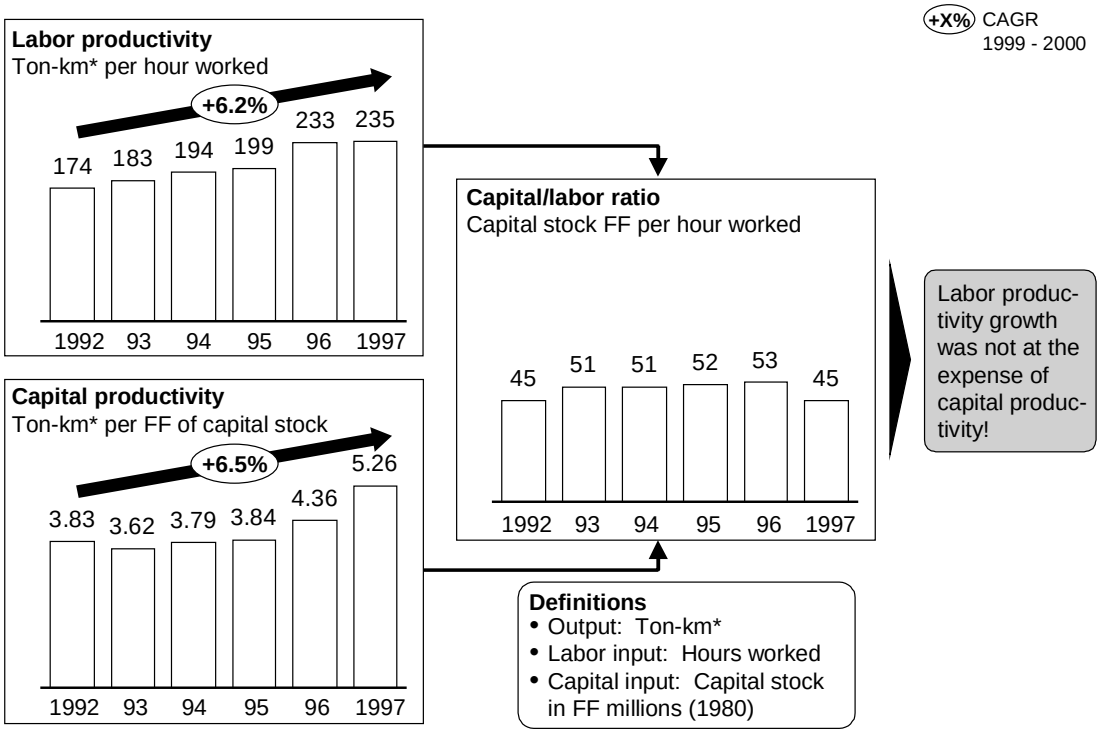
Source: MGI analysis

¶ What is the contribution of IT to growth rates and level differences?

Since capital inputs account for 35 to 40 percent of total capital and labor inputs, the high growth rates in labor productivity could have been at the expense of capital productivity. However, the exemplary analysis of changes in French capital productivity suggests that this was not the case (Exhibit 5).

Exhibit 5

LABOR vs. CAPITAL PRODUCTIVITY GROWTH – EXAMPLE: FRANCE



* Adjusted for time-definite and expedited

Source: DAEI-SES, CEPII, MGI analysis

Capital productivity in French road freight grew at 6.5 percent CAGR between 1992 and 1997.[1] During the same period, labor productivity growth in the industry in France was 6.2 percent CAGR, suggesting that there was no capital deepening, i.e., no increase in capital per labor inputs. Thus, we can assert that the substitution of labor by capital was not a key driver of the labor productivity growth in road freight between 1992 and 2000.[2]

This result appears plausible, given that the factors that drive labor productivity also improve capital productivity, e.g., share of hours worked by drivers, output mix and capacity utilization. If, for example, capacity utilization goes up as a consequence of improved network optimization, the effect will be positive for both labor and capital productivity.

Labor productivity performance in road freight transportation is mainly determined by regulations, demand factors, and structural conditions.

- ¶ Regulation determines capacity restrictions, working hours of drivers, tariffs, and conditions for market access and cross-border trade. This

1 Based on output per FF of capital stock; the period between 1992 and 1997 was chosen due to data availability on net capital stock in "Capital Stock and Productivity in French Transport: An International Comparison" by CEPII.

2 Similar rates assumed for Germany.

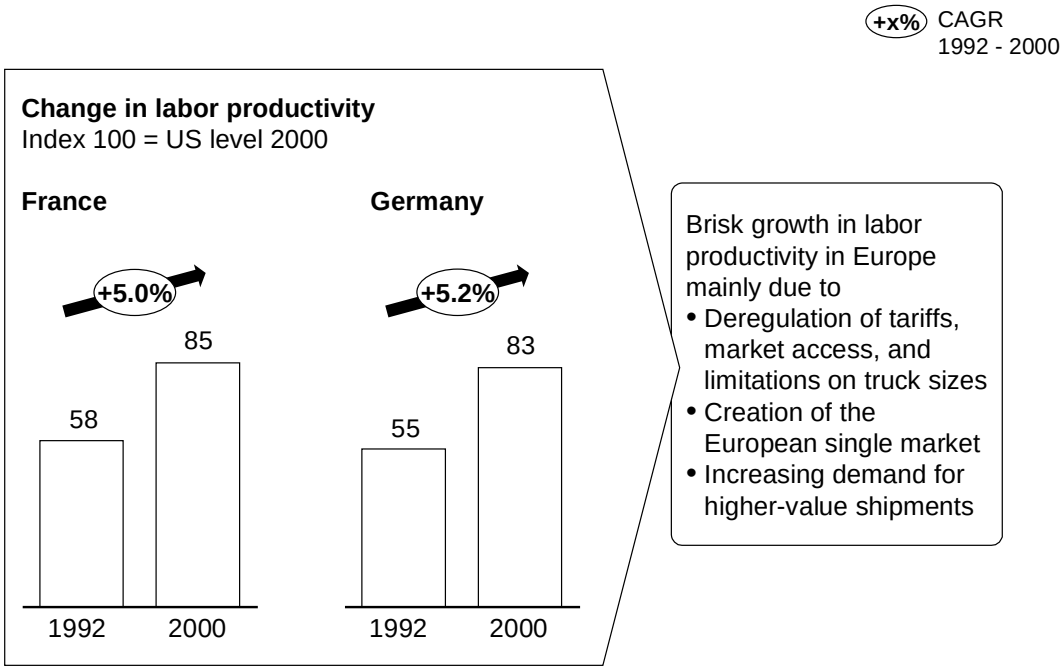
could directly impact productivity by limiting input or output potential. Or it might indirectly both influence competitive pressure and, thereby, impact productivity performance.

- Structural conditions – such as geography, population density or the structure of the national economy – influence the average length of hauls and the flow and mix of goods shipped.
- Demand factors have an impact on the output mix, determining the value added per physical output.

The growth witnessed in France and Germany of an average 5.0 and 5.2 percent CAGR, respectively, between 1992 and 2000 was mainly due to the impact of European deregulation and the creation of the European single market (Exhibit 6). A demand shift towards higher-value shipments also had a positive but smaller contribution.

Exhibit 6

LABOR PRODUCTIVITY GROWTH IN ROAD FREIGHT

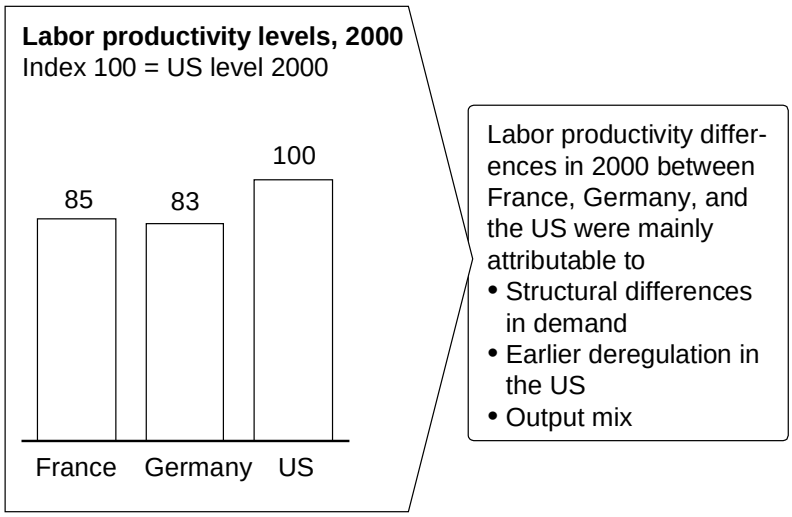


Source: DAEI-SES, DIW, BAG, ENO, VIUS, CFS, MGI analysis

French and German labor productivity in road freight trailed the US by 15 to 17 percent in 2000. This gap can mainly be explained by structural differences in demand, earlier deregulation in the US and, to a lesser extent, by the difference in demand for higher-value shipments (Exhibit 7).

Exhibit 7

DIFFERENCES IN LABOR PRODUCTIVITY LEVELS – ROAD FREIGHT



Source: DAEI-SES, DIW, BAG, ENO, VIUS, CFS, MGI analysis

In the next chapter, we will first analyze productivity changes and cross-country differences on the firm level. In a second step, we will explain how these firm-level performance differences were driven by external factors and industry dynamics.

DRIVERS OF LABOR PRODUCTIVITY GROWTH

Firm-level factors

At an operational level, the strong growth in labor productivity was mainly due to the increase in the average capacity of trucks, while capacity utilization was kept stable. Improvements in average speed and share of hours worked by drivers, as well as a change in output mix also contributed (Exhibit 8).

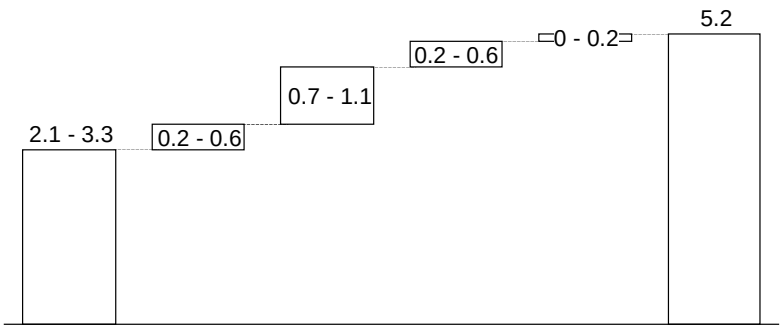
Exhibit 8

LABOR PRODUCTIVITY GROWTH, 1992 - 2000

ESTIMATE

Percent CAGR

Germany



	Increase of average capacity of trucks*	Change in capacity utilization	Increase of average speed**	Change in productive time ***	Change in output mix****	Growth 1992 - 2000
France	2.1 - 3.3	N.a.	0.5 - 0.7	0.7 - 1.2	0 - 0.2	5.0

* Estimates based on German data as French data was not available
** Estimates based on French data as German data was not available
*** Total hours worked by drivers/total hours worked by all employees
**** Productivity gain from higher-value services less additional labor input required
Source: DIW, BAG, DAEI-SES, ONISR, CNR, MGI analysis

Average length of hauls and IT use impact all operational indicators

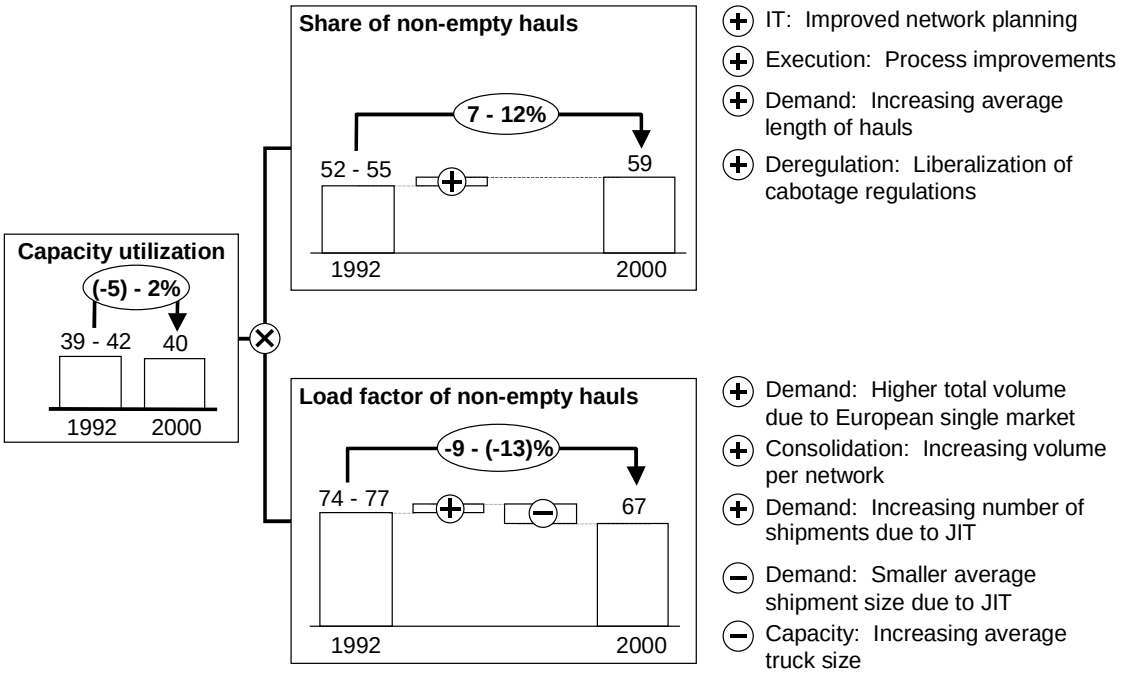
Average truck capacity. The major change observed at the operational level that led to productivity growth in France and Germany was increasing average truck capacity. The increase was due to a combination of changing fleet mixes and the 1993/1994 liberalization of truck size regulations. The liberalization increased the maximum weights permitted, and led to average truck capacity in Germany increasing 18 percent from 1995 to 2000. Increasing truck capacity is estimated to account for an annual growth of up to 3.3 percent in labor productivity growth.

Capacity utilization. The hidden driver behind the French and German productivity growth was, however, capacity utilization. Despite the increase in average truck capacity, capacity utilization remained stable at approximately 40 percent between 1992 and 2000. Naturally, this means that real volumes increased and, therefore, so did labor productivity. The increase in share of non-empty hauls was neutralized by the decline in the load factors (Exhibit 9).

Exhibit 9

CHANGES IN CAPACITY UTILIZATION – EXAMPLE: GERMANY

Percent of total ton-km, 1992 - 2000 total change



Source: BAG, MGI analysis

- *Share of non-empty hauls* – The share of non-empty hauls increased by 7 to 12 percent to approximately 59 percent due to the implementation of network optimization tools, better execution practices and increasing average lengths of haul. In addition, liberalization of cabotage contingents[3] within the EU allowed companies to increase their share of backhauls.

- *Load factor* – The load factor of non-empty hauls decreased due to the increase in average truck capacity and the fall in average shipment size due to higher demand for expedited and time-definite services. Despite the positive contributions of increasing volumes due to the creation of the European single market and increasing consolidation trend, the load factor decreased by 9 to 13 percent to 67 percent.

Average speed – Although speed limits remained unchanged during this period, average truck speed increased by 6 percent in France and 9 percent in Germany. The increase was possibly due to increasing use of highways and a reduction of congestion, while the difference between the countries mainly resulted from the

3 Cabotage contingents are limits on how much foreign carriers can transport within a given country domestically or from the given country to a third country.

increase in the average length of hauls in Germany. The reduction of congestion was achieved by new highways, improved regulations, and increased information flow on traffic conditions. The growth (CAGR) due to increasing average speed is estimated at 0.5 to 0.7 percentage points in France and 0.7 to 1.1 percent in Germany.

Productive time – Productive time is defined as the share of driver hours in total hours worked. Back-office optimization through better execution practices and process automation using IT, e.g., EDI for order-taking, as well as the elimination of customs in the EU helped to reduce paperwork and streamline administrative processes. As a consequence, less time was needed for non-driving activities increasing labor productivity by 0.7 to 1.2 percent (CAGR) in France and 0.2 to 0.6 percent in Germany.

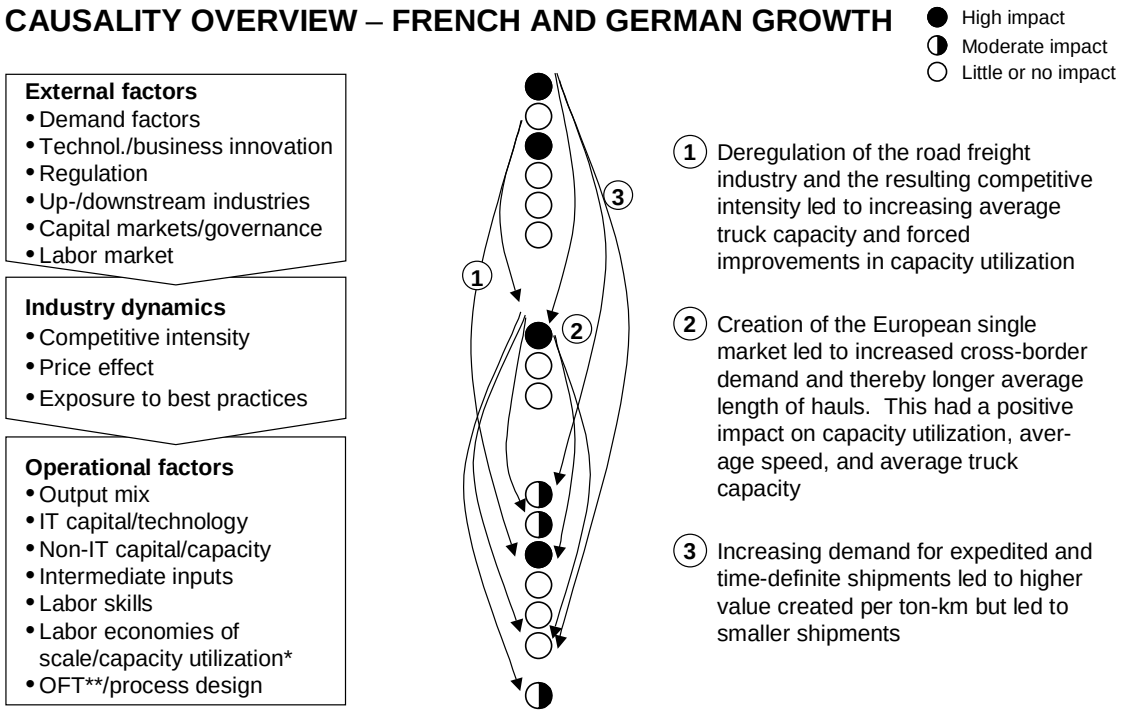
Output mix – Demand for expedited and time-definite shipments increased between 1992 and 2000 mainly due to an increased focus on just-in-time (JIT) manufacturing practices in the automotive industry, and advanced inventory management in retailing. On the one hand, these shipments require increased labor inputs and decrease average shipment size but, on the other hand, they create a higher value-added which is captured by our adjusted output measure, so that labor productivity increased between 0 and 0.2 percent (CAGR).

Industry-level and external factors

The operational factors laid out above were predominantly fueled by deregulation in the road freight sector and by increasing demand following the creation of the European single market. The shift to higher-value shipments also made a positive but smaller contribution (Exhibit 10).

Exhibit 10

CAUSALITY OVERVIEW – FRENCH AND GERMAN GROWTH



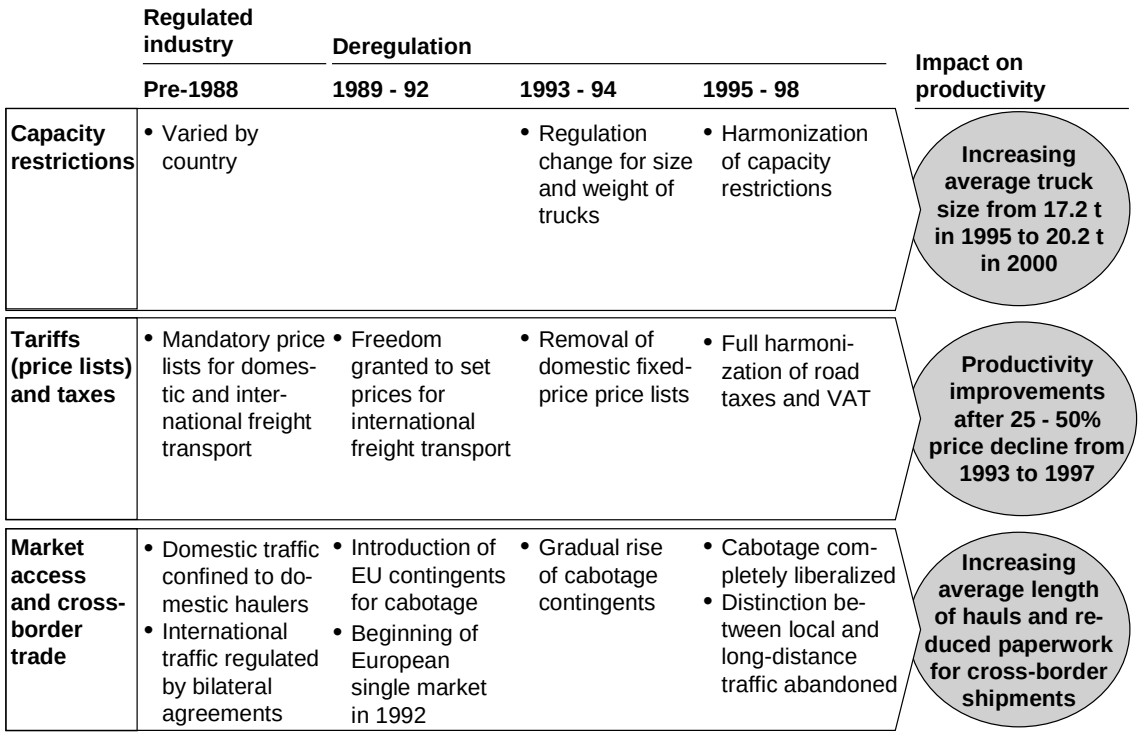
* Various effects cancel each other out
** Organization of functions and tasks
Source: MGI analysis

Deregulation – Deregulation was the key driver of productivity in French and German road freight during the 1990s. A comparison with the US shows the potential impact of deregulation. Ten years earlier, labor productivity growth in the US increased from stagnant levels to 2.2 percent CAGR[4] following the deregulation of prices and the easing of entry barriers. Deregulation in European road freight was even more extensive. Three areas in particular had an effect on productivity in both countries (Exhibit 11):

4 Between 1980 and 1992.

Exhibit 11

IMPACT OF DEREGULATION ON PRODUCTIVITY – EXAMPLE: GERMANY



Source: BAG, Aberle, MGI analysis

- *Liberalization of EU restrictions on truck size and weights* – The changes in the law, enacted in 1993/94, allowed an increase in average truck capacity.
- *The abolition of tariffs* – This eliminated fixed prices for road freight services and allowed price competition.
- *Easing of market access* – This had two components. First, domestic licenses for specific lanes, e.g., between Hamburg and Berlin, were abolished, allowing all companies within a country to operate on any given route. The distinction between local and long-distance traffic was also abandoned. Second, cabotage contingents and cross-border traffic within the EU were gradually liberalized over the decade, allowing companies to operate freely in other EU countries by 1997.

As a result of easing market access and the abolition of tariffs, competitive intensity soared and prices decreased, while the liberalization of the truck sizes allowed average capacities to increase. These regulatory changes had two major effects and were the main driver of the 5.0 to 5.2 percent annual growth in French and German road freight between 1992 and 2000.

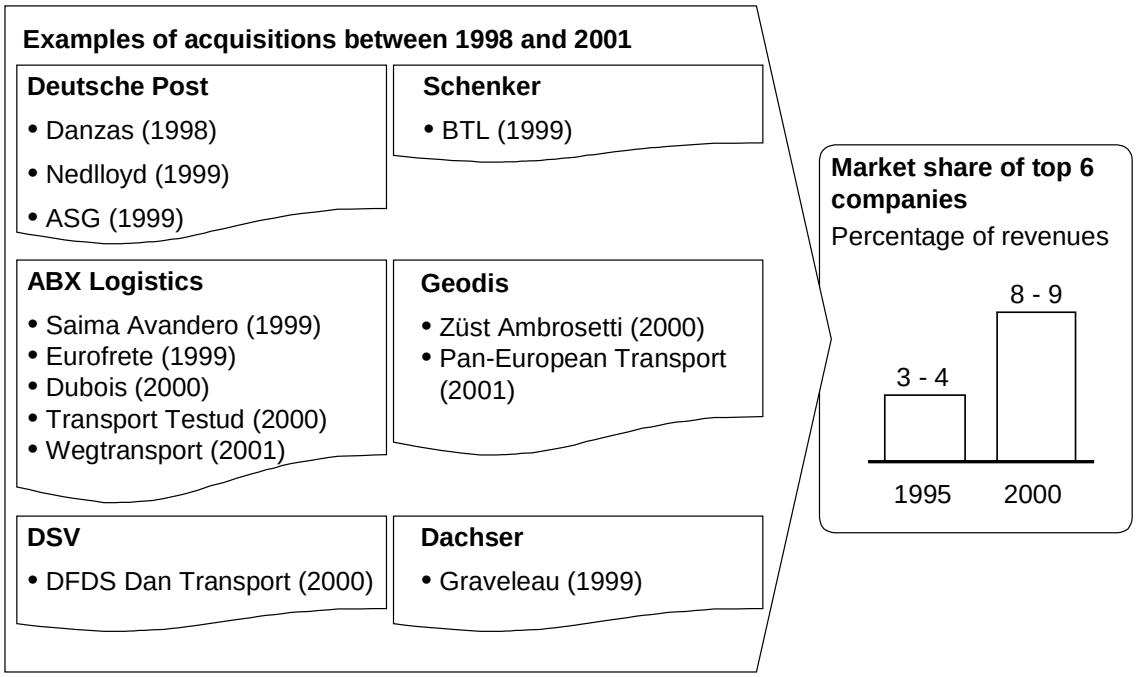
¶ *Operational improvements* – To remain competitive, companies were forced to increase operational efficiency. They increased the average capacity of their trucks, improved capacity management, and optimized their fleet mix.

¶ *Industry consolidation* – Increasing competitive intensity in a deregulated environment led to price declines, increased bankruptcies, and more consolidation in the European road freight industry. The top six companies in Europe, increased their share of the market from 3 to 4 percent in 1995 to 8 to 9 percent in 2000 (Exhibit 12), following an acquisition spree during the late 1990s. Consolidation offers potential synergies, e.g., through increasing network density in LTL and in the back-office. These synergies had, for the most part, not yet been realized by 2000. However, they are expected to have a positive impact on productivity during the decade 2000 to 2010.

Exhibit 12

INDUSTRY CONSOLIDATION IN EUROPE

ESTIMATE

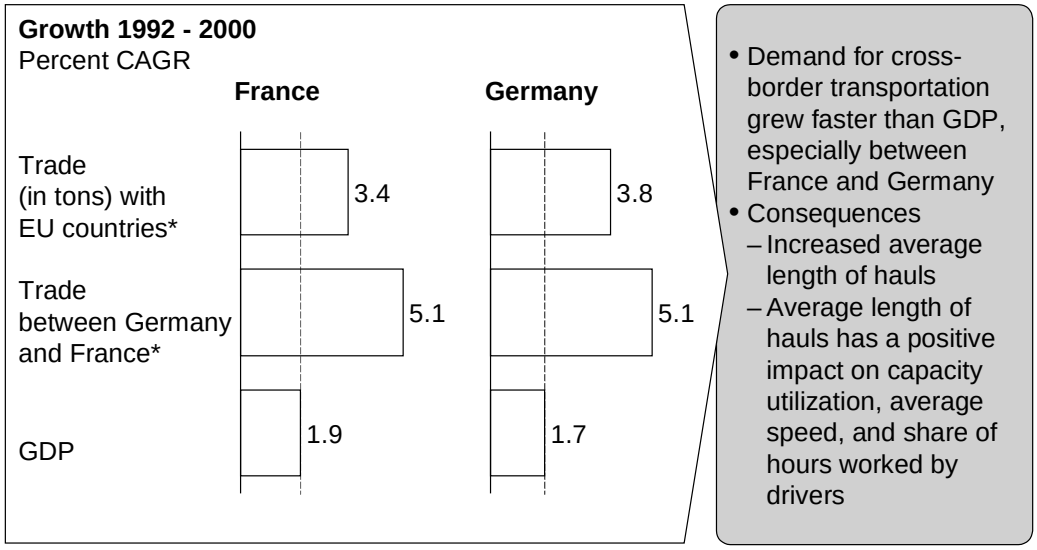


Source: Press clippings, broker reports, annual reports, Internet

European single market. Following the creation of the European single market in 1992, trade between France and Germany grew by 5.1 percent CAGR[5] (Exhibit 13). Meanwhile, German companies increased cross-border output by 9.4 percent CAGR and gained market share from French companies[6].

Exhibit 13

CROSS-BORDER DEMAND INCREASED



* Transported by all carriers

Source: Eurostat Com text Database, MGI analysis

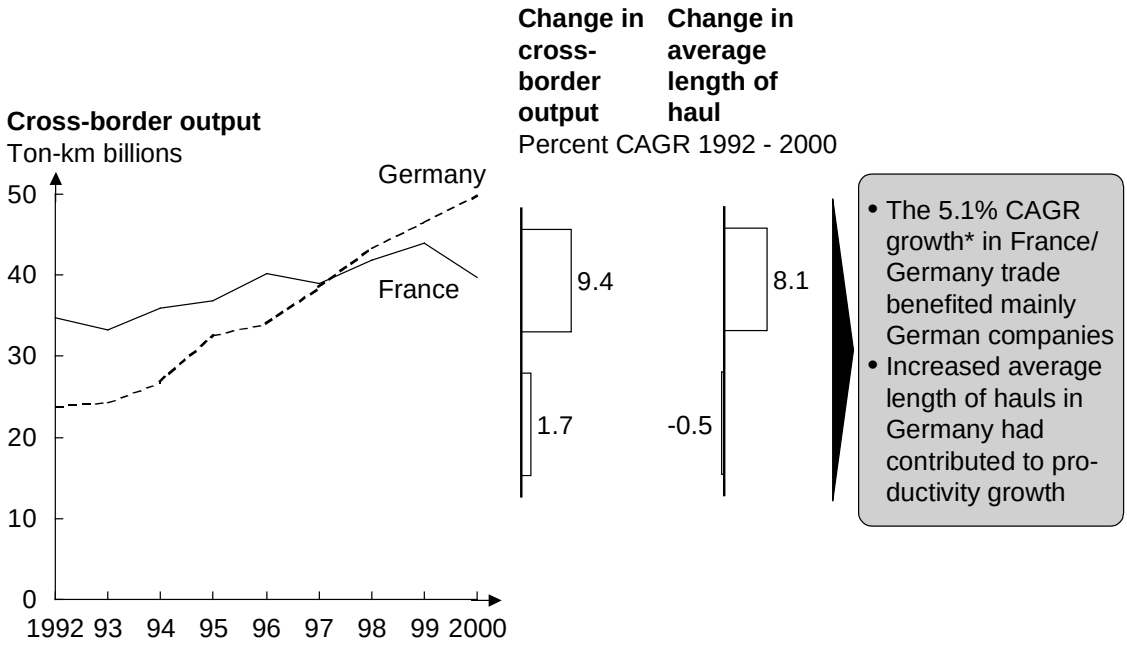
By gaining market share of the increasing cross-border traffic, German companies were able to increase the average length of hauls from 87 to 129 km (Exhibit 14).

5 CAGR 1992 to 2000 for trade in tons, transported by all carriers.

6 Between 1992 and 2000, French companies enjoyed high growth in domestic traffic. However, their cross-border output increased by only 1.7 percent CAGR, and the average length of haul was stagnant at ~ 127 km. Three important reasons why German companies increased their market share in cross-border output were their international positioning, i.e., European networks, their geographic advantage and their access to cheaper labor from former East German states and in some cases from Eastern Europe.

Exhibit 14

CROSS-BORDER OUTPUT



* CAGR 1992 - 2000, metric tons traded

Source: Ministère de l'Equipement et des Transports, DAEI/SES, "L'utilisation des vehicules de transport routier de marchandises", BAG, DIW, MGI analysis

The increasing volumes and average length of hauls had a positive impact on average truck capacity, capacity utilization, and average speed.

Demand for higher-value shipments. The output mix change in favor of expedited and time-definite services contributed up to 0.6 percent CAGR to productivity growth despite the additional labor input required and decreasing average shipment size.

DRIVERS OF LABOR PRODUCTIVITY LEVEL DIFFERENCES

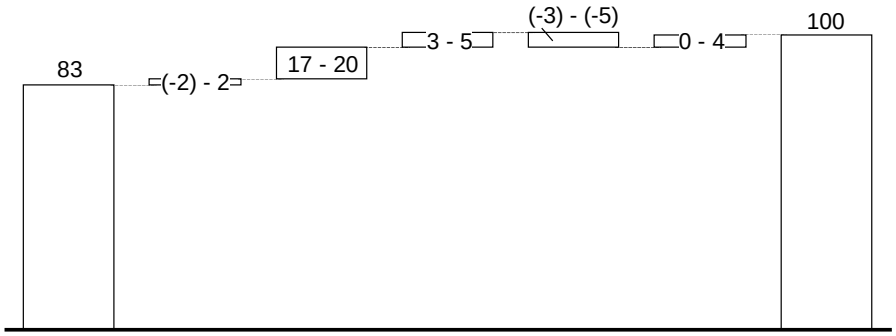
Firm-level factors

At the operational level, the main difference between France/Germany and the US was their respective levels of capacity utilization (Exhibit 15).

Exhibit 15

DIFFERENCES IN PRODUCTIVITY LEVELS BETWEEN FRANCE/ GERMANY AND THE US, 2000 ESTIMATE

Index 100 = US level 2000



	Level in 2000	Difference in average capacity of trucks*	Difference in capacity utilization	Difference in average speed**	Difference in productive time***	Difference in output mix****	US level 2000
France	85	(-2) - 2	N.a.	3 - 5	(-6) - (-4)	0 - 4	100

Average length of hauls and IT use impact all operational indicators

* Estimates based on German data as French data was not available
** Estimates based on French data as German data was not available
*** Total hours worked by drivers/total hours worked by all employees
**** Productivity gain from higher-value services less additional labor input required
Source: DIW, BAG, DAEI-SES, ONISR, CNR, MGI analysis

Average truck capacity – Average truck capacity did not contribute to the productivity level difference. Following the drastic increase in average truck capacities in Europe, the average capacity of trucks in Germany and the US converged at approximately 20.2 tons in 2000. This is not surprising given the similar nature of EU and US federal restrictions on truck capacity, and the high competitive pressure in both markets.

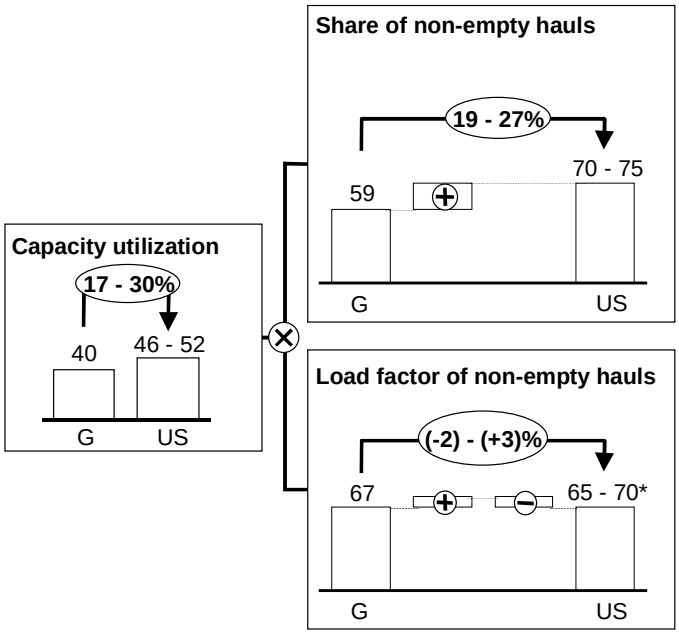
Capacity utilization – Capacity utilization was the main factor behind the difference between France/Germany and the US. During 2000, the difference in capacity utilization explained 17 to 20 percentage points in the difference in the level between the US and Germany and was mainly due to the higher share of non-empty hauls[7] (Exhibit 16).

7 A similar difference was assumed between the US and France.

Exhibit 16

REASONS FOR CAPACITY UTILIZATION DIFFERENCES – EXAMPLE: GERMANY

Percent of total ton-km, 2000



⊕ Average lengths of haul: Replacement of long empty hauls by shorter tours to get additional shipments
⊕ IT: Higher visibility in the IT systems
⊕ Consolidation: Earlier and higher consolidation in the industry
⊕ Demand: More balanced flow of goods shipped
⊕ Execution: Process improvements
⊕ Regulation: Inefficiencies due to legacy of old cabotage regulations within EU

⊕ Average length of haul: Higher cost of unused capacity per trip
⊕ IT: Higher visibility in the IT systems
⊕ Demand: Mix of goods shipped

⊖ Demand: Stronger growth in JIT causes sharper decline in average shipment size in the US

* Based on the assumption of similar load factors of non-empty hauls in Germany and the US

Source: BAG, US Census Bureau "Transportation Annual Survey", VIUS, ENO, CFS, interviews, MGI analysis

- *Share of non-empty hauls* – This was approximately 20 to 25 percent higher in the US than in Germany. The difference was due to a combination of factors including higher average length of hauls, higher visibility in the IT system, and more balanced flow of goods in the US, as well as continuing inefficiencies due to cabotage regulations in Europe that were abolished within the EU during the 1990s.
- *Load factor* – The load factor of non-empty hauls was at a similar level in both Germany and the US. Although the higher demand for JIT shipments in the US led to a sharper decline in average shipment size, this was compensated by increased visibility in the IT systems, longer average hauls, and differences in the mix of goods shipped.

Average speed – The average speed of trucks in the US is estimated to account for 3 to 5 percentage points in the productivity gap and largely results from higher speed limits for trucks in the US than in France and Germany.[8]

Productive time – In France and Germany, the higher share of hours worked by drivers decreased the productivity level difference with the US by 3 to 6

8 The 65 mph (105 kmh) speed limits on the US interstate highways also apply to trucks, while speed limits for trucks in France and Germany are 90 and 80 kmh, respectively.

percentage points. The difference between France and Germany compared to the US was due to the higher productivity of the US drivers and higher optimization of the non-driving personnel in Europe. Output per driver in the US is higher than in Europe possibly due to driver compensation schemes and the twice-as-long average length of hauls in the US. Most French and German drivers are paid hourly wages, while the FTL drivers in the US are incentivized by output-based pay. Moreover, due to the longer average haul distances, US drivers spend more time on the road and are more productive. Finally, there is increased pressure on French and German companies to optimize the back-office because of higher labor costs than in the US.

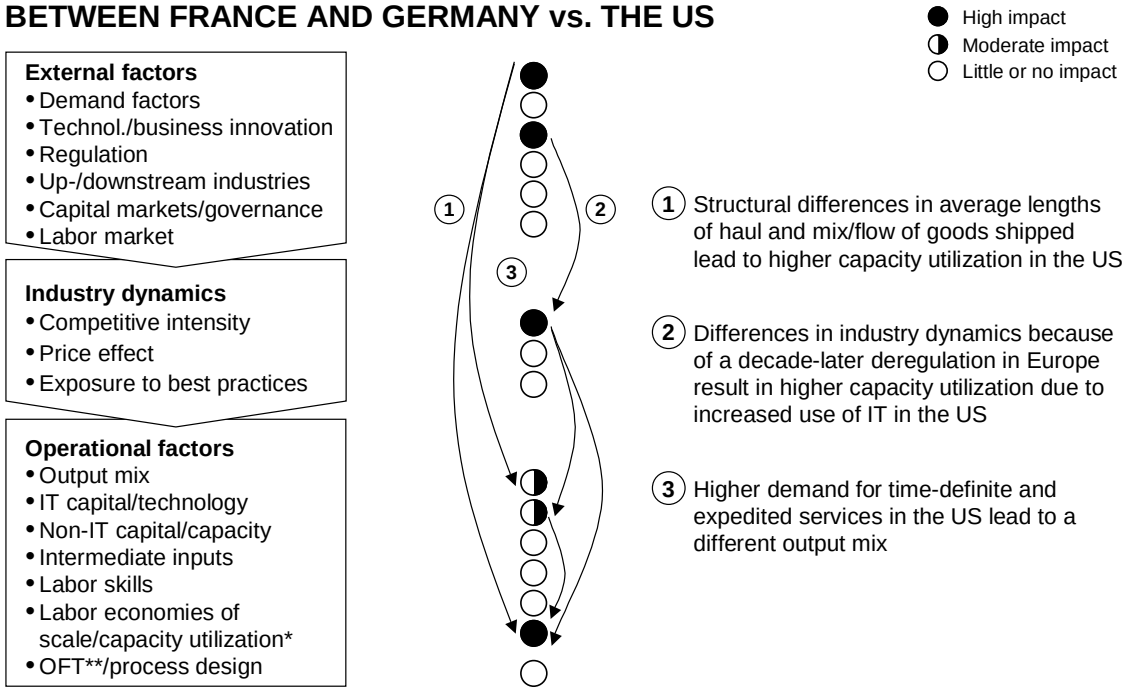
Output mix – Demand for expedited and time-definite shipments was about 10 percent higher in the US due to both more advanced JIT manufacturing practices and advanced inventory management of retailers. However, these shipments also require higher labor input and lead to decreased average shipment sizes, so the additional value-added accounts for just 0 to 4 percentage points in the difference in productivity level.

Industry-level and external factors

The differences in the operational factors can largely be traced back to structural differences and earlier deregulation and, to a lesser extent, to the differences in demand for higher-value shipments and in speed limits (Exhibit 17).

Exhibit 17

CAUSALITY OVERVIEW – PRODUCTIVITY LEVEL DIFFERENCES BETWEEN FRANCE AND GERMANY vs. THE US



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

Structural differences – The structural differences are characterized by longer average hauls in the US as well as by the mix and flow of goods shipped. They accounted for up to half of the productivity level gap between France/Germany and the US in 2000.

- *Average length of hauls* – These were approximately 230 km per trip in the US compared to 129 and 127 km in Germany and France, respectively[9]. The almost twice as high average length of hauls in the US lead to higher capacity utilization levels due to the higher cost of empty hauls, higher average speed and higher share of driver hours because of longer trips.

- *Mix and flow of goods* – A more balanced flow of goods and the difference in mix of goods shipped, e.g., higher share of bulk goods, such as coal, iron, and steel, has led to higher capacity utilization in the US.

Earlier deregulation – The earlier deregulation in the US resulted in earlier and a higher degree of consolidation and competitive pressure. In turn, this led to an increased network density and forced companies increasingly to use IT to improve

9 1997 data for the US versus 2000 data for France and Germany; all trips including local and cross-border traffic.

capacity utilization through the 1990s. On the other hand, although similar technologies were available in Europe, most French and German companies were concentrating on increasing market share through acquisitions and did not focus on IT until the late 1990s. Consequently, the benefits of IT investments had not been realized fully by the end of the decade. The difference in industry consolidation and the increased IT use accounts for 9 to 13 percentage points for France and Germany in the productivity gap, but this is expected to diminish during the decade 2000 to 2010.

Demand for higher-value shipments – A higher demand for expedited and time-definite services in the US, due to more advanced just-in-time (JIT) and inventory management practices, accounts for 0 to 5 percentage points in the level difference for France and Germany.

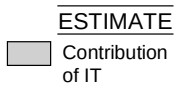
Regulatory differences – Higher speed limits for trucks in the US resulted in up to 10 to 15 percent higher average speeds and thereby increased ton-km for the same driver hours.

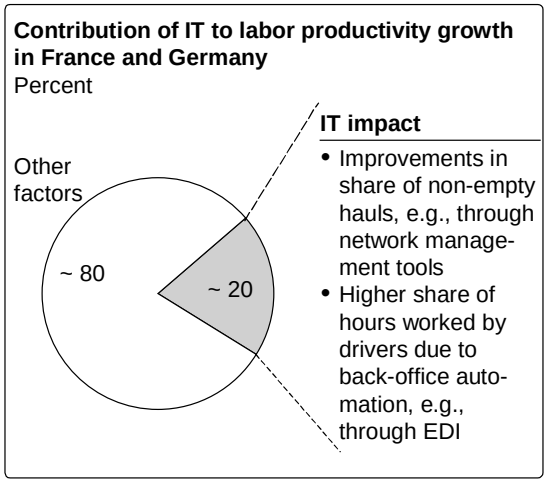
THE ROLE OF IT

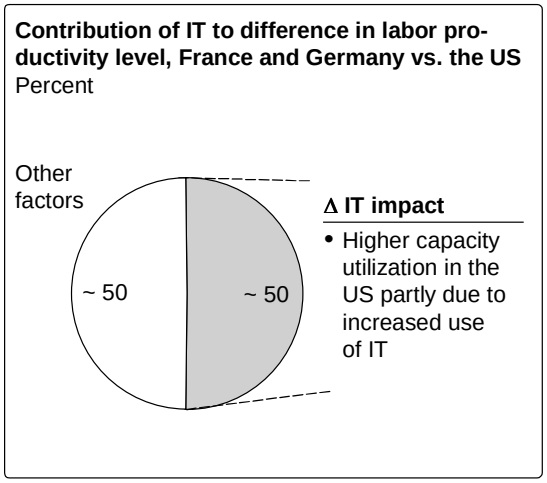
IT was not a main focus area for most French and German road freight companies until the mid- to late 1990s. Its total impact on labor productivity growth was estimated at 0.8 to 1.2 percent CAGR between 1992 and 2000, which is about 20% of the overall growth. At the same time, the difference in deployment of technologies accounted for about half of the productivity level difference between France/ Germany and the US in 2000 (Exhibit 18).

Exhibit 18

CONTRIBUTION OF IT TO LABOR PRODUCTIVITY GROWTH AND DIFFERENCES IN LEVELS







Source: MGI analysis

The impact of IT derives mainly from increasing the share of non-empty hauls and reducing the time of non-driving hours (Exhibit 19).

Exhibit 19

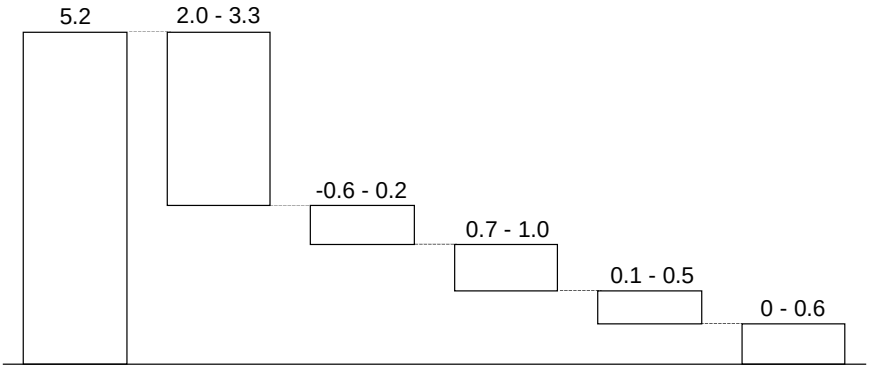
IT CONTRIBUTION TO GROWTH IN FRANCE AND GERMANY

ESTIMATE

Percent CAGR 1992 - 2000

IT contribution

Germany



Contribution by operational factor	Total growth	Change in average capacity of trucks	Change in capacity utilization	Change in average speed	Change in productive time	Change in output mix*
France	5.0	2.0 - 3.3	-0.6 - 0.2	0.3 - 0.7	0.7 - 1.2	0 - 0.6
Contribution by IT	0.8 - 1.2	0	0.6 - 0.7	0	0.1 - 0.4	0.1

IT contribution to total productivity growth is approx. 20%

* Increasing share of time-definite and expedited shipments

Source: MGI analysis

There were four major categories of IT investments during the 1990s in Europe (Exhibit 20):

Exhibit 20

GOALS AND IMPACT OF IT IN FRANCE AND GERMANY

● High impact
◑ Moderate impact
○ Little or no impact

ESTIMATE

Goals	IT initiatives	Total spending	Effect on productivity* Labor	Effect on productivity* Capital	Evaluation of overinvestment/ future potential	Impact in the US during 90s
Operational excellence	• Data exchange with customers	◑	○	○	• Investments necessary to fulfill customer requirements, however, orders still keyed in manually	◑
	• Network optimization and dispatching	◑	◕	◕	• Most large players implemented it with positive impact, but not yet throughout their whole network	●
	• Barcoding and scanning	●	◔	◔	• Significant investments during end of 90s, high future potential	●
New products, services, or businesses	• Online freight exchanges	●	◔	◔	• Possible area of overinvestment, as most start-ups failed	◑
	• Online T&T services	◑	◔	◔	• Offered only in LTL; little impact on productivity as most customers not willing to pay	◔
Exceptional events	• Integration of acquired companies	●	◔	◔	• Significant investments, high future potential	• N.a.
Maintenance	• Upgrading of existing IT systems	◑	◔	◔	• Investments in back-office software, e.g., SAP module; little impact on productivity	• N.a.
Regulatory requirements	• Implementation of trip recorders	◑	○	○	• Investments by drivers to comply legislation; not used in improving productivity	• N.a.

* Gross productivity increase; cost of IT investment not included

Source: Expert interviews, MGI analysis

¶ *Network optimization and back-office automation* – These investments had a positive impact on productivity growth, increasing the share of non-empty hauls and optimizing the back-office workforce. The IT impact in terms of non-empty hauls is estimated at 5 to 7 percent, and in terms of share of driver hours at 3 to 5 percent in France and 1 to 3 percent in Germany.

¶ *Visibility in the IT system* – Significant investments were made in increasing visibility in the IT system. These included advanced barcoding and scanning solutions, as well as integrating IT systems from acquired companies. Increasing visibility in the IT system enables improved load-to-capacity matching and network scheduling, thereby increasing capacity utilization. The benefits of these investments had not been captured by 2000, but are expected to have a significant impact on productivity growth during this decade.

¶ *Trip recorders* – The implementation of electronic trip recorders was necessary to comply with EU regulations. However, because most driv-

ers continue to use manual logs in parallel, the impact on productivity was negligible.

¶ *Online freight exchanges* – Start-ups and auctioning platforms in this area were, for the most part, not successful, as most French and German forwarders did not want to lose contact with their customers. However, established freight exchanges such as Teleroute or internal exchanges by major forwarders were successful in carrying their existing business models online.

By the end of the 1990s, France and Germany lagged significantly behind the US in the use of IT and penetration of technologies (Exhibit 21).

Exhibit 21

PENETRATION OF TECHNOLOGIES

● < 5% ◑ 5 - 15% ○ 15 - 30% ○ 30 - 50% ○ > 50% ESTIMATE

IT initiatives	US Early 90s	US Mid-90s	US Late 90s	US Today	Europe Early 90s	Europe Mid-90s	Europe Late 90s	Europe Today
• Data exchange with customers								
– EDI	◑	◕	●	●	◑	◕	●	●
– Internet	○	◔	●	●	○	○	◑	◕
• Network optimization and dispatching	◑	◕	●	●	○	◔	◑	◕
• Barcoding and scanning	◑	◕	●	●	◔	◔	◑	◑
• Intelligent vehicle systems								
– Specialized mobile radio	◕	◕	●	●	◕	◕	●	●
– Cell phone/pager	◕	◕	●	●	○	◔	●	●
– On-board computers	○	◔	◑	◕	○	○	◔	◑
– Maintenance support system	◔	◑	◕	●	○	○	◔	◑
– Electronic logbooks/trip recorders	○	○	◔	◔	○	○	◕	●
• Positioning and remote tracking								
– Automatic vehicle location	○	◔	◔	◕	○	○	◔	◔
– Satellite communications	○	◑	◑	◕	○	○	○	◔
– RF tags	○	○	○	◔	○	○	○	◔
• Telematics systems	○	○	○	◔	○	○	○	○
• Online T&T services	○	○	◔	◑	○	○	◑	◔
• Online freight exchanges	◔	◑	◕	◕	◑	◑	◕	◕

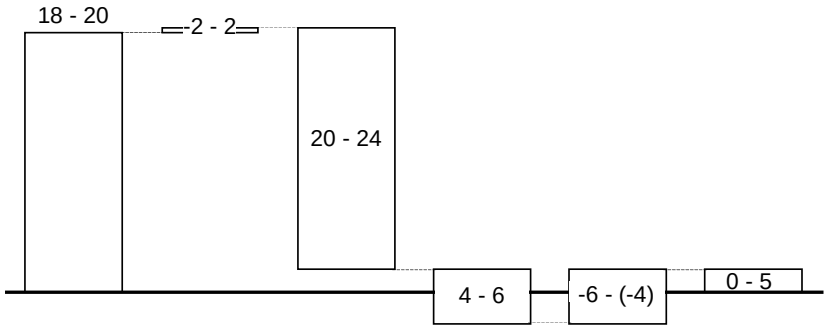
Source: ATA, expert interviews

While French and German companies were struggling to get the basics of their IT system right, most companies in the US were enjoying the benefits of high visibility in the IT system, increased communication and information flow between drivers, the central IT system and customers, as well as a high degree of optimization, e.g., in scheduling and loading. The difference in IT is estimated to account for 9 to 13 percentage points in the 18 to 20 percent productivity gap in 2000 (Exhibit 22).

Exhibit 22

PRODUCTIVITY LEVEL DIFFERENCE DUE TO IT
Percent of US 2000 level

ESTIMATE
IT contribution



Difference due to operational factor	Total level difference	Average capacity of trucks	Capacity utilization	Average speed	Productive time	Output mix*
Contribution by IT	9 - 13	0	8 - 8 - 12	0	0	~ 1

IT accounts for ~ 50% of labor productivity difference between France and Germany vs. the US

* Difference in share of time-definite and expedited shipments
Source: MGI analysis

As discussed earlier, similar technologies were available in road freight in Europe and the US. The discrepancy in IT usage stems from the earlier deregulation in the US, which allowed US companies to focus on achieving operational excellence in the 1990s while French and German companies were concentrating on increasing market share through acquisitions. However, during this decade, French and German companies will also be able to focus increasingly on technology. IT is expected to be a key driver of productivity growth in Europe and in narrowing the productivity gap to the US.

OUTLOOK AND RECOMMENDATIONS

Given the physical limits in road freight transportation, high productivity growth rates in France and Germany are not sustainable in the long term. Growth is expected to slow down gradually during this decade as the effects of deregulation and the resulting industry consolidation take hold. Europe is expected to reduce further the productivity gap with the US. However, a full conversion of the levels is not expected due to the structural differences that accounted for approximately 10 percent of the level difference in 2000. During the coming decade, the major drivers of growth are expected to be IT, continuing industry consolidation,

increasing demand for higher-value services, and the eastward expansion of the EU.

- *IT impact* – As the benefits of deregulation are captured fully, operational efficiency improvement through IT is expected to emerge as the main driver of productivity during this decade. The IT investments of the late 1990s focused on increasing visibility in the IT system, as well as on integrating the IT systems of acquired companies. This is expected to increase capacity utilization and position companies for offering higher-value products, e.g., expedited and time-definite shipments as well as value-added services such as labeling, warehousing and logistics planning. Furthermore, Europe is expected to catch up in penetration of technologies as companies increasingly use IT to improve operational efficiency. The impact of IT investments will be determined by the degree to which requirements are defined accurately, timing is chosen correctly, and roll-out is conducted effectively.

- *Continuing industry consolidation* – During this decade, the economies of scale from past and continuing consolidation are expected to lead to higher capacity utilization and increased productivity of non-driving personnel.

- *Demand for higher-value services* – From 2000 to 2010, increasing demand is expected for higher-value products and value-added services. As mentioned above, IT will allow companies to meet this demand.[10]

- *Eastward expansion of the EU* – This will provide access to lower-wage drivers and allow Eastern European companies to operate in the current EU countries. European players are expected to shift their employee base to lower-wage drivers from Eastern Europe. If EU expansion only enables access to lower labor costs, it can shift the trade-off between labor and capital inputs in favor of higher share of labor inputs. On the other hand, the productivity of local players will also increase due to increasing competition and the net effect of these factors on labor productivity is unclear. However, in addition to lower-wage drivers, the EU expansion will also allow Eastern European companies to compete in EU markets. This will increase the price pressure on forwarders employing lower-wage drivers, local players, and owner operators and force these companies to increase labor productivity further.

- *Continuing output growth* – Strong demand growth for freight transportation in Europe is expected to continue during this decade. Despite the current deregulation, rail is not likely to compete directly with road

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[10] The value-added services are not directly included in the output measured in this study. However, increased bundling of these services with transportation will have a positive impact on the value added in road freight.

freight in the short term due to the massive investments and time required to further develop the current rail freight network. Consequently, an increase in the road freight network density is expected to lead to higher labor productivity.

Regulatory issues

Following deregulation, the main regulatory issues remaining in the industry will be labor laws on working hours and restrictions, regulatory steps taken during the expansion of the EU to Eastern Europe, and new restrictions on truck capacity and speed limits.

- *Labor laws* – Stricter labor laws in the EU led to a lower average number of hours worked by drivers in Europe than in the US. However, we found no evidence that the difference in restrictions on driving hours has had an impact on productivity. Still, country-specific labor laws within the EU need to be analyzed carefully. They may become a competitive disadvantage for drivers in a given country and lead to increased employment of drivers from other countries, thereby reducing employment levels in the first country. The EU's initiative to implement Pan-European labor laws for road freight by the end of the decade could solve this problem.
- *Eastward expansion of the EU* – The regulatory steps planned for the expansion of the EU to Eastern Europe will gradually allow Eastern European trucking companies to operate freely within the current EU borders. While discussions continue with Poland, the current plan is to raise cabotage contingents for other countries gradually after 2004 before eliminating them in 2009. Consequently, the expansion is not expected to lead to a discontinuity in the European road freight industry.
- *Highway tolls* – A new toll system on German highways will be introduced in 2003 to 2004. All trucks operating on German highways will be required to implement a device for automatic recognition and billing. Although this toll system will increase IT spending, labor productivity is not expected to be affected.
- *Capacity and/or speed limits* – Changes in restrictions on truck capacity and/or speed limits are not expected as they would improve productivity at the expense of safety and increased infrastructure spending.

Key success factors for companies

During the 1990s, companies focused on growth and acquisitions in a fast growing market following deregulation. The key success factors during the coming decade

will be improving operations, expanding the service offering, fully integrating acquired companies, and continuing acquisitions.

- *Improving operations* – Operational improvements are mainly expected to come from achieving transparency in the IT system. This will enable companies to improve capacity utilization by improving efficiency of load to capacity assignments, to increase the quality of service by offering real-time online T&T information, and to offer higher-value services, such as expedited and time-definite services.

- *Expanding service offering* – Forwarders acting as a one-stop shop will be the best positioned in the market. These companies will have to offer a full range of services including expedited and time-definite shipments, as well as value-added services, such as labeling, warehousing, and logistics planning.

- *Integrating acquired companies* – European forwarders that successfully integrate acquired companies into their IT systems and operational processes will have a competitive advantage, as they will be able to capitalize on economies of scale in operations, e.g., higher network density, as well as in back-office activities.

- *Continuing acquisitions* – While largest European players have built Pan-European networks and reached a significant size, there are still significant economies of scale to be captured for most players through acquisitions.

APPENDIX: METHODOLOGY

Definition of productivity

The MGI definition of productivity in road freight is the total ton-km per hours worked, where the ton-km is adjusted for time-definite and expedited services (Exhibit 23). Total output includes all for-hire ton-km produced by the trucks registered in a given country.

Exhibit 23

METHODOLOGICAL APPROACH – ROAD FREIGHT ANALYSIS

	Approach
Output	
Basis for output measure	• Physical output adjusted for time-definite and expedited services
Definition of products and services in output measure	• Ton kilometers (ton-km) of all for-hire domestic and cross-border local and long-distance road freight transportation services – France: Local and intercity road freight, auxiliary services – Germany: Local and intercity road freight, postal services vehicles > 3.5 t included – US: Local and intercity traffic, excl. parcels, > 150 lb
Adjustments	• Adjustments for time-definite and expedited services based on interviews based on percentage of shipments and price premium • No adjustments for differences in quality, average length of hauls, and mix of transported goods • Data refinement done for outliers and missing data points in Germany and the US
Input	
Basis for labor input	• All headcounts in Germany • FTEs in France • FTEs except owner-operators in the US
Adjustments	• Hours worked calculated per driver and per non-driving personnel, average number of weeks worked per driver and non-driving personnel • Adjustment for share of part-time workers to headcounts in Germany • Data refinement for outliers and missing data points in Germany • Adjustments for owner-operators in the US

Source: MGI analysis

Definition and adjustments for output data

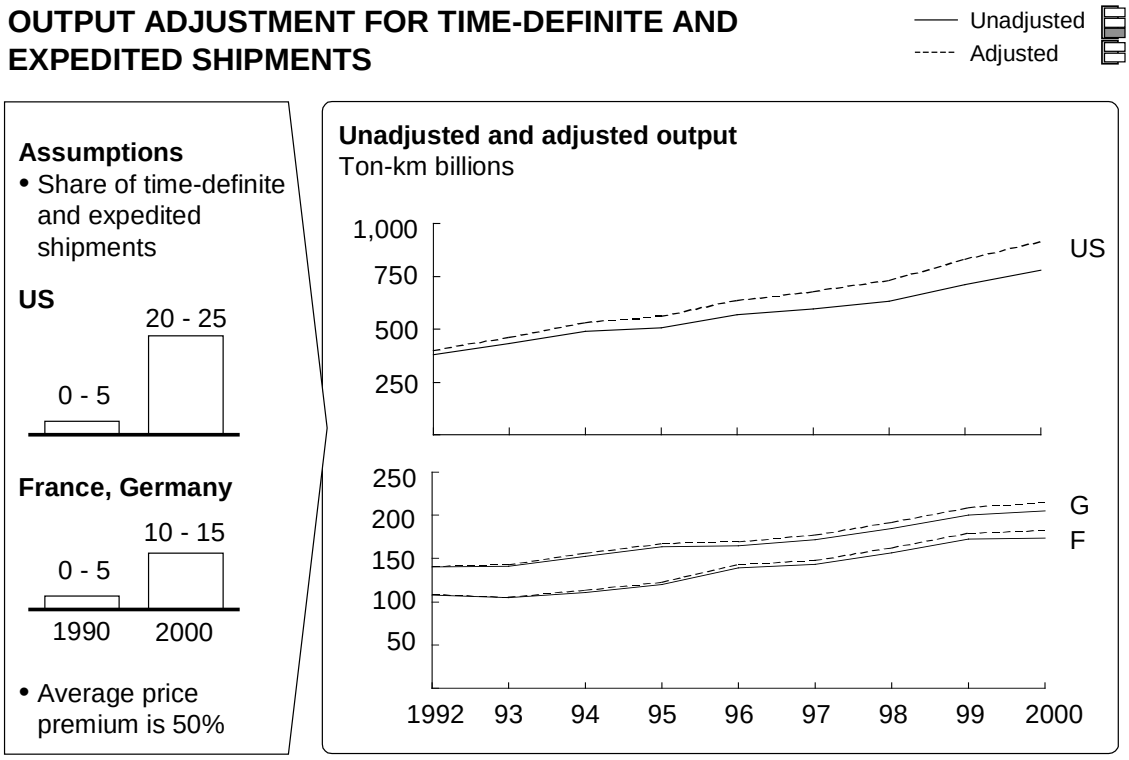
The ideal output for measuring productivity is GVA (gross value-added). However, national statistics across countries do not have a common definition for what is included in road freight GVA figures. For example, the Bureau of Economic Analysis in the US includes GVA from warehousing, whereas the Statistisches Bundesamt in Germany does not. Comparing GVA figures also requires additional steps that further blur the picture, such as building deflators by using services that are not directly comparable across countries. Consequently, we decided

that the GVA figures were not comparable across countries and that using the physical measure of ton-km would provide us with a more comparable data set.

The ton-km measure accounts for the physical output in road freight but fails to differentiate between different service levels. For example, the physical output is the same for a regular shipment and a time-definite shipment to an automotive manufacturing plant using JIT practices, despite the fact that the time-definite shipment has a higher value-added. To correct for this, an output adjustment was made for higher-value services based on the price premium for these services and the percentage of higher-value shipments. Higher-value shipments are defined as expedited and time-definite shipments, e.g., for just-in-time (JIT) manufacturing in automotive, or for improved inventory management in retailing (Exhibit 24).

Exhibit 24

OUTPUT ADJUSTMENT FOR TIME-DEFINITE AND EXPEDITED SHIPMENTS



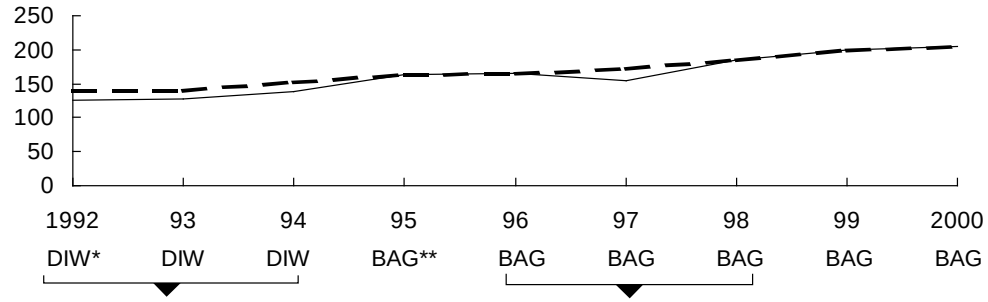
Source: Expert interviews, MGI analysis

Further adjustments in the output data were made for Germany and the US for "outliers" and missing data (Exhibits 25 and 26).

Exhibit 25

OUTPUT – APPLIED DATA REFINEMENT FOR GERMANY

Ton-km billions



	1992	93	94	95	96	97	98	99	2000
Source	DIW*	DIW	DIW	BAG**	BAG	BAG	BAG	BAG	BAG

Explanation of adjustments made

- DIW numbers do not include foreign part of cross-border traffic
- Retropolate share of foreign cross-border traffic, assuming half CAGR of 1995 - 2000
  - – Cross-border traffic grew disproportionately
  - – Retropolating cross-border traffic in absolute numbers more blurred due to high volatility

- "Outlier"
  - – Cross-border traffic shows sudden decrease by 40% in 1997
  - – Growth rates from other years and from domestic traffic suggest statistical error
- Interpolate between 1996 and 1998

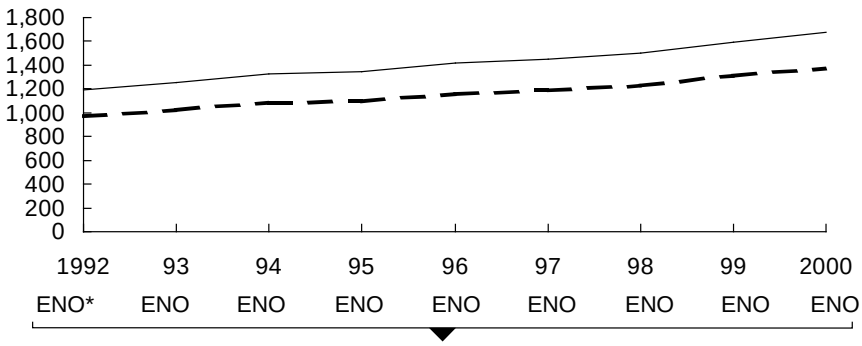
* Deutsches Institut für Wirtschaftsforschung
** Bundesamt für Güterverkehr

Source: DIW, BAG, MGI analysis

Exhibit 26

OUTPUT – APPLIED DATA REFINEMENT FOR THE US

Ton-km billions



Explanation of adjustments made

- Adjustment for for-hire**
  - Share of for-hire traffic in total road freight transportation is 72% in both the 1993 and 1997 commodity flow surveys
  - Assumption: Outsourcing rate did not change
  - Assumption: For-hire traffic has had a stable share of total over the last decade
  - Deduct 28% of all ton-miles and change ton-miles into ton-km
- Adjustment for local
  - Share of local in for-hire is 6% in both the 1993 and 1997 commodity flow surveys
  - Assumption: Local has had a stable share over the last decade
  - Add 6% of all for-hire ton-miles and change into ton-km

* ENO Transportation Foundation, Washington

** Estimate assumes 5% growth for 2000, corresponds to the 1990 - 1999 CAGR of 1990 - 1999 intercity ton-miles

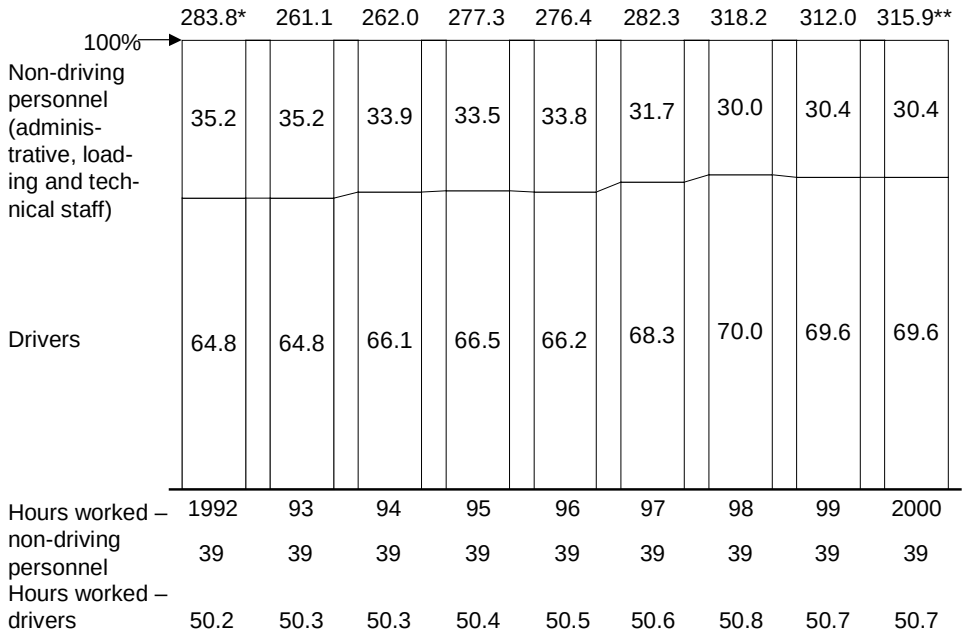
Source: ENO, Commodity Flow Surveys 1993 and 1997, MGI analysis

Definition and adjustments for input data

MGI's input measure for this study is total hours worked. Total hours worked was calculated based on average hours worked by driving and non-driving personnel, and the share of driving and non-driving personnel in total Full Time Equivalents (Exhibit 27).

Exhibit 27

INPUT IN ROAD FREIGHT – EXAMPLE FRANCE
Percent of total FTEs, thousands, hours per week



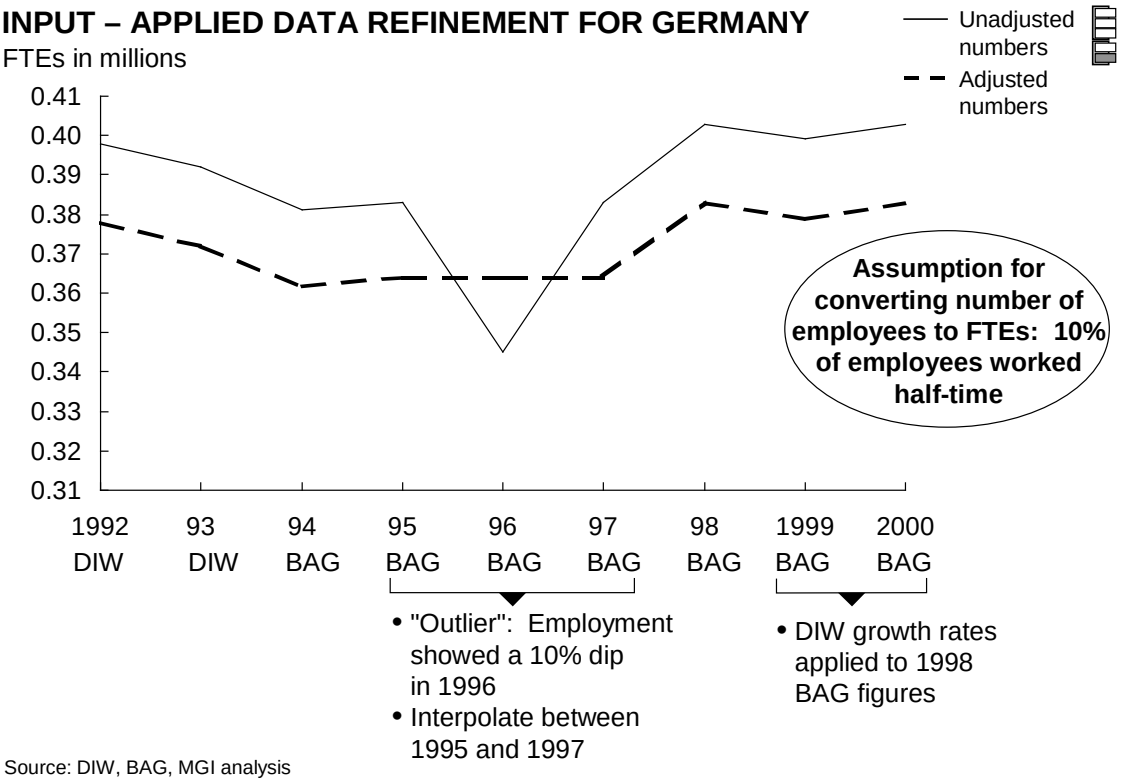
* Same share of drivers and non-driving personnel assumed as in 1992
** Same share of drivers and non-driving personnel assumed as in 1999
Source: DAEI/SES "Observatoire social des transports" conjoncture sociale 07/2001, MGI analysis

Further adjustments in the input data were made for Germany and the US for "outliers" and missing data (Exhibits 28 and 29).

Exhibit 28

INPUT – APPLIED DATA REFINEMENT FOR GERMANY

FTEs in millions



- "Outlier": Employment showed a 10% dip in 1996
- Interpolate between 1995 and 1997

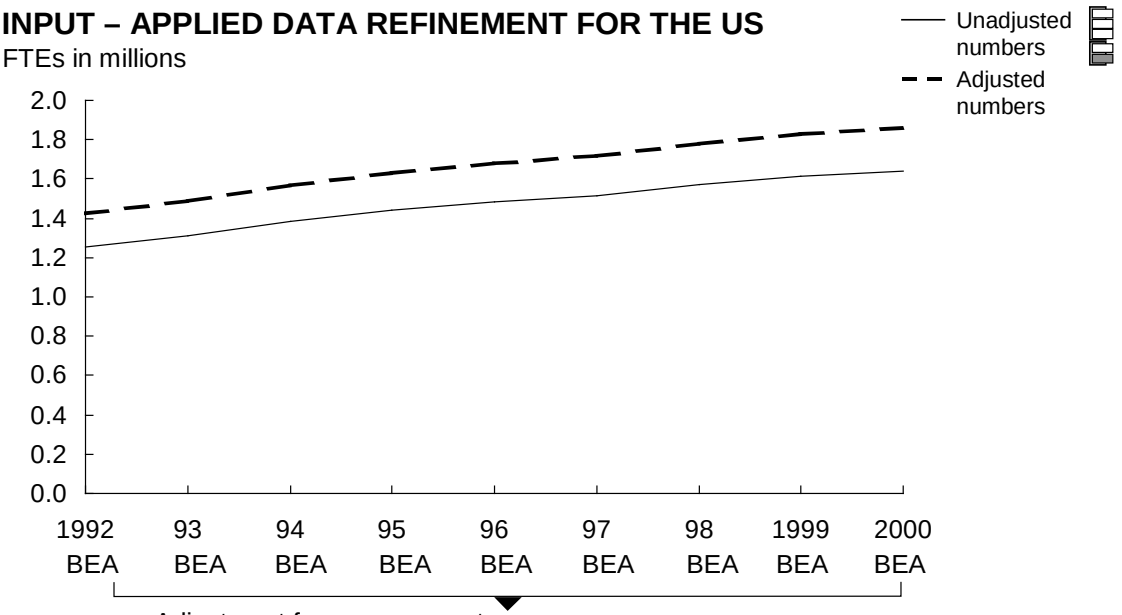
- DIW growth rates applied to 1998 BAG figures

Source: DIW, BAG, MGI analysis

Exhibit 29

INPUT – APPLIED DATA REFINEMENT FOR THE US

FTEs in millions



- Adjustment for owner-operators
  - Share of owner-operators 14% in 1997 and 13% in 1993 according to the Census Bureau Vehicle Inventory & Use Survey
  - Assumption: Owner-operators with a steady 13.5% of employment over the last decade

Source: BEA, Census Bureau, MGI analysis