

# Reaching higher productivity growth in France and Germany

Sector case: Telecommunication Services



McKinsey  
Global  
Institute

with assistance from our Advisory Committee

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October 2002

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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 performances 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, policymakers 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 policymakers 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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October 2002

## **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 Erking, 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, Na ima Sboron, Ulrich Scholz, Jonathan Turton and Stéphane Veyer.

# Telecommunications services

## EXECUTIVE SUMMARY

Telecoms is a major employer in France, Germany and the US. It is also a fast growing industry, reaching annual double-digit growth rates in all three countries over the course of the 1990s. A series of major regulatory and technological developments over the past ten years has substantially affected the industry and its labor productivity.

### Labor productivity performance

Germany showed the highest levels of labor productivity growth from 1992 to 2000 with an average annual rate of 19.4 percent. This meant that by 2000, the German telecoms sector was actually 3 percent more productive than the US telecoms sector. France's growth was not far behind at 17.7 percent, although it has still to catch up with the US overall. The US experienced a more modest, but nevertheless impressive, growth of 9.4 percent annually.

Telecoms covers two businesses in very different stages of maturity: Fixed-line and mobile. They share some commonalities in terms of the underlying causes of labor productivity, but the rates of growth and the market environments are markedly different. French and German labor productivity growth in mobile services almost double US levels, whereas the gap in fixed-line was far narrower, and France in particular still lags a long way behind the US.

### Labor productivity level differences in fixed-line services

Demand and regulation lie behind the productivity differences between the US and France/Germany in fixed-line services. At the heart of the matter, people in the US spend more time on the phone, especially on long-distance calls, although this holds true for all types of calls. The European countries do have some advantages, with national operators benefiting from economies of scale and, in Germany, the rampant success of ISDN.

- ¶ *Firm-level factors* – Traffic per line in the US is 2 to 3.5 times the level it is in France or Germany. This alone boosts labor productivity, and still more than counteracts the negative effect of the fragmentation of the US

telecoms market and the attendant loss of economies of scale. Germany's success in pushing its high-value, low-labor ISDN service has helped it come close to US levels.

- ¶ *External factors* – Higher incomes, higher mobility, and several other factors drive higher demand in the US, and this is more relevant than the lack of deregulation in the French and German markets in terms of explaining the labor productivity differences. However, the fragmentation in the US again has a negative effect, causing replication of labor pools for both back-office and marketing and sales departments. Privatization in Europe has helped improve labor productivity levels there, although there are still large differences between France and Germany in the extent of state ownership.

### **Labor productivity level differences in mobile services**

Regulation has worked against the US companies, despite trying to force a competitive market. The end result is fragmentation, overlapping networks and the consequent replication of labor. Germany suffers from comparatively low traffic per user. Meanwhile France – which has only three operators making it superficially the least competitive market – has been very successful in mobile services with labor productivity levels 45 percent higher than in Germany and more than 100 percent higher than in the US in 2000.

- ¶ *Firm-level factors* – The US and France have similar levels of mobile penetration, but the US has far higher labor costs per subscriber. The lack of economies of scale has proved dear, not least by encouraging levels of competitive intensity that create high (and expensive) churn rates. German operators are still trying to boost traffic, which has lagged French levels for five years.
- ¶ *External factors* – Regional licensing is the core of the problem for the US mobile operators, who find it hard to achieve scale. To a lesser extent, labor productivity is also lowered by a more dispersed population. The lower traffic volume in Germany might be a result of differences in the complexity of pricing schemes and/or differences in consumer demand profiles and behavior.

### **Role of IT**

Telecoms is an extremely IT-intensive sector, with IT systems at the heart of the business. IT contributed to the majority of the productivity growth in all three countries over the 1990s, accounting for as much as 75 percent in Germany. IT has helped operators maximize the benefits from economies of scale and, more



directly, it has introduced new technologies to the mass -markets such as fixed data and mobile digital communication. In the US, IT spending has been higher per output unit than in France and Germany, again as a result of fragmentation.

### **Outlook and recommendations**

It has been a successful ten years for labor productivity in this sector, but there is potential for further improvement. In France, there is scope for further work force reduction in fixed -line operations. The US mobile market needs to consolidate; already there are some national mobile operators in the market. In the German market, ways need to be identified to further stimulate demand. The European examples in mobile services show that regulators need to balance the number of competitors with the benefits of economies of scale.

Looking into the future, all three countries can be confident that new services – some already being rolled out, others still being dreamed up – will continue to help them boost productivity in both fixed -line and mobile services.

## OVERVIEW OF THE TELECOM SERVICES SECTOR

The telecom services sector reached double-digit annual productivity growth rates in the 1990s. It contributed substantially to overall productivity growth in the three countries being analyzed: France, Germany, and the US.

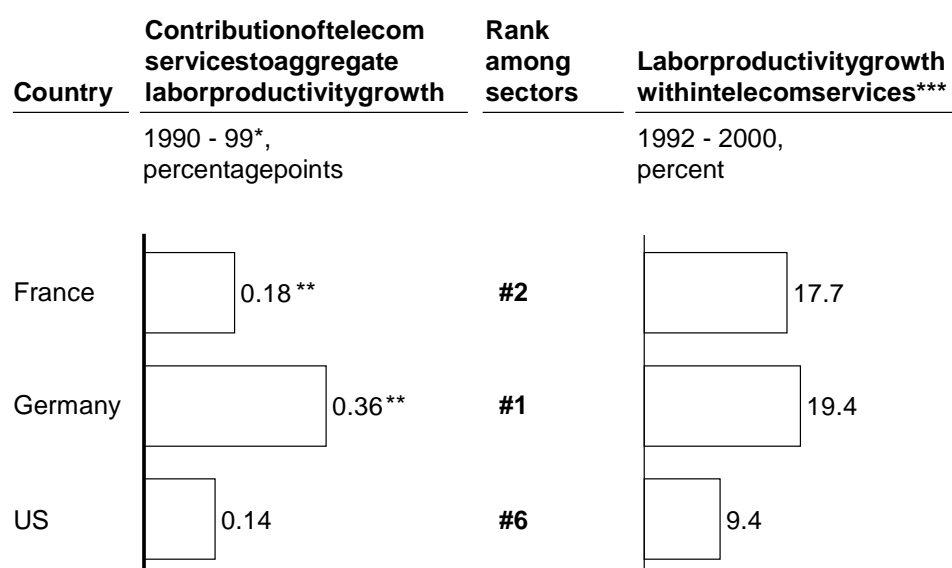
### Importance of the sector to the overall question

Telecom services was a major contributor to aggregate labor productivity growth during the 1990s; it was the first, second and sixth contributor to productivity growth in Germany, France, and the US, respectively (Exhibit 1). In addition, the 1990s were a period of major change in the industry with market deregulation, privatization of national incumbents, and the development of mobile services and data communication taking place, all of which had a tremendous effect on labor productivity growth.

Exhibit 1

### CONTRIBUTION OF TELECOMMUNICATION SERVICES TO AGGREGATE LABOR PRODUCTIVITY GROWTH

CAGR



\* 1992 - 99 in Germany

\*\* Including postal services in France and Germany

\*\*\* Based on MGI productivity measures

Source: INSEE, Statistisches Bundesamt, BEA, MGI analysis

## Industry profile

In 2000, fixed-line and mobile telecom services employed around 163,000 people in France, 200,000 in Germany, and 1,074,000 in the US, representing 0.69, 0.53 and 0.73 percent of total employment, respectively. While labor input grew significantly over the 1990s in the US, it remained stable in France and actually fell slightly in Germany, with average annual growth rates of labor input of 3.3, 0.1 and -1.9 percent, respectively. However, this relatively stable trend in employment occurred during a time of substantial growth in the set of services provided, particularly in data and mobile services. This has helped telecom services to provide high value-added per employee relative to most other sectors: The Telephone and Telegraph sector contributed to 2.21 percent of total US GDP in 2000, but only 0.8 percent of total employment. In other words, the telecom industry is 2.6 times more labor-productive than the US average.

The telecom industry went through several major regulatory changes and technology breakthroughs during the 1990s. The opening of markets and the privatization of national incumbents in France and Germany, the Telecom Act of 1996 in the US, and the development of mobile digital telephony and IP<sup>2</sup>-based networks were some of the more notable. Those changes dramatically affected the service mix of the telecom industry (Exhibit 2). Their impact is reflected in the dynamic productivity growth of the sector but also in the fact that France and Germany have largely closed the gap to US levels of productivity.

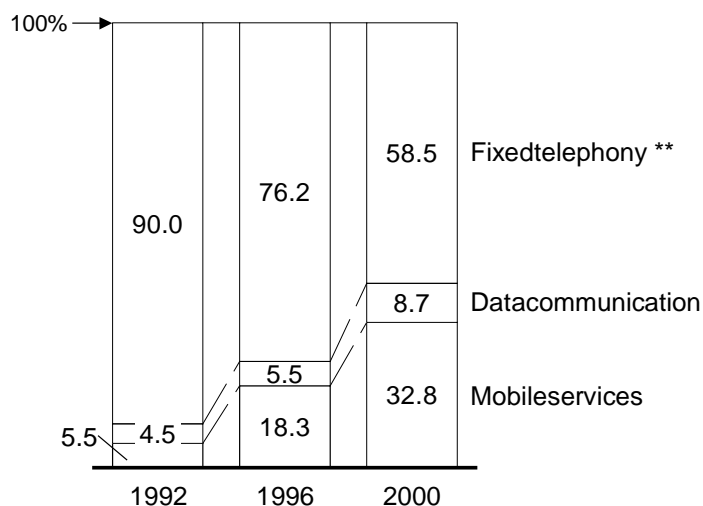
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<sup>1</sup> Based on BEA sector perimeter. We use BEA data here to be consistent between employment and GDP data perimeters. The 0.73 percent share of employment mentioned previously is based on the MGI telecom perimeter, as in the rest of the document (see methodological appendix).

<sup>2</sup> Internet Protocol

**TELECOMMUNICATIONS SERVICES REVENUE MIX\***

Percent of total revenues



\* Based on average of France, Germany, and the US

\*\* Including Internet dial-up traffic revenues

Source: RegTP, ART, NECA, FCC, CTIA, MGI analysis

**LABOR PRODUCTIVITY PERFORMANCE**

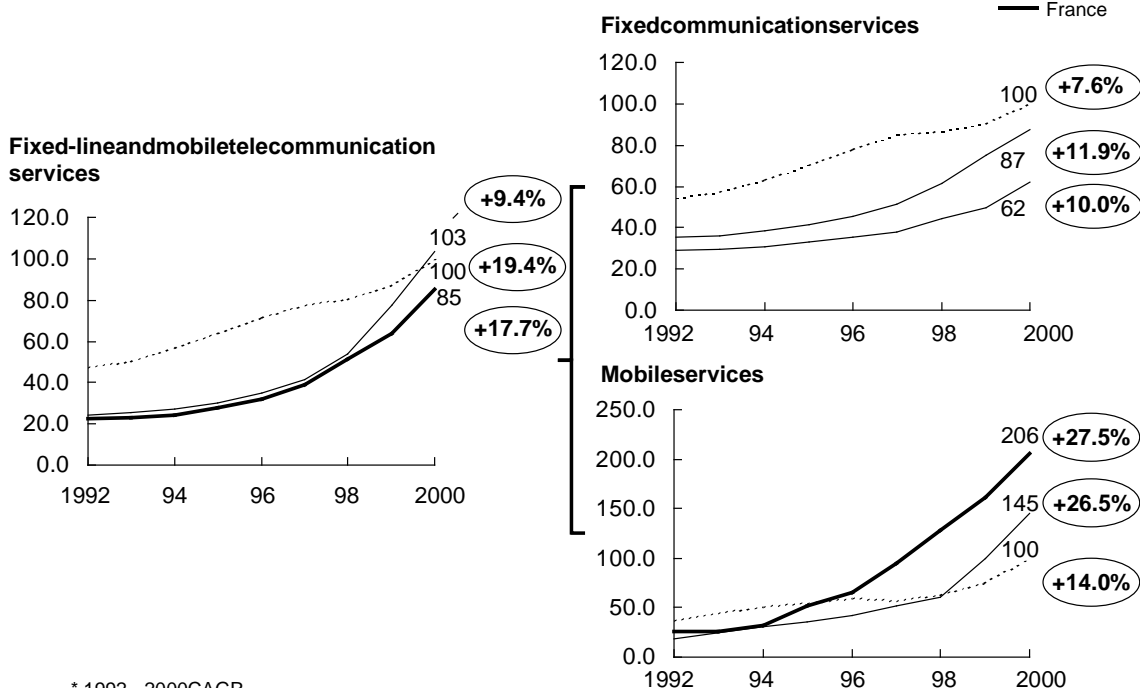
Productivity is measured using physical output indicators for access (e.g., main lines, mobile subscribers, data ports) and traffic (e.g., call minutes, SMS sent), and hours worked for the labor input. We split the productivity analysis between fixed-line (including fixed-line telephony, data communication and leased-line services), and mobile services, to account for distinct development patterns, including different regulatory frameworks and industry structures.

Over the course of the 1990s, labor productivity in fixed-line and mobile telecom services grew strongly, and France and Germany converged on US levels. From 1992 to 2000, the average annual growth rate of labor productivity was 17.7 percent in France, 19.4 percent in Germany, and 9.4 percent in the US. France and Germany now stand at 85 and 103 percent of the US level in 2000, respectively, yet just eight years earlier, both were only half as productive as the US (Exhibit 3).

**LABOR PRODUCTIVITY IN FIXED -LINE AND MOBILE SERVICES**

Index 100 = US level 2000

+X% CAGR\*  
 — Germany  
 - - - US  
 — France



\* 1992 - 2000 CAGR

Source: FCC, NECA, CTIA, RegTP, ART, ITU, OECD, Gartner/Dataquest, annual reports, operators' websites, MG I analysis

¶ *Fixed-line services* – Labor productivity increased in all three countries, with average annual growth rates of 11.9 percent in Germany, 10 percent in France, and 7.6 percent in the US from 1992 to 2000. This allowed Germany to close its gap to the US, moving from 63 percent of the US levels in 1992 to 87 percent in 2000. France has been far slower to catch up, moving from 53 percent of the US levels in 1992 to just 62 percent in 2000.

tch

¶ *Mobile services* – European countries achieved considerably faster productivity growth than the US, resulting in overall higher productivity levels. France and Germany's productivity reached 206 and 145 percent of the US level in 2000, respectively, with annual growth rates in the 1990s reaching 27 percent in France and Germany, compared to 14 percent in the US.

Given the particularly high capital intensity of telecom services, capital productivity is certainly an important issue. However, we concluded that the lack of available data, and issues of data consistency across countries, created too much uncertainty about capital productivity measures to allow conclusions to be drawn. Moreover, most of the conclusions drawn from the labor productivity analysis apply equally to capital productivity analysis: In particular, labor productivity gaps related to differences in traffic per line in fixed-line telephony, or traffic per

subscriber in mobile services, affect capital productivity in a similar way. Therefore, we focus here on labor productivity levels, although capital productivity will be mentioned where it adds additional insights.

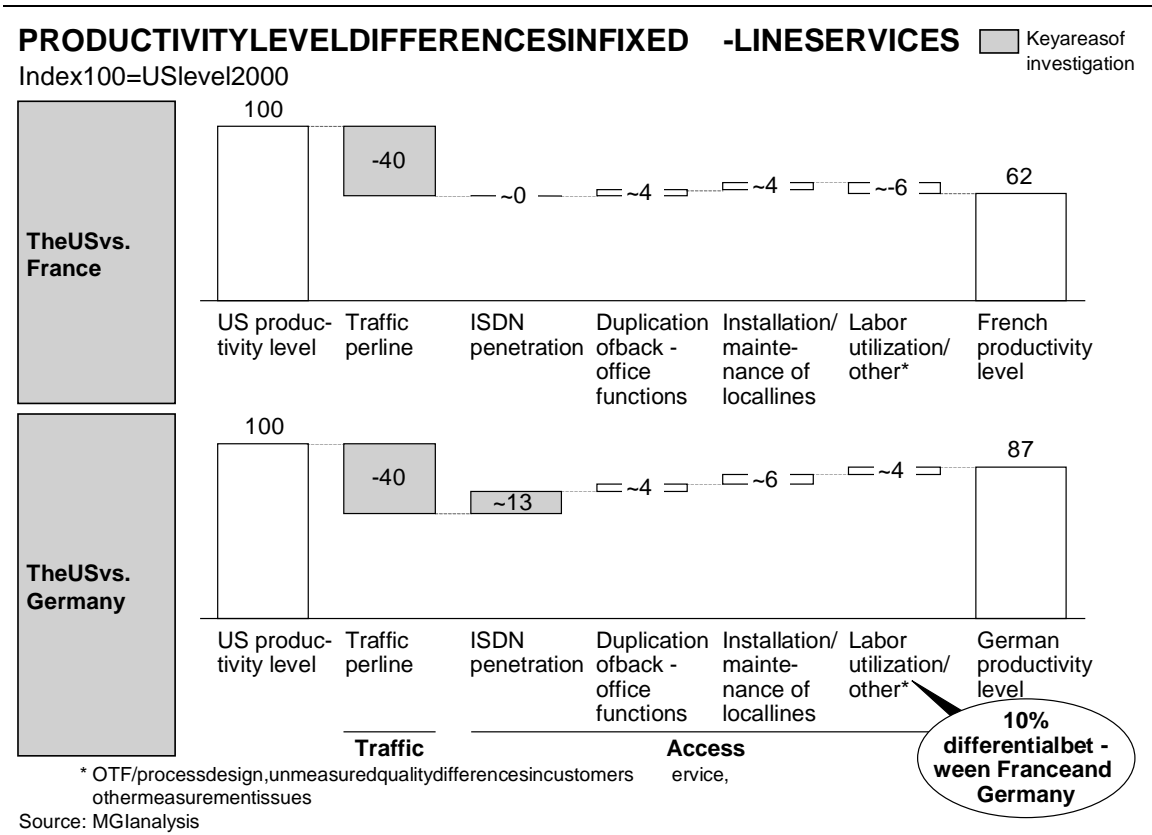
## LABOR PRODUCTIVITY LEVEL DIFFERENCES IN FIXED-LINE SERVICES

Demand and regulatory factors –including the legacy effects of former regulations –drive US traffic levels far higher than in France and Germany, thus generating a productivity advantage through labor economies of scale. German telecom services partly compensate for their traffic gap to the US with a high penetration of ISDN services.

### Firm-level factors

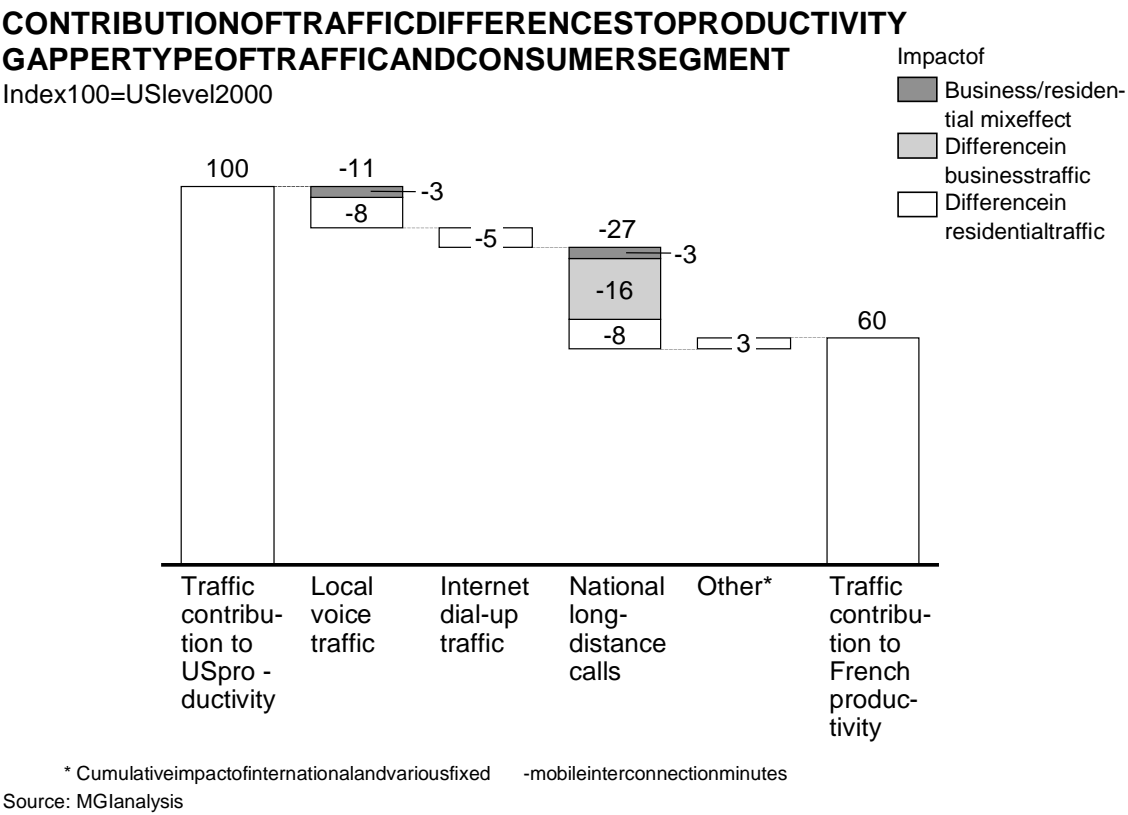
In fixed-line voice and data services, labor productivity levels in France and Germany reached 62 and 87 percent of the US 2000 level, respectively. Differences in traffic per line have remained the main factor behind higher productivity in the US compared to France and Germany over time (Exhibit 4).

Exhibit 4



*Traffic per line*<sup>3</sup>. The US has a 40 percentage points productivity advantage over France and Germany, due to traffic per line typically 2 to 3.5 times French and German levels. Differences in long-distance traffic are of particular importance to the total traffic impact on productivity levels<sup>4</sup>, but the US maintains its advantage for most categories of traffic, including local voice and Internet dial-up, as well as for both residential and business customer segments (Exhibits 5 and 6). The US also benefits from its particular mix of business and residential lines. Business line penetration is far higher in the US, with 28.3 lines per 100 inhabitants compared to only 17.3 in France. This increases the average traffic per line in the US compared to France and Germany, as business lines generate more long-distance traffic than residential lines.

Exhibit 5

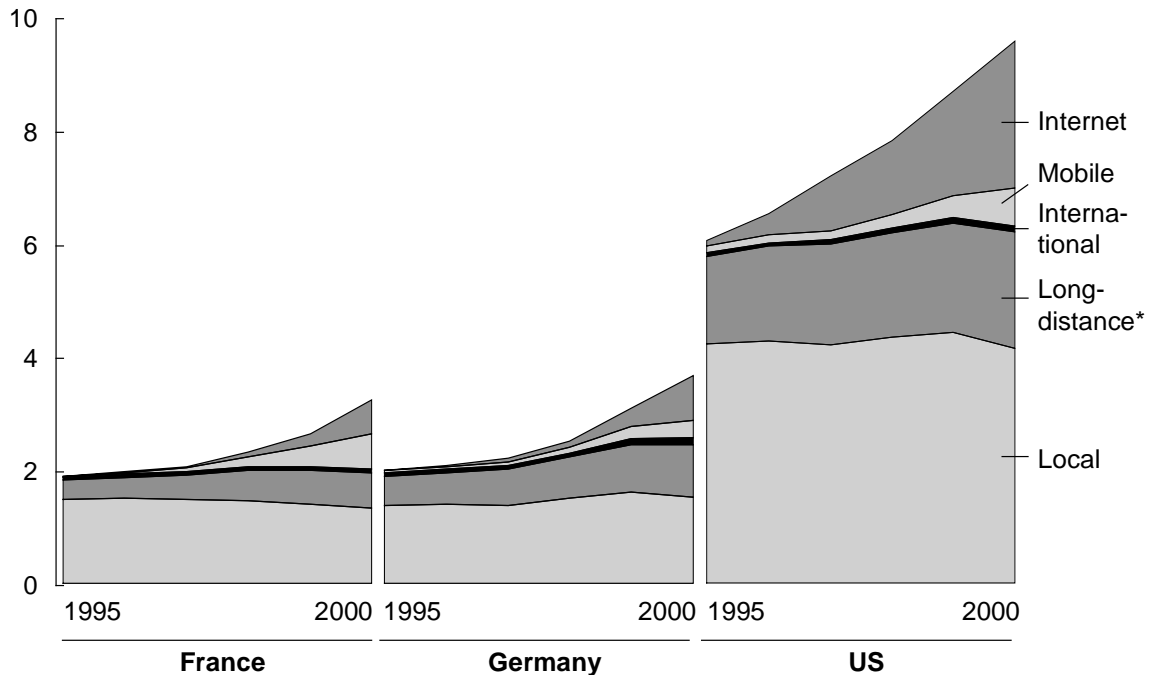


<sup>3</sup> Traffic per line: The number of communication minutes per main access line, including voice and Internet dial-up traffic.

<sup>4</sup> The impact of the long-distance traffic gap is higher than for local traffic as we aggregate various categories of minutes using their relative unit prices as weights, with a higher unit price for long-distance communications.

**TOTAL CALL MINUTES IN FRANCE, GERMANY, AND THE US**ESTIMATE

Annual outgoing minutes per capita, thousands



\* Including fixed -to-mobile traffic in France and Germany, and intrastate and interstate traffic in the US  
 Source: RegTP, ART, NECA, FCC, ITU, CTIA, MGI analysis

*Output mix*. During the 1990s, ISDN services developed very rapidly in Germany, significantly more than in any other country. By 2000, ISDN channels accounted for more than 35 percent of access lines in Germany, compared to 13 percent in France and 11 percent in the US (Exhibit 7). Providing ISDN services almost double the value added in terms of access compared to a standard analog line – and is billed as such – but requires no significant additional labor input. ISDN development therefore brings a productivity advantage to German telecom services of approximately 13 percent over France and the US. The impact of ISDN on capital productivity is lower but still clearly positive, as it is only mainly terminal equipment that needs to be upgraded.

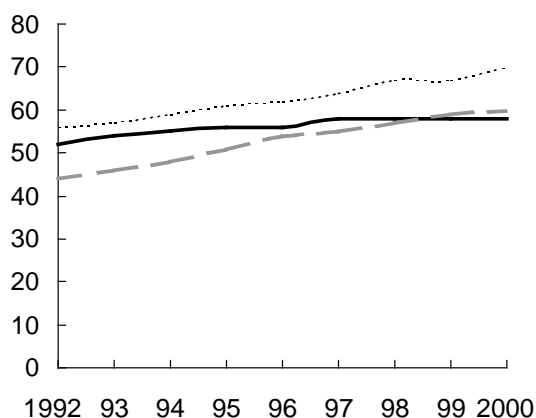


**FIXED ACCESS LINES PENETRATION AND ISDN SHARE**

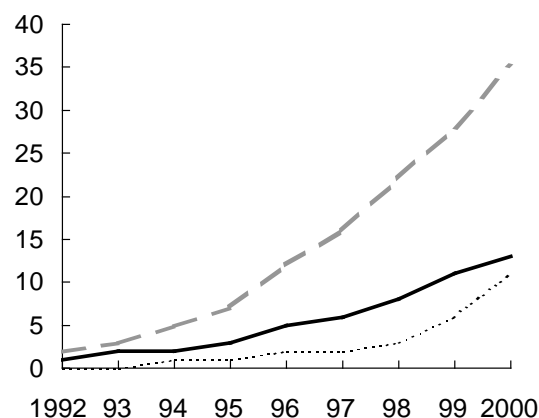
— France  
 - - Germany  
 ..... US

**Access lines penetration rate**

Access lines per 100 inhabitants

**ISDN share of total access lines**

ISDNB - channels per 100 access lines



Source: RegTP, ART, ITU, MG I analysis

*Back-office functions and marketing and sales intensity.* Local access services are fragmented in the US, but still provided by national incumbents in France and Germany. The fragmentation in the US leads to the replication of fixed labor, shrinking some potential economies of scale. As a result, incumbent local exchange carriers (ILECs) have 2.3 times the number of lines per employee as competitive local exchange carriers (CLECs), which translates into a negative effect on labor productivity in the US of 4 percent compared to France and Germany. In addition, it actually increases labor requirements in marketing and sales functions due to the fiercer competition. The lower productivity of CLECs is also linked to lower IT usage, and to a higher focus on business customers, as this segment requires greater sales efforts per line than the residential segment.

*Local line installation and maintenance.* The US telecom services sector spends 50 to 100 percent more on metal cable than France and Germany for each access line installed. As that spending is linked directly to work force requirements for installing and maintaining cable and wire facilities, we estimate that it negatively affects the US productivity level by 4 percent compared to France and 6 percent compared to Germany.

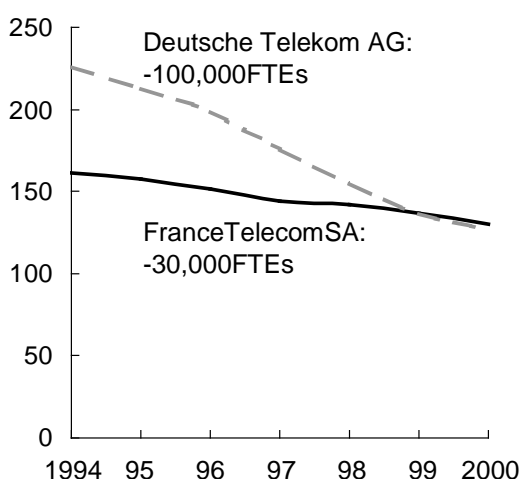
Workforce level. France lags Germany by an additional 10 percent in labor productivity<sup>5</sup>. Although no direct evidence is available, we believe that this is mainly due to differences in the workforce levels between the two national incumbents, France Telecom and Deutsche Telekom<sup>6</sup>. The workforce reduction was much steeper for the domestic fixed-line business of Deutsche Telekom than it was at France Telecom, following privatization and market liberalization in the mid-1990s (Exhibit 8).

Exhibit 8

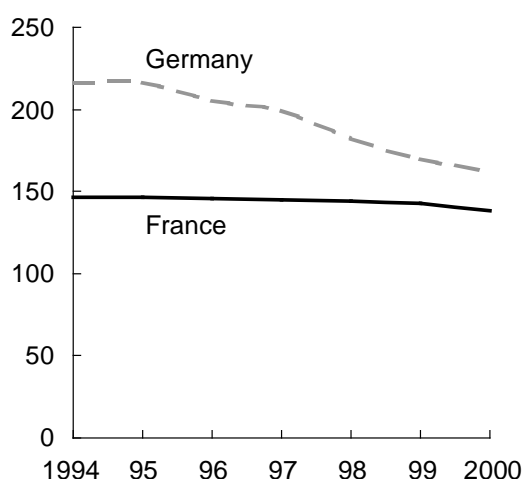
## LABOR INPUT IN FIXED SERVICES IN FRANCE AND GERMANY IN THE LATE 1990s

FTEs in thousands

### National incumbents' workforce in home country fixed services



### Total labor input in fixed services\*



\* Including national incumbents' competitors, excluding workforce in physical distribution networks and in nonrelevant services (e.g., cable TV, ISP, etc.)

Source: Operators' publications

## Industry-level and external factors

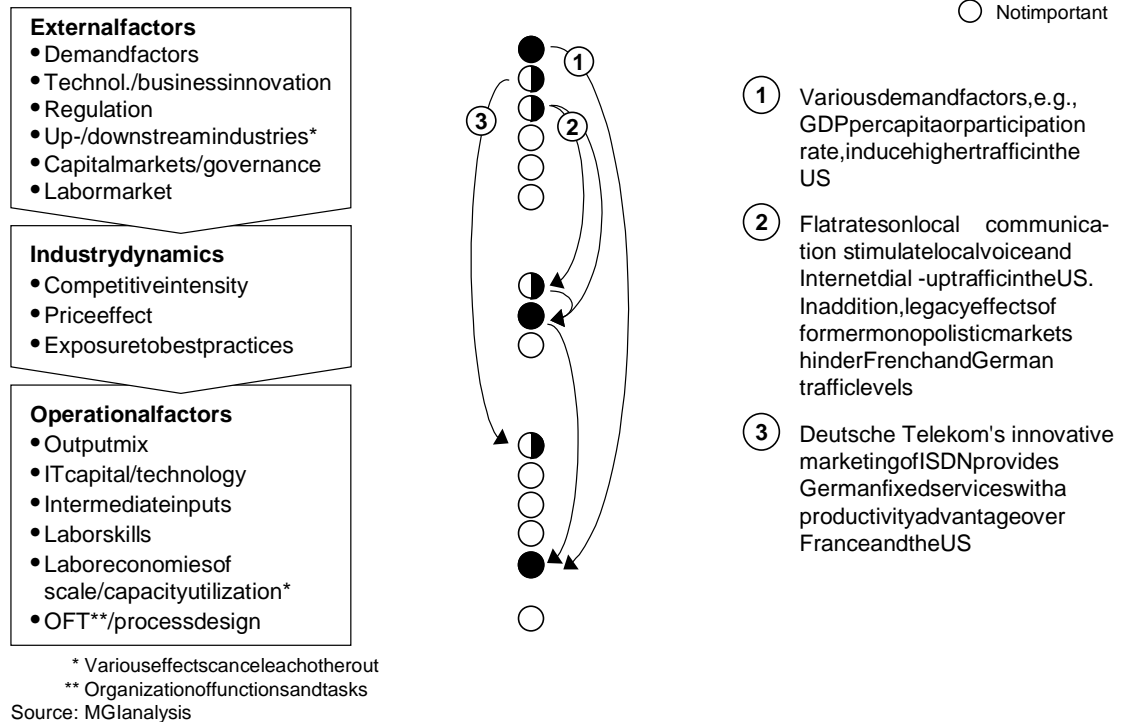
Behind the operational factors outlined above are external factors that caused the labor productivity gaps (Exhibits 9 and 10).

<sup>5</sup> Based on the -6 percent gap between France and the US and +4 percent gap between Germany and the US (Exhibit 4).

<sup>6</sup> Several other factors could also account for the remaining gaps between the US, France and Germany, including measurement issues, in particular, unmeasured differences in service quality.

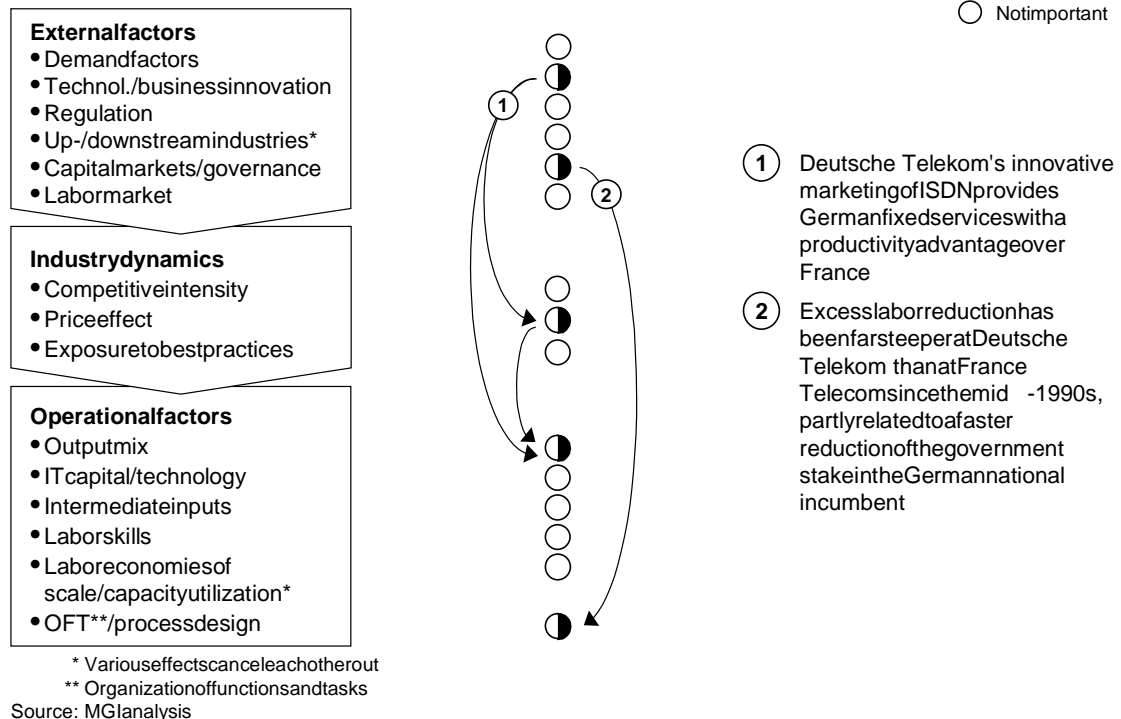
## FACTORS CAUSING/AFFECTING PRODUCTIVITY GAP BETWEEN FRANCE/GERMANY AND THE US IN FIXED SERVICES

- Important  
◐ Somewhat important  
○ Not important



## FACTORS AFFECTING THE PRODUCTIVITY GAP BETWEEN FRANCE AND GERMANY IN FIXED SERVICES

- Important  
◐ Somewhat important  
○ Not important

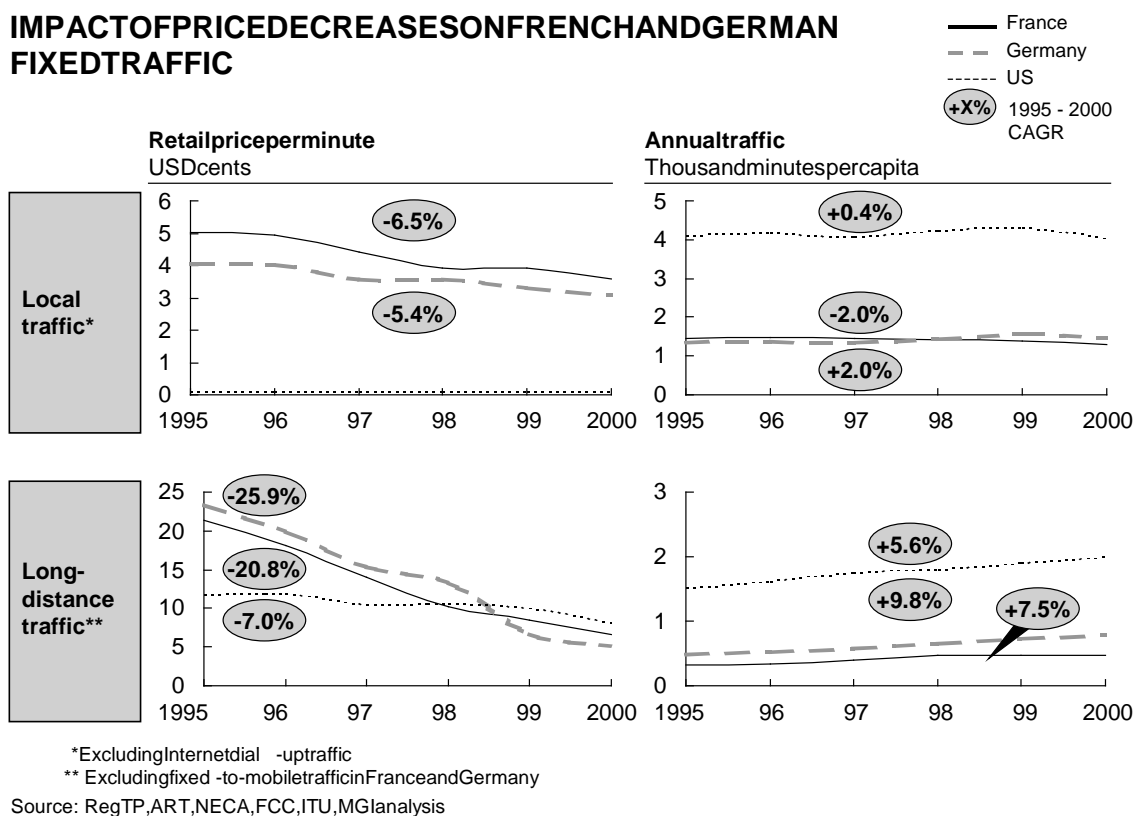


Differences in demand cause most of the gap in long-distance traffic, driving the US productivity advantage over France and Germany. Regulatory factors also contribute to building the US traffic advantage, mainly through the setting of flat rates on local communications in the US, and through the legacy effects of former monopolistic markets in France and Germany. At the same time, business innovation and the more extensive privatization of national incumbent operators explain most of the faster productivity growth in Germany than in France.

*Traffic per line: Demand and regulation* Local voice, Internet dial-up and long-distance traffic all contribute positively to the US productivity level compared to France and Germany. Demand and historical regulatory factors in France and Germany both contribute to the US advantage over France and Germany in these various categories of traffic.

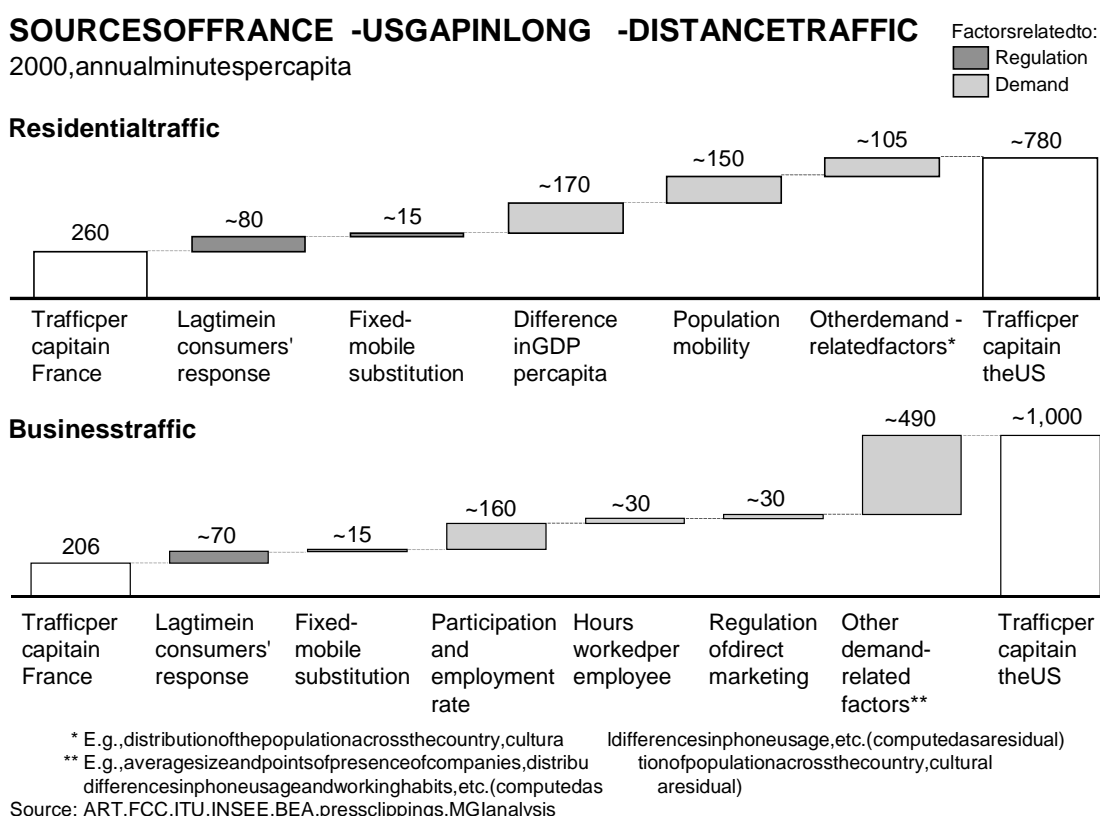
¶ *Long-distance traffic* – The US advantage in long-distance traffic accounts for just over two thirds of the traffic-related gap. The rapid price decrease on long-distance rates in France and Germany has had very little impact on the gap, despite tariffs now being close to US levels (Exhibit 11).

Exhibit 11



¶ Instead, the difference can be linked to various demand or regulatory factors<sup>7</sup> (Exhibit 12). We use traffic per capita instead of traffic-per-line figures to account for the higher penetration of business lines in the US, which increases the average traffic per line as mentioned above.

Exhibit 12



It is often argued that the regulation of telecom services, or the hangover from former regulations, explains most of the traffic gap between European countries and the US. However, MG I analysis clearly points in the opposite direction. Demand drives the difference between France and the US whereas the regulatory impact is minor, at least in the short term.

- **Regulation** – Two factors are often proposed to explain the large remaining traffic gap between the US and France/Germany: A greater substitution of fixed -line traffic by mobile telephony in Europe, and French and German consumers not spending more time on the phone following the recent large tariff cuts. Both of these factors are legacy effects from former regulations, as they are linked to the delay in the opening-up of French and German markets compared to the US.

<sup>7</sup> The comparison is based on French and US figures, as no German data is available for residential vs. business split.

However, the fixed -mobile substitution effect explains only 30 annual minutes per capita<sup>8</sup>, out of a total long -distance traffic gap of 1,400 minutes. In addition, the low -0.34 price elasticity on long -distance minutes observed in France in the late 1990s suggests that it will be sometime yet before French consumers fully change their calling patterns. This lag -time would explain a gap of only approximately 150 annual minutes per capita, i.e., less than 11 percent of the total gap<sup>9</sup>. The impact of this delay could, however, be greater in the longer term, as the culture of phone use may change in France and Germany. A significant part of the long -distance traffic gap would remain any way, as most of the demand factors will not be affected by tariff decreases.

- *Demand* – Differences in wealth and mobility account for approximately 60 percent of the long -distance residential traffic gap. Other demand characteristics, such as a more even geographical population distribution in the US –especially compared to France –and cultural differences surrounding phone usage, also contribute to the higher traffic in the US, but could not be quantified separately. For long -distance business traffic, the higher participation rate and the larger size and greater number of points of presence of companies explain part of the US advantage. To a lesser extent, longer working hours and less restrictive regulation of direct marketing<sup>10</sup> also contribute to the higher long -distance business traffic in the US. In total, the demand factors that could be isolated explain a gap of 540 annual minutes per capita, amounting to 40 percent of the total long -distance traffic gap between France and the US. These factors are not influenced by changes in tariffs.

¶ *Local and Internet dial -up traffic* – The gap in local voice and Internet dial-up traffic is tied to the use of flat rates in the US, despite significant price cuts on local rates in France and Germany since the mid-1990s. We consider the use of flat local rates in the US as a regulatory factor, as it dates back to the 1934 Telecom Act, which installed the Federal Universal Service Program in the US. In addition, some of the demand factors referred to in the long -distance traffic analysis also boost the US advantage in local traffic, in particular the higher employment participation rate. As with long -distance traffic, the argument that higher European level of fixed -to-mobile traffic substitution are important is over -

<sup>8</sup> Estimated using the long -distance share of total mobile traffic.

<sup>9</sup> Calculated assuming a -0.8 price elasticity instead of the -0.34 elasticity actually measured in the late 1990s in France.

<sup>10</sup> This is considered as a demand factor for telecom services, as it is linked to the regulation of another sector that influences demand levels for telecom services.

stated. The impact is marginal: In 2000, annual mobile outgoing traffic was typically around 600 minutes per capita (in Europe), with a gap (to the US) that reached 2,800 minutes per capita in local voice traffic.

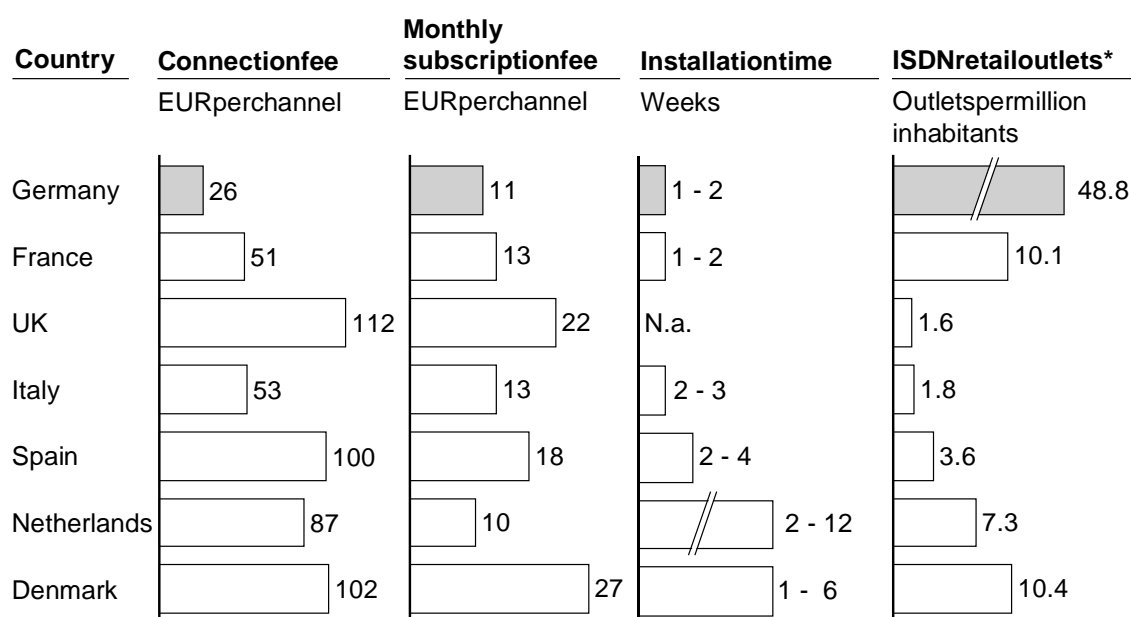
Having shown how both demand and regulatory factors explain the traffic gap between the US and France/Germany, we now look at the external factors behind the productivity gaps observed in access provisioning, i.e., differences in output mix, labor economies of scale, or labor utilization.

*Output mix: Business innovation* Deutsche Telekom's innovative marketing program, introduced in the mid-1990s, has enabled the tremendous increase in ISDN penetration in Germany. German customers have benefited from the lower prices and greater availability of ISDN compared to other European countries (Exhibit 13).

Exhibit 13

### ISDN PRICING AND AVAILABILITY ACROSS EU MEMBERS

1997



\* Retail outlets where Telecom operators sell ISDN access and ISDN telecommunications shops where ISDN access and products are sold  
Source: European Commission

terminal equipment, including specialized under agreement with the operator

Deutsche Telekom worked together with a variety of sales and marketing partners: Equipment manufacturers, distributors, application developers, etc. Customers got guaranteed delivery times, and self-installation was made faster and simpler. In addition, segmented marketing was used to customize offers based on user-type (e.g., business or consumer, voice or data). Finally, in communicating the

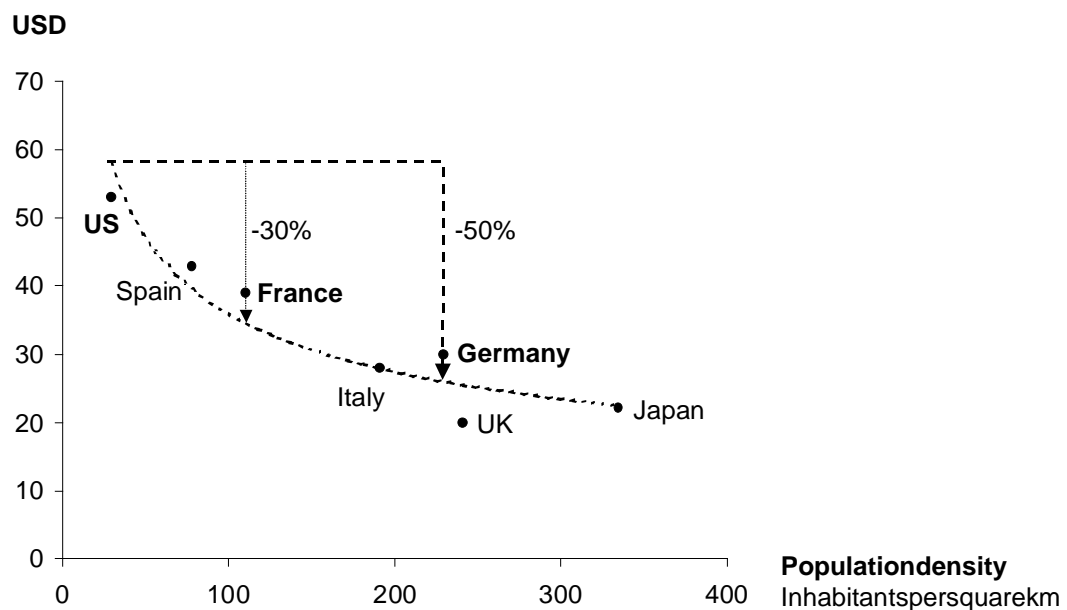
advantages of ISDN, Deutsche Telekom focused on concrete user benefits rather than on abstract technical features, further helping ISDN adoption.

*Back-office functions and marketing and sales intensity: Regulation* . Although local loop unbundling – that is, the possibility for competitive operators to serve a national incumbent's access lines to customers – was implemented only recently in France and Germany, US regulation has enabled competition in local access provisioning for some years, a move strengthened by the Telecom Act of 1996. This led to a large increase in the number of competitors, which as we showed earlier has led to the replication of fixed labor pools as well as higher requirements in marketing and sales, thus negatively affecting the US productivity level. However, the increase in competitive intensity that resulted, also contributed to the higher access line penetration rates in the US compared to France and Germany.

*Maintenance and installation of local lines: Demand* . The lower the population density, the higher the distances between network extremities, and the more cable is needed <sup>11</sup> (Exhibit 14).

Exhibit 14

#### CUMULATIVE CAPITAL EXPENDITURE IN METAL CABLES PER PHYSICAL ACCESS LINE – 1993 - 99



Source: OMSYC, OECD, MGI analysis

<sup>11</sup> It also implies more access lines if differences in population densities are due to a different mix of people living in apartment blocks vs. individual houses.



Due to the lower population density in the US than in France and Germany, the US spends more on metal cables per access line, for both maintenance and installation. This negatively affects US labor productivity levels compared to France and Germany.

*Workforce level: Privatization* . Differences in the scale of government withdrawal from Deutsche Telekom and France Telecom certainly contributed to the steeper workforce reduction at the German incumbent. In December 2000, the government stake in Deutsche Telekom stood at 42.8 percent, compared to 55.5 percent state ownership of France Telecom. The added pressure from private shareholders on Deutsche Telekom has helped push it towards faster operational improvements.

## **LABOR PRODUCTIVITY LEVEL DIFFERENCES IN MOBILE SERVICES**

Regulatory factors caused most of the productivity gaps between the two European countries and the US. In the US, the regional licensing approach has led to a highly fragmented industry and limited labor economies of scale compared to France and Germany.

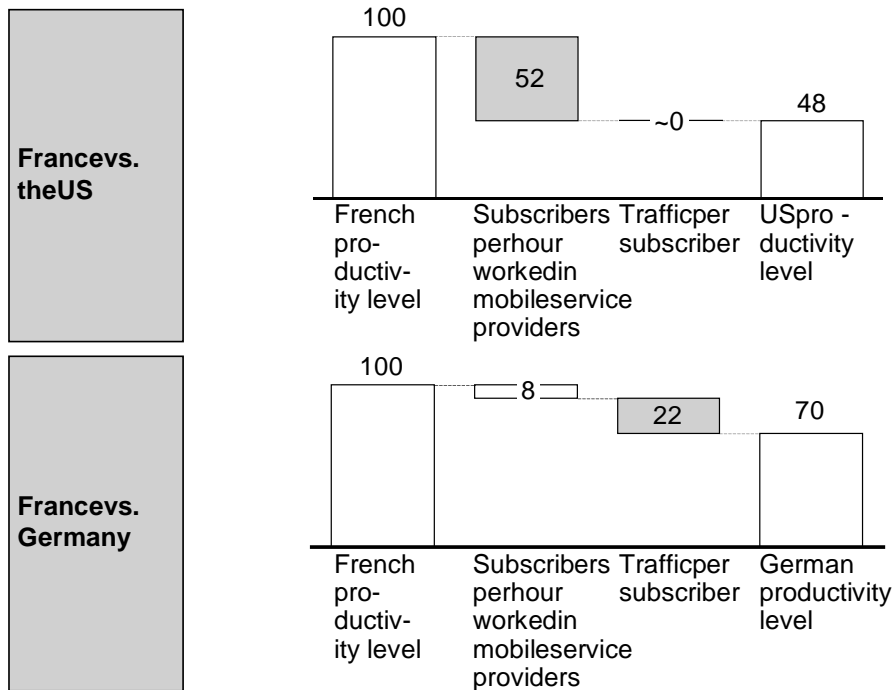
### **Firm-level factors**

In 2000, French mobile services had the highest productivity level of the three countries, with Germany lagging by 30 percentage points and the US by more than 50 percentage points. US mobile services suffer from a very low ratio of subscribers per employee. By contrast, German productivity levels are dampened primarily by low traffic per subscriber (Exhibit 15).

## SOURCES OF PRODUCTIVITY LEVEL DIFFERENCES IN MOBILE SERVICES

Index 100 = French level 2000

■ Key areas of investigation

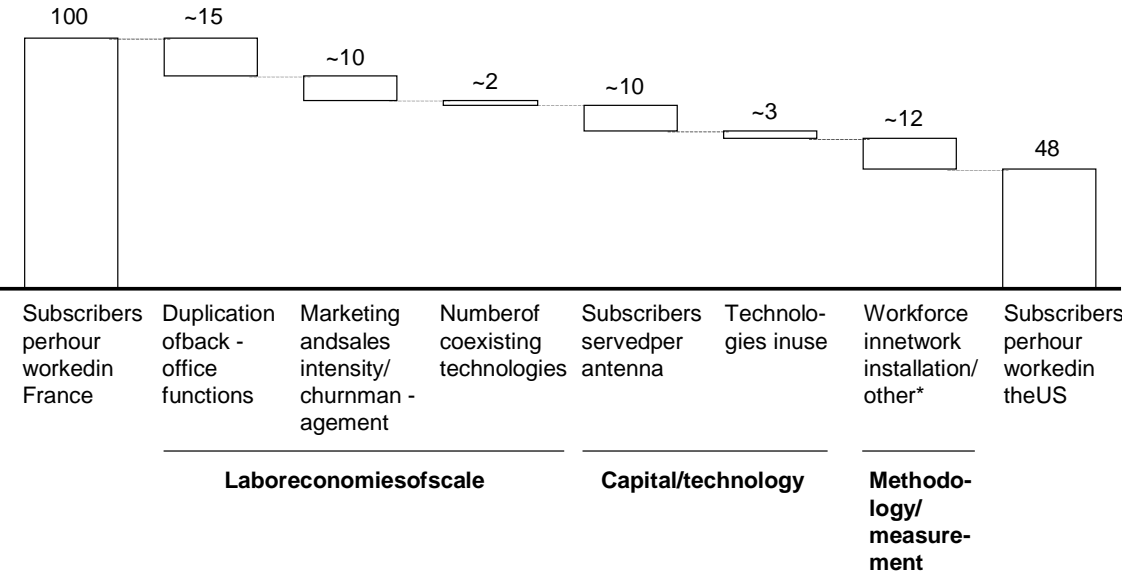


Source: MGI analysis

*Low productivity in access provisioning in US mobile services*. In 2000, the number of mobile subscribers per hour worked in US mobile service providers was half of that in France, even though penetration rates are not substantially different at 35.3 and 41.8 percent, respectively. The bulk of the operational factors behind this are related to losses of labor economies of scale (Exhibit 16):

# SOURCES OF HIGH LABOR INTENSITY PER SUBSCRIBER

Index 100 = French level 2000



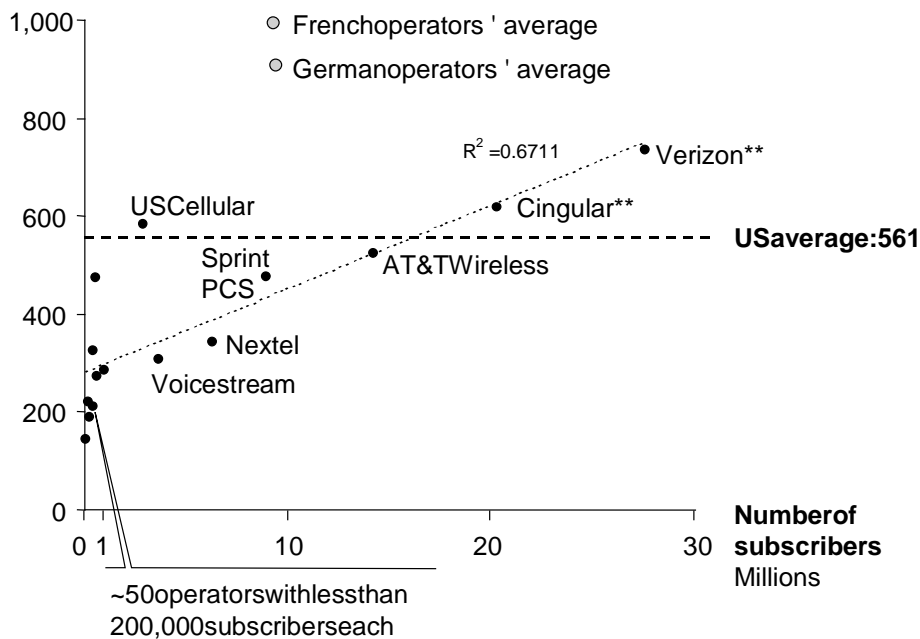
\* Unmeasured quality differences in customer services, data quality. Computed as a residual

Source: MGI analysis

¶ *Back-office functions* – French and German mobile markets are covered by three or four nationwide operators, with an average of 10 million subscribers per operator. The US market, by contrast, is highly fragmented with many small, regional players that have less than 200,000 subscribers. As with fixed-line services, this leads to the replication of back-office functions and thus large productivity losses due to the lack of economies of scale. Productivity levels clearly increase for network operators that operate at a large scale (Exhibit 17). This replication effect accounts for approximately 15 percentage points out of the 52 that the US lags France.

## SUBSCRIBERS PER EMPLOYEE AT TOP 25 US MOBILE OPERATORS\*

Year-end 2000



\* Only a selection of the top 25 US operators is presented here, for data availability reasons

\*\* Based on end 2001 figures, as 2000 data is not available

Source: FCC, Hoovers, MGI analysis

¶ *Marketing and sales functions and churn management* – The US market fragmentation also induces a loss of economies of scale in marketing and sales functions. In addition, more operators per market resulted in higher churn rates, with negative implications for customer acquisition and retention costs and for corresponding workforce requirements. In 2000, annual churn rates were around 30 percent in the US, while only 24 percent in France and just 13 percent in Germany<sup>12</sup>. However, higher churn rates certainly indicate a high competitive intensity in the US, and explain the fast tariff decreases and surge in traffic per subscriber in the late 1990s. In total, the lack of economies of scale in marketing and sales functions, and the additional workforce requirements due to higher churn rates negatively affect the US productivity level by approximately 10 percentage points compared to France.

¶ *Subscribers per antenna* – The average number of subscribers per antenna is also negatively affected by the US market fragmentation, as more network overlap. This effect is accentuated by the need to cover more rural areas. Both factors result in a lower number of subscribers

<sup>12</sup> The large difference between French and German churn rates is mainly due to differences in pricing policies, which we analyze later.

per antenna in the US, which leads to additional labor requirements in network operations. This negatively affects the US productivity level by 10 percentage points compared to France.

¶ *Mobile technologies* – In Europe, the GSM standard has been set for mobile digital telephony, and analog subscribers represented a negligible share of the total subscriber base in 2000. By contrast, US mobile services use five different technologies: Four digital standards (CDMA, TDMA, GSM, and iDEN) and one analog, which still accounted for more than one third of the subscriber base in 2000. Both the variety of standards and the wider use of analog than in Europe have only a minor impact on labor productivity, slightly reducing labor economies of scale in network deployment and infrastructure building.

¶ *Additional labor use for network build-up* – The residual productivity gap of 12 percentage points is mainly related to the delay in the installation and digitization of the US network compared to France and Germany, which implies a larger workforce in network operations in the US in 2000 and thus a lower level of labor productivity. This US productivity disadvantage will disappear once the network digitalization is completed<sup>13</sup>.

*Low traffic per subscriber in Germany* . Although French and German ratios of subscribers per hour worked at service providers are similar, the gap in terms of traffic per subscriber negatively affects the German productivity level by 22 percentage points. This gap appeared as early as in 1996, and significantly increased from 1999 to 2000 due to the entry of many low-traffic prepaid customers in Germany (Exhibit 18). As a result, in 2000 the average number of monthly outgoing minutes per mobile user was 62 in Germany compared to 120 in France.

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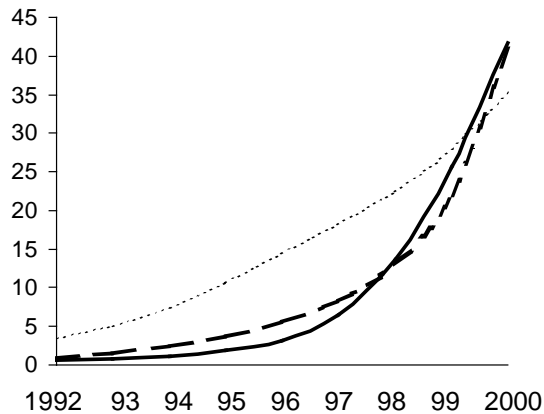
<sup>13</sup> Part of the residual gap could also be due to data reliability issues, or to unmeasured differences in service quality.

## PENETRATION AND TRAFFIC IN MOBILE SERVICES

— France  
 - - Germany  
 ..... US

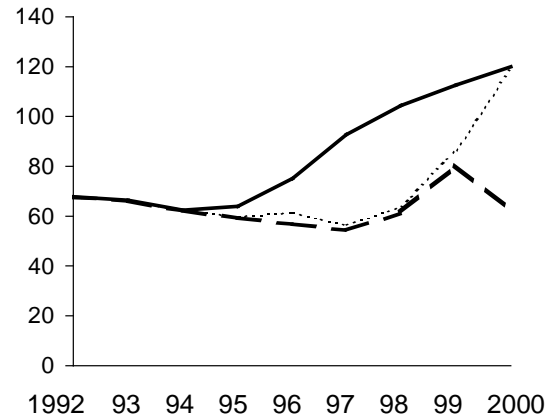
### Mobile penetration rate

Mid-year mobile subscribers per 100 inhabitants



### Mobile traffic\*

Monthly outgoing minutes per subscriber



\* The decrease in average traffic per subscriber in Germany in 2000 is due to the massive entry of prepaid users into the subscriber base

0 is due to the massive entry of prepaid users into the subscriber base

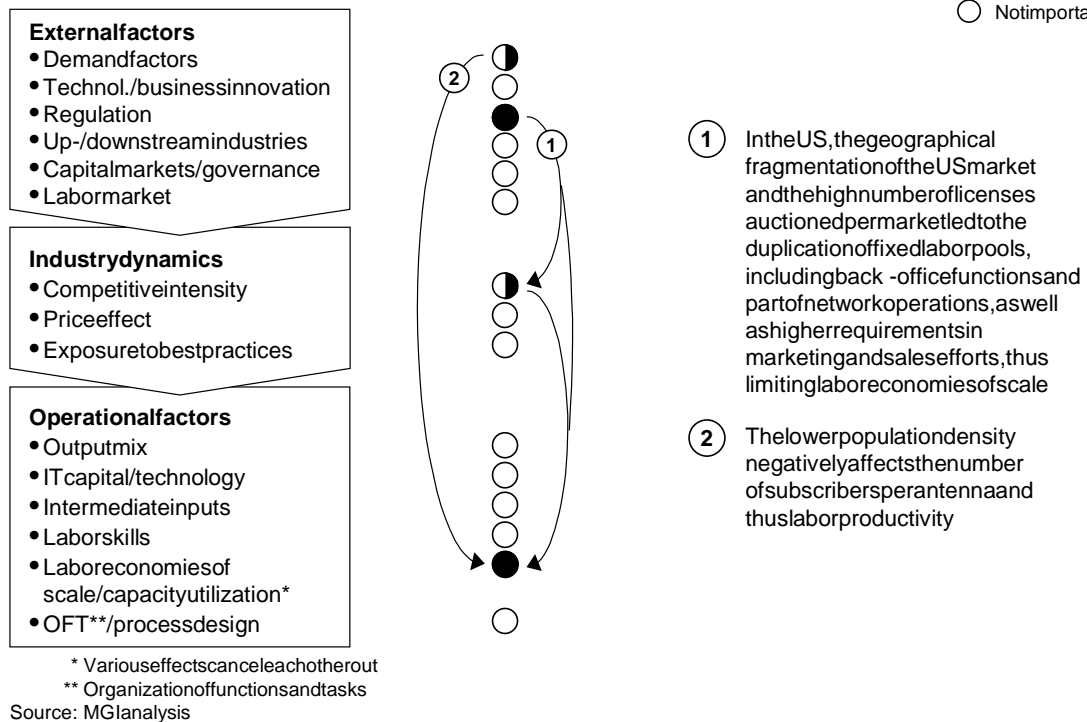
Source: RegTP, ART, CTIA, ITU, OECD, MGI analysis

## Industry-level and external factors

The high labor input that in the US labor productivity levels are related mainly to the US licensing approach, which fragments markets, leading to the duplication of fixed labor pools (Exhibit 19). This effect has a far greater impact in mobile services than in fixed-line businesses.

## FACTORS AFFECTING THE PRODUCTIVITY GAP BETWEEN THE US AND FRANCE/GERMANY IN MOBILE SERVICES

- Important  
 ◐ Somewhat important  
 ○ Not important



*Low productivity in access provisioning in US mobile services: Regulation* . In the US, mobile licenses were auctioned regionally, producing a fragmented industry of small-scale players. The licensing also permitted up to six operators in some regions, reducing economies of scale yet further. Low consumer prices in France indicate that a competitive environment can be achieved with as few as three operators, ensuring both the economies of scale and high levels of consumption. To a lesser extent, low population density areas affected the US productivity level through higher requirements in network building and maintenance labor.

*Low traffic per subscriber in Germany:* Germany's low traffic per subscriber – half that of France's – might be a result of differences in the complexity of pricing schemes and/or differences in consumer demand profiles and behavior.

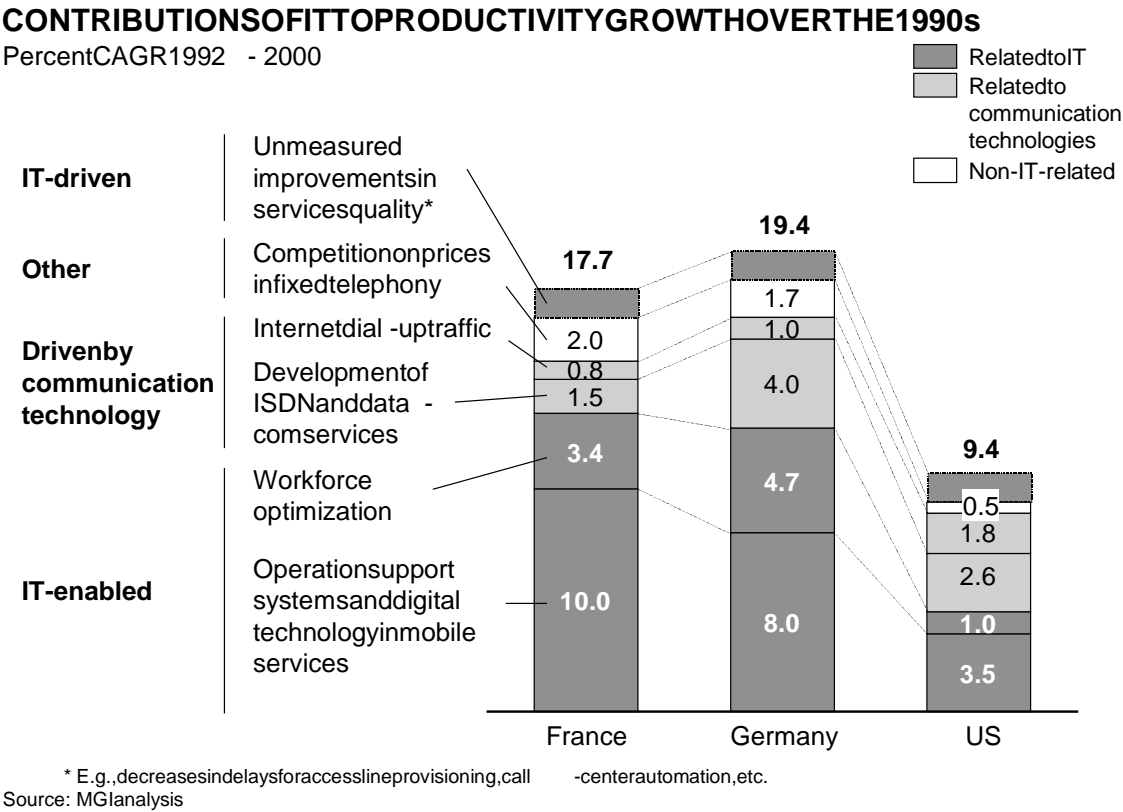
## THE ROLE OF IT

The telecom industry is, with banking, one of the two most IT-intensive sectors, spending typically 6 percent of its revenues on IT. In addition to non-sector-specific applications, e.g., related to human resource management or accounting, telecom service providers are served by IT in all their core processes. IT systems are deeply involved in all information flows between network elements and

customer interfaces: Order handling, billing and rating, network inventory and workforce management, etc.

IT contributed to most of the productivity growth in all three countries over the 1990s, enabling 65 to 75 percent of total productivity gains in France and Germany. The productivity growth can be split into three categories: IT-enabled, driven by new communication technologies, and non-IT<sup>14</sup>-related (Exhibit 20).

Exhibit 20



¶ *IT-enabled growth* – IT enabled most of the productivity growth in all three countries over the 1990s. In mobile services, the intensive implementation of operations support systems enabled large labor economies of scale as the customer base increased dramatically. In fixed-line services, part of the workforce reduction at French and German national incumbents was enabled by IT, notably in processes such as order handling, fault management, network inventory and workforce management. IT also contributed to large increases in service quality, enabling shorter times for service provisioning, or better customer care through call centers.

<sup>14</sup> Information and Communication Technology



¶ *Growth driven by new communication technology* –Looking at the impact of IT as a whole on productivity, the message is further strengthened, as new communication technologies drove from 70 percent of productivity gains in France to 84 percent in the US over the 1990s. In mobile services, digital technology greatly increased the available capacity, and drove the development of mobile services penetration in the late 1990s. In fixed-line services, the development of data communication, ISDN services and Internet dial-up traffic brought a significant share of the labor productivity growth in fixed-line services over the 1990s, driving 30 percent of the growth in France, 44 percent in Germany, and 75 percent in the US.

¶ *Non-IT-related growth* –Additional labor productivity gains were not related to IT, but driven by increases in competitive intensity that resulted in price cuts for communication and thus higher levels of traffic. Although IT helped reduce communication costs –in particular for long distance traffic –price cuts in France and Germany in the late 1990s were achieved mainly through rebalancing traffic-to-access revenues.

To a large extent, IT also enabled the productivity advantage of France and Germany over the US in mobile services: Nationwide licensing in France and Germany allowed network operators to use IT to gain large economies of scale and reach high levels of subscribers per employee. Economies of scale were limited in the US due to the regional licensing approach. In addition, the fragmentation of the US mobile services market also led to higher IT spending per output unit, as IT projects were replicated across numerous US industry players. Complexity drives IT costs more than company size, so the fragmentation of the US mobile market meant losses of economies of scale on IT spending. The US mobile telecommunications sector, therefore, as a case where regulation, through its impact on industry structure, has limited the benefits of IT.

## OUTLOOK AND RECOMMENDATIONS

The telecom industry is still going through major technological and regulatory changes with implications for both service mix and industry structure, and thus labor productivity levels. The development of broadband residential access, a further shift from fixed-line to mobile telephony, new generations of mobile services, and local loop unbundling in France and Germany will all have an impact over the coming years. We can foresee some important developments based on our findings, some of them are already starting to happen (Exhibit 21).

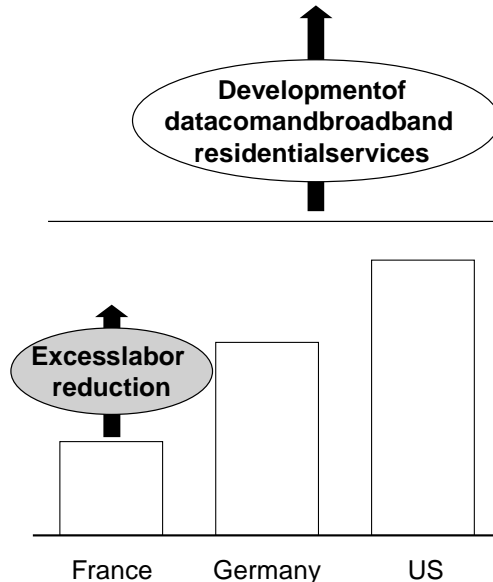
## OUTLOOK AND RECOMMENDATIONS FOR FUTURE PRODUCTIVITY GROWTH

CONCEPTUAL

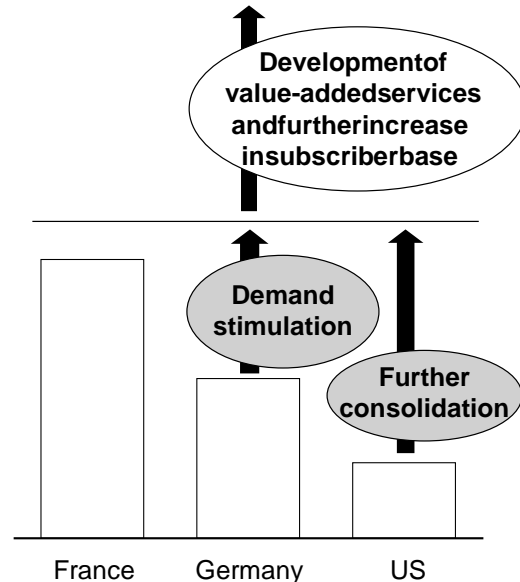
○ Outlook

● Recommendation

### Fixed-line services



### Mobile services



Source: MGI analysis

- ¶ *Industry consolidation* – In the US, mobile service companies have undergone dramatic consolidations since the late 1990s, leading to the first nationwide players such as Verizon or Cingular. A look at France and Germany indicates clearly that large productivity gains are still possible in the US and that further industry consolidation is likely.
- ¶ *Labor reduction* – In France, large productivity gains are still foreseeable for the national incumbent operator. Their speed will be driven partly by employee demographics, i.e., with a probable acceleration in the near future.
- ¶ *Demand* – In the long term, putting aside potential productivity gaps caused by differences in regulation or business innovation, the US should benefit from a continuous productivity advantage over France and Germany, due to higher demand as a result of higher wealth, employment participation rate, population mobility, etc. In mobile telephony, the level of traffic per subscriber was similar in France and the US in 2000, but first available estimates for 2001 put traffic levels approximately 40 percent higher in the US than in France. Ultimately, most of the demand factors that explain the higher fixed long-distance traffic in the US should play a similar role in mobile telephony, making US traffic levels higher than in France and Germany. Nevertheless, given the gap in

traffic per subscriber between France and Germany, there might be still further potential to stimulate demand in the German mobile services market.

Our analyses of fixed-line and mobile services suggest several ways of improving productivity levels in the sector beyond the developments described above:

- ¶ *Licensing approach: Competition vs. economies of scale* – The experience of France and Germany in mobile services shows that high competitive intensity is attainable with only a few operators, while still enabling large economies of scale. European operators and regulators should assess the potential economies of scale that would be released by European-wide licensing for future telecom services.
- ¶ *Penetration of new services* – Deutsche Telekom's positive ISDN experience brought large productivity gains and provides interesting indications on how to push new telecom services, in particular residential broadband and third-generation mobile services. Several factors that served Deutsche Telekom well are directly transposable to those new services: The deep involvement of several categories of partners in the marketing and sales process (e.g., application and content providers, equipment manufacturers, distributors, etc.), highly segmented marketing and customized offers, fast and simple self-installation, and the communication of new services advantages focused on concrete user benefits rather than on abstract technical features<sup>15</sup>.

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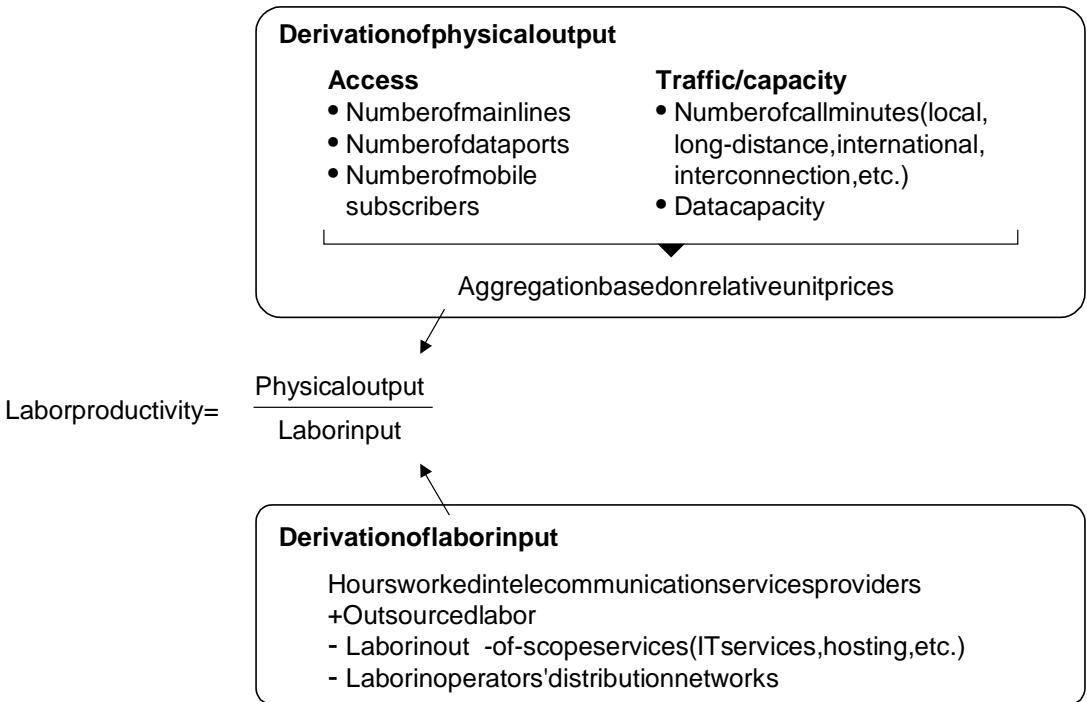
<sup>15</sup> ISDN services could also trigger a faster penetration of residential broadband access in Germany than in France in the short term. Many ISDN users have already subscribed to an ISP (Internet Service Provider), and thus need to pay only for the technological upgrade from ISDN to ADSL to enjoy broadband access. The high penetration rate of ISDN may also help broadband service providers target their offers, and bring useful marketing insights. By the end of 2001, there were 2 million ADSL subscribers in Germany, compared to only 400,000 in France.

METHODOLOGY

Wemeasuredlaborproductivityusingaccessandtraff ic indicatorsfortelecom servicesvalue -added,andhoursworkedatserviceprovidersforlaborinput, adjustedfordifferencesinoutsourcingratiosandinownershipofdistribution networks(Exhibit22).

Exhibit22

METHODOLOGICALAPPROACHFORPRODUCTIVITYMEASUREMENT



Source: MGI analysis

Output measurement

The measure of value added of telecom services was based on Fisher -aggregated physical<sup>16</sup> indicators for access and traffic.

In fixed-line services, we measured access provisioning using number of access lines, including standard mainlines, ISDN channels, and various dataports in

<sup>16</sup> Aggregated using relative unit prices of indicators as weights. Growth rates over time are the geometric average of growth rates using beginning-of-period and end-of-period prices. Cross-country ratios are the geometric average of ratios using prices in both countries.

use, i.e., mainly private lines, X25, Frame Relay, ATM, and xDSL. The measure of traffic-related value added is based on the aggregation of various categories of communication minutes, including local voice, Internet dial-up, national long distance, fixed-to-mobile and international outgoing calls.

In mobile services, access provisioning is measured by mid-year numbers of mobile subscribers, and the contribution of traffic is based on outgoing minutes and SMS sent.

We adjusted the fixed-mobile split of value added for interconnection, to distribute traffic or associated revenues according to each subsector's participation in carrying the calls. Consequently, the value added of fixed-line service takes mobile-to-fixed and mobile-to-mobile calls into account, and the value added of mobile services uses fixed-to-mobile calls. In a similar way, we adjusted for international interconnect fees, i.e., we added a contribution for international incoming minutes, and removed interconnect fees paid to foreign operators out of revenues for international outgoing calls.

The physical indicators for access and traffic are Fisher-aggregated, i.e., aggregated using their average unit prices as weights. The aggregated physical output indicator then represents the real value added of each subsector, as main categories of intermediate inputs are adjusted for. Typically, intermediate inputs for telecom service providers consist of external services, interconnection minutes, end-user equipment, and leased lines. Main categories of external services are included back in the measure of labor input, as detailed below. Interconnection fees paid by operators are accounted for in revenue weights when they concern cross-subsector or cross-country transactions. End-user equipment, such as handsets for mobile telephony, does not need any specific adjustment, as they are not accounted for by any of the output indicators used. The revenues for equipment sales are, however, excluded when Fisher-aggregating the various indicators. Finally, leased lines could introduce a bias only by switching value between fixed and mobile subsectors within each country. This potential bias is, however, linked to a small share of employment, having therefore no significant impact on the measurement of labor productivity growth or level differential in each subsector.

## **Labor input measurement**

We based our labor input measure on hours worked at telecom service providers.

We excluded operators' workforce in business units whose output is not in the perimeter of the study, for instance ISP activities, cable or broadcasting services, etc. We also excluded workforce in physical distribution networks, i.e., agencies or outlets, to adjust for different ratios of distribution network ownership across countries.

We included key categories of external services back in the measure of labor input, in order to account for the entire workforce participating in the production we measure. These categories include mainly call centers services, IT services, billing services, or tower construction.

## **Datasources**

National regulation agencies provided the majority of output indicators in France (ART), Germany (RegTP) and the US (FCC/CTIA), as well as corresponding revenues: Number of mainlines, mobile subscribers, call minutes, etc. Numbers of data ports per type of protocol, and corresponding revenues, are provided by Gartner reports.

Data for labor input measures are based on regulators' estimates. In most cases, they are adjusted for out-of-scope business units, physical distribution network or external services using figures provided in operators' publications.