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 **economics****Digital economy and structural change****Broadband: Europe needs more than DSL**

- **Germany, France and Italy** have a lot of **ground to make up** on the world frontrunners South Korea, Japan and the USA in terms of the penetration of broadband technologies. The huge gap between Europe and the leading broadband nations will not be closed in the foreseeable future.
- The communications network is an important factor in international locational competition. **Broadband technologies drive**, among other things, an economy's **innovativeness, international competitiveness and growth potential**.
- Advances in deregulating telecommunications markets differ considerably by countries and technologies. Whereas marked progress is being made with the **liberalisation of voice telephony, broadband communication, which is particularly interesting commercially, has not yet** made the real breakthrough. This is all the more disquieting in that innovativeness is high in liberalised markets.
- **Hopes that ISDN would open the door to broadband communication** have been **disappointed**. People in mainland Europe in particular continue to focus on ISDN, switching far less frequently to broadband technology than the Americans.
- Worldwide penetration of DSL is twice as high as for the cable modem. Since incumbents generally dominate DSL services, this strong **position for DSL** represents a **challenge** in terms of **competition policy**.
- In the **leading broadband nations** the **cable modem also acts as a crucial means of accessing the web, in addition to DSL**. In terms of cable penetration the USA is way ahead of Europe.
- **Internet telephony** (Voice over Internet Protocol, VoIP) **should bring minute-based voice telephony rates tumbling down**.
- Only through technology competition can new providers firmly establish themselves with innovative solutions. And as regards technology competition, many hopes are pinned on mobile telephony. **Broadband mobile telephony technologies** such as WLAN, UMTS or WiMax **will capture increasing market share from the fixed network**. Mobile telephony frees broadband from the restrictions of fixed-line business.
- **Policy-makers should support the dissemination of broadband with technology-neutral measures, without shoring up any one provider's dominance**. From a competition policy aspect, special promotion for DSL is critical. What is needed are strategies that foster innovation technology-neutrally.

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Broadband: Europe needs more than DSL

The progress of a modern economy in general and of digital E-business in particular hinges on the efficiency of its communications networks. Euphorically, the German government says that “broadband technology will contribute one-third to productivity growth in the industrial countries by 2011”.¹ Doubts on the exact numeric contribution to productivity growth aside, there is no gainsaying that the efficiency of the communications network acts as a major driver of an economy’s innovativeness, international competitiveness and growth potential.

This study examines broadband communications in France, Germany, Italy, the UK and the USA. The comparison draws attention to clear national market specifics.

USA, UK: Beacons of liberalisation

The roots of the monopolistic structures in telecommunications existing down to the present day go back to the 19th century. In contrast, acknowledgement of the need for liberalisation reflects a quite modern view of how the telecom market works. It was first put into practice in the USA, Japan and the UK. Recognising early on the problems ensuing from concentration, these countries rolled out deregulation of the telecom sector more than two decades ago. Both the USA and the UK broke up their telecom monopolies back in 1984 by privatising the telecom companies AT&T and British Telecom respectively, which had until then been run as state operations. In mainland Europe, however, monopolies have proved extremely persistent. On the continent the EU emerged as the engine of telecom liberalisation. But some individual member states were tardy in transposing EU directives into national law.

The liberalisation drive has brought significant changes to the telecom segment, incremental as the steps have been in some cases.

EU: Engine of liberalisation in mainland Europe

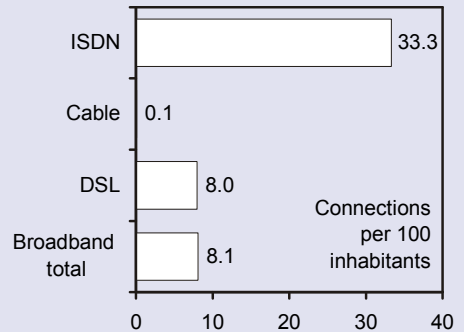
The Council of the European Union issued in 1984 an initial recommendation on telecom harmonisation. This was followed in 1987 by the Green Paper on the Development of the Common Market for Telecommunications Services and Equipment, in 1990 by the Directive on competition in the markets for telecommunications services (90/388/EEC), in 1996 by the Directive with regard to the implementation of full competition in telecommunications (96/19/EC) and in 2002 by the comprehensive telecommunications legislation package on competition in electronic communication networks and services. The overall package covers six areas and breaks down into the framework, authorisation, access, universal service, data protection and radio spectrum directives.

Germany: A liberalisation laggard

Deregulation of the telecommunications market in Germany is based on legislation dating from 1989 (Reform of the postal authorities I, Strukturgesetz), 1994 (Reform of the postal authorities II, Neuordnungsgesetz) and the 1996 telecommunications act (Telekommunikationsgesetz) and culminating in 1998 in abolition of the sovereign fixed network monopoly guarantee in telecommunications. Then in mid-2003 competition was also permitted in the local network. Amendment of the telecommunications act in 2004 implemented the EU provisions on harmonised and simplified regulation into German law.

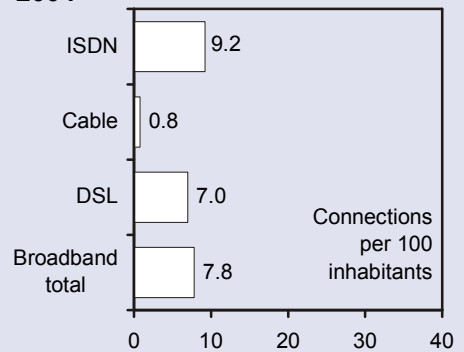
¹ German economics and labour ministry (2005). Breitband – mit Höchstgeschwindigkeit ins Netz. Homepage broadband portal <http://www.zukunft-breitband.de/>.

Germany, technology penetration, 2004



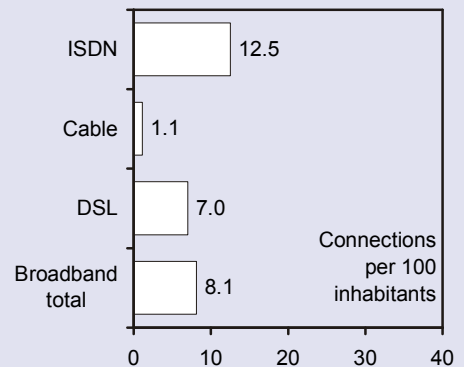
Source: DB Research, 2005

France, technology penetration, 2004



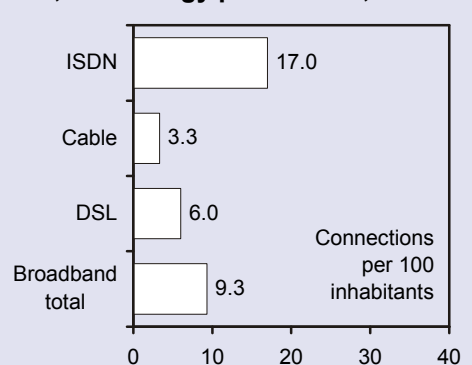
Quelle: DB Research, 2005

Italy, technology penetration, 2004



Source: DB Research, 2005

UK, technology penetration, 2004



Source: DB Research, 2005

Price difference and number of competitors reflect liberalisation phases

Economic theory says that a newly deregulated market should feature a comparatively large number of competitors and a comparatively large difference between the former monopolist's price and that of its rivals. If suppliers fail to capture customers through differences in product quality and competition thus focuses essentially on prices, over time most of the virtually identical suppliers will be squeezed out of a sufficiently transparent market again. Immediately after market liberalisation the former monopolist can exploit its customer awareness and traditional direct contacts with end users to maintain a higher price for longer, amid the general drop in the level of prices. The price difference between the incumbent and its rivals is therefore usually greatest in newly liberalised markets. But the ex-monopolist's reputation edge is blunted over time, as a result of which the prices it charges move into line with those of its new rivals.

Competition in fixed-line voice telephony

The empirics of the markets for voice services tally with economic theory (see box). In the newly liberalised markets, most notably France and Germany, an exceptionally large number of telecom services providers, nine big firms in total, are active. In the UK and Germany the incumbent's competitors handle more than 40% of all traffic minutes.

Market opening is mirrored most impressively by consumer prices (see chart). The price difference in Germany between the ex-monopolist's standard rates and the cheapest call-by-call providers is particularly pronounced, at 86% for long-distance calls. In Italy and France the gap in rates for long-distance calls works out at around 60%, and in both the USA and UK at about 30%. Since 2000 consumer prices for long-distance fixed-line calls in Germany have dropped by 12% and in the USA by 26%.

Market data for voice telephony point to substantial success with liberalisation. In the following we examine whether this success has also already been achieved in broadband communication, which is particularly interesting commercially.

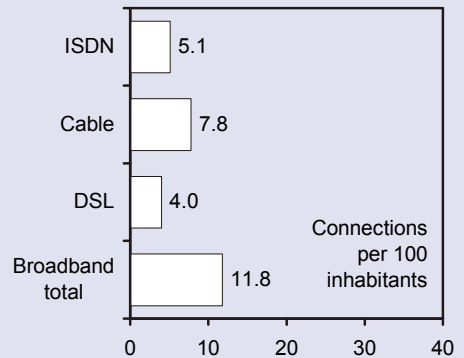
Broadband not a universally valid term

There is no general definition of the nature of broadband. Basically, it is a term denoting high data transfer rates relative to state-of-the-art technology. As higher transfer rates become technically feasible, so the perception of broadband changes. At the moment broadband is attributed to technologies whose line speeds are higher than those of ISDN. These are above all fixed-line technologies such as Digital Subscriber Line (DSL), Fibre To The Home (FTTH) and internet access by cable modem or Powerline Communications (PLC). Also classified as broadband are mobile telephone technologies such as Universal Mobile Telecommunication System (UMTS), Wireless Local Area Network (WLAN) or Worldwide Interoperability for Microwave Access (WiMax).

ISDN not opening the door to broadband

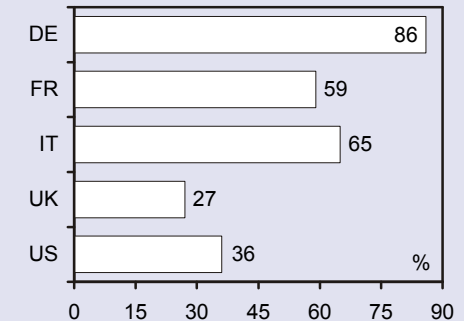
Until just a few years ago it was believed that ISDN would introduce users to new premium services as the first step. In a second stage these premium services would create customer demand for the appropriate broadband transmission technology. To this way of thinking, ISDN thus served to open the door to broadband communication. But the relationship between ISDN and broadband is more complex than outlined here. In conformity with the above logic, countries featuring high broadband penetration certainly do exhibit falling penetration rates for ISDN. In the period 2004 to 2007 an average of 7% fewer Americans will use ISDN (see chart).

USA, technology penetration, 2004



Source: DB Research, 2005

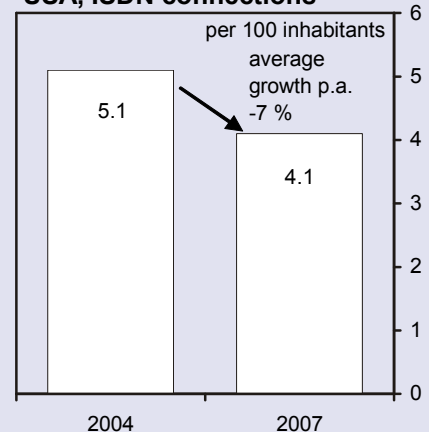
Call-by-call savings on long-distance calls, 2004



Difference between incumbent's standard rate and the average of the three cheapest providers

Source: ZEW, 2005

USA, ISDN connections



Source: DB Research, 2005

However, empirical observation of the data for Europe contradicts the logic of ISDN as a door-opener. Many Europeans continue to rely on ISDN, venturing into the realm of broadband less often than their American cousins. ISDN penetration in Italy, the UK, Germany and France edged up in 2004 by at least 2% yoy. This means that more than half of all ISDN connections, but less than a quarter of all broadband connections are located in western Europe.

Broadband stepping out swiftly

In terms of the penetration of broadband technology mainland Europe is way behind the world frontrunners South Korea (2004: 24 connections per 100 inhabitants), Japan (16 connections) and the USA (12 connections) (see chart). At present 23% of the 144 million broadband connections in the world are located in the USA, 5% in Germany, 4% in the UK and 3% each in France and Italy.

The number of broadband links is increasing worldwide. In 2007 the USA will retain its lead with 21 connections per 100 inhabitants. In Europe the UK will remain top of the league (2007: 18 links per 100 inhabitants). Italy will rev up with a broadband offensive worth EUR 300 m, to overtake France (16) and draw level with Germany (17).

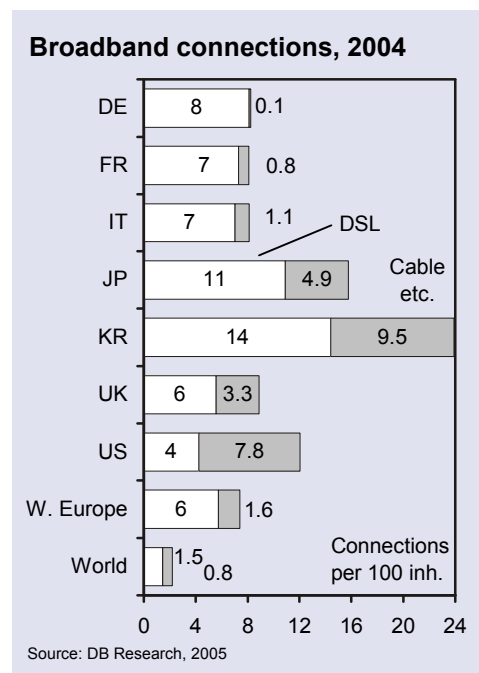
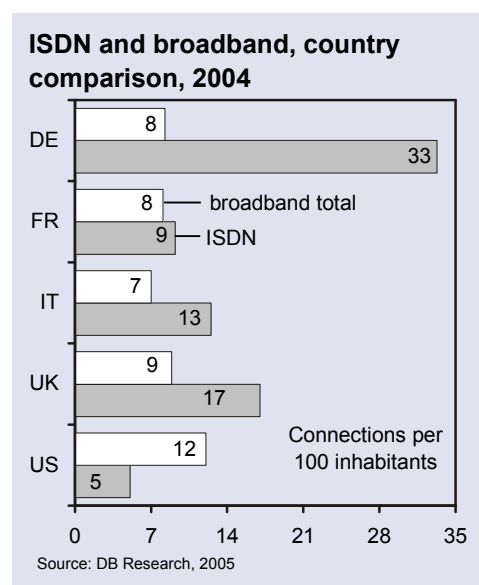
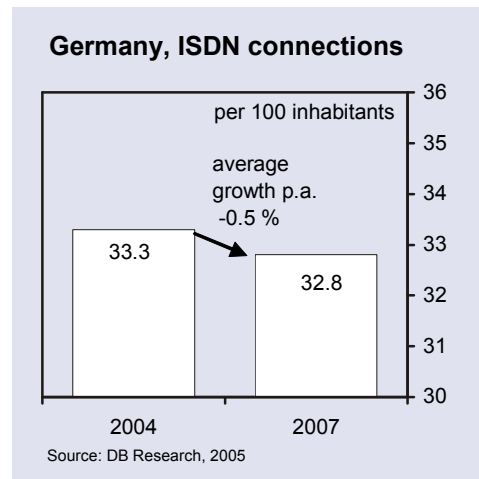
Cable only really popular outside Europe

The international comparison shows that high broadband penetration is not based on the incidence of DSL alone. End-users in the leading broadband nations South Korea, Japan and the USA also take advantage of alternative broadband technologies, foremost among them the cable modem.

In broadband communication by cable modem the USA is easily the major player. Coming from TV entertainment, US TV cable operators were quick to open up their modern networks to voice and data telephony as well. This triple play architecture meets US end-users' demand. Consequently the USA is home to almost half of all 49 million broadband cable links. Three times as many cable connections thus exist in the USA as in western Europe and 12 times more than in the UK. Cable operations in Germany are only just beginning to develop and are confined largely to the big urban agglomerations. Germany therefore has 16 times fewer cable modems than the UK.

The number of broadband cable connections is soaring worldwide. Growth rates in excess of 40% yoy were registered in 2004 in the USA and UK. Moving forward, the Americans will continue to rely more heavily on the cable modem, widening their lead on other countries. Growth will average 19% between 2004 and 2007, lifting the USA to a penetration rate of 13% by 2007. In the same period Germany will notch up respectable growth of around 60% p.a., albeit from a very small base. By 2007 one in every 250 Germans, one in every 76 French and no less than one in every 21 Britons will use a cable modem for their broadband access.

The marked distinctions in broadband communication by cable modem stem from end-users' varying preference patterns, differing market approaches by providers and not least different infrastructural conditions from country to country. The USA is demonstrating how the cable modem can emerge as a serious rival to DSL. However, the example of the US cannot be emulated one-for-one everywhere in the world. In Germany, for instance, complicated ownership rights to the infrastructure are hampering the necessary upgrading of the TV cable network with a high-speed back channel facility. With several thousand network operators on various structural levels, it is difficult within Germany's given



regulatory framework to split up the massive investment costs among the cooperating partners in such a way as to successfully enable the great leap forward by cable modem into the broadband era.²

DSL business models: differences in value added

The varied forms of cooperation between network operators and service providers are one determinant of country-specific DSL potential. The DSL business models are divided into four categories according to their value added structure. These are resale, bitstream access, line sharing and fully unbundled access.

In the case of **resale** service providers buy a telecommunications service from an infrastructure operator (generally the ex-monopolist) and sell this service on to their final customers without altering it in any way. The resellers sell their selling achievement in their own name and with their own billing. With simple resale the infrastructure operator sets all the parameters of the services through its technology. Resellers cannot make any technical alterations to the service. While resale therefore has its positive aspects in terms of competition, it does not lead to any permanent innovation competition.

Bitstream access is a wholesale product for DSL services comprising a DSL access link and a backhaul service. With bitstream access the network operator activates a high-speed access link to the customer for the new entrant. The newcomer can thus control the relationship with the final customer directly and offer its own services.

Besides resale and bitstream access there also exists the business model of **unbundled access**, which gives new entrants far more scope in service design. This model, in turn, distinguishes between the two types full unbundling and line sharing. With **line sharing** voice telephony remains the domain of the incumbent, while the new entrants operate the data telephony with their own infrastructure over the same local loop. Since voice and data use separate frequency bands anyway, line sharing is technically simple to implement. As with bitstream access, with line sharing newcomers also offer their own broadband services through their own systems. However, line sharing and bitstream access differ in respect of the technical responsibility for the point of interconnection (POI) from the DSL modem to the backbone network. Since the newcomer does not control the POI itself, it has no way of making technical alterations to the final customer's DSL access. With **full unbundling** the new entrant rents the entire local loop and offers the final customer all its own services.

Breathtaking growth in DSL

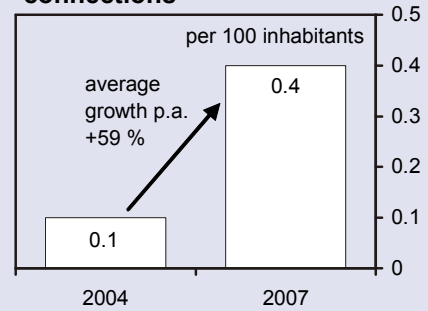
DSL penetration is almost twice as high as that of the cable modem. Of the 95 million DSL lines in the world 12% are located in the USA, 25% in western Europe and not quite 7% in Germany alone. Starting from a low level, DSL is achieving extremely high rates of growth. In 2004 alone the number of DSL connections in the USA jumped by 35% yoy, in Italy by 60% and in the UK by 74%, no less. This heady growth continues. In the period 2004 to 2007 the number of DSL connections stateside will increase by an average of 22% p.a., in Germany by 27%.

The gap in DSL penetration between Europe and the USA is widening. Given the broadband alternatives, even in 2007 barely 8% of all US-Americans will use DSL (see chart p. 6). At the same time, with the aid of government DSL initiatives, Italy is launching its unprecedented drive to catch up. With almost 17 DSL connections per 100 inhabitants by 2007, it will overtake France (15 connections per 100 inhabitants in 2007) and Germany (16).

DSL bolstering the ex-monopolists' position

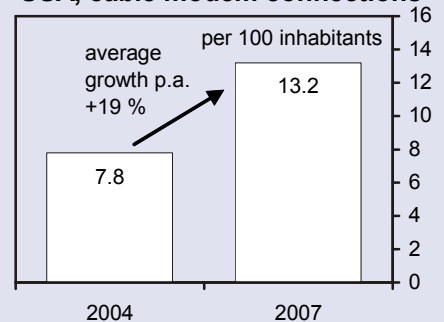
Owing to the ownership situation, DSL is dominated by the incumbents, as the main owners of the fixed telecom network, in virtually all countries. Because they own the "last mile" to the end

Germany, cable modem connections



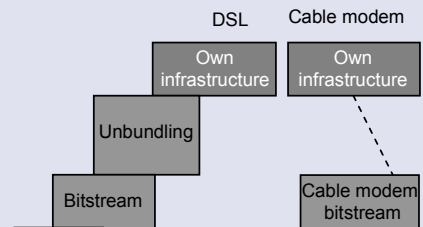
Source: DB Research, 2005

USA, cable modem connections



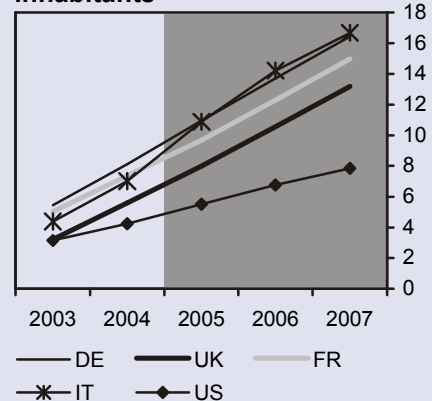
Source: DB Research, 2005

Stages of value added



Sources: DB Research, ERG, 2005

ADSL connections per 100 inhabitants



Source: DB Research, 2005

² See Heng, Stefan (2003). Germany's broadband networks – innovation on hold. Deutsche Bank Research. E-economics No. 35, Frankfurt am Main.

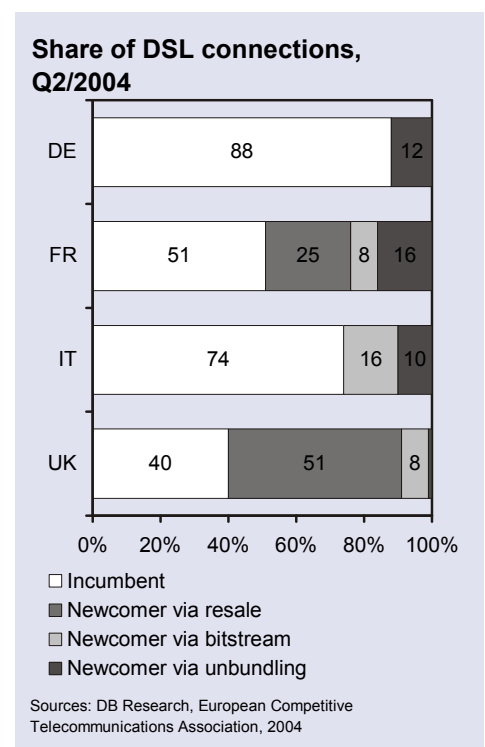
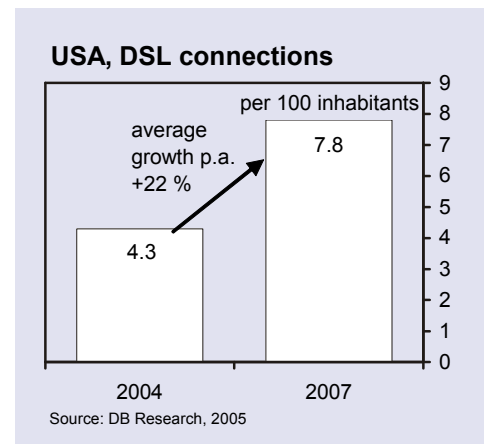
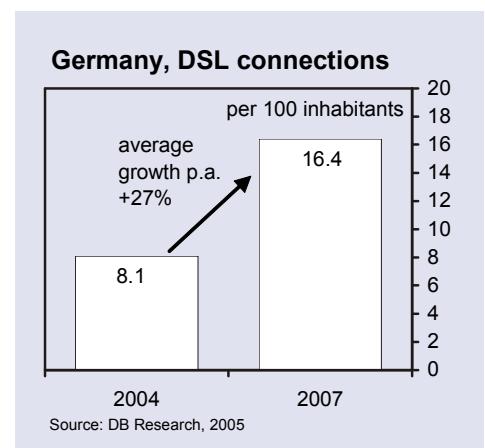
user (local loop), the former monopolists can make it difficult for alternative providers to gain a foothold in the market. What is more, owing to their traditional direct customer relationships they enjoy an important information edge on new entrants. Ownership of the “last mile” and the information edge in respect of end-user attributes shore up the ex-monopolists’ position in the market. Even at first glance, the dominance of the incumbent in the German DSL market is particularly striking; ultimately, though, it is also evident in other countries. The former monopolist in Germany directly operates 88% of all DSL connections. The British incumbent, although reined in, nevertheless still holds 40% of all connections. Even this analysis of concentration, pause for thought as it may give, still paints too positive a picture of progress with the liberalisation of DSL. In fact, the incumbents in Italy and France each control, directly or indirectly, three out of every four DSL connections, and the figure is as high as 91% in the UK.

Bitstream access also enables new entrants to build up a direct relationship with the end user in the technical sense, through which they can offer their own customised services. This makes bitstream access, as an additional element of liberalisation, an important factor in freeing up the networks. Italy (16 bitstream accesses per 100 DSL connections), the UK and France (8 each) are the trailblazers of this business model. The fully unbundled connection, as the form of value added least dependent on the ex-monopolists, meets with the greatest acceptance in France (16% of DSL connections) and Germany (12%). Economic policies and regulators should allow a broad spectrum of different ways of adding value in broadband communication, fostering speedy market access for newcomers at all levels.

While some steps have been taken towards opening up the broadband communications sector, a competitively organised market is still way off. Not only in Europe are policy makers seeking suitable ways of promoting the dissemination of broadband technology while deregulating the telecommunications sector as a whole. In practice the two objectives clash with one another. Public broadband offensives giving one-sided preference to DSL over alternative broadband technology are highly questionable in terms of free competition, given the former incumbents’ dominance in this sector. The German association of telecom services providers castigates government programmes to spread DSL as “subsidising old monopolistic structures”.³ Although exaggerated, this does sum up the actual challenge very precisely. As a matter of principle government promotion should be technology-neutral, and under no circumstances should it underpin any one provider’s dominant position.

Internet telephony giving rise to interest in broadband

Internet telephony (Voice over Internet Protocol, VoIP) is seen as being able permanently to encourage users’ need for broadband technology. Many articles in the media – in Germany alone more than 1,000 news items on the subject appeared last month – rave over the huge potential of internet call services. However, anything more than a fleeting glance at the subject is enough to dampen some of this exuberance. The market potential of the media darling VoIP as a stand-alone product is generally overstated. The actual share of VoIP services in total voice telephony volume is negligible.



³ Grützner, Jürgen (2005). Keine öffentlichen Gelder zur Subventionierung alter Monopolstrukturen. VATM press release, April 7, 2005, Berlin.

Point Topic, a commercial research institute, estimates that 17 million users worldwide, i.e. 0,3% of the world population, have telephoned over the internet at one time or another. Internet is most widespread in countries that unbundled the “last mile” to the final customer early on. Point Topic identifies 65% of all internet telephony users in Japan, 19% in North America and 10% in France. The European regulators organised in the European Regulators Group (ERG) consider Point Topic’s analysis of internet telephony too optimistic. For example, the ERG points out that in Germany a mere 2% of all traffic minutes are conducted over the internet, concluding: “The quantitative impact of the VoIP services on the broadband market is so far considered too small to be analysed.”⁴

As a stand-alone product, internet telephony possesses only very limited potential. Even so, it does constitute an interesting new telecom application. The empirics of the telecom segment show successful providers expanding their comprehensive service packages around the voice application. With their triple play multimedia package offers permitting TV transmission and voice and data telephony US companies are, indeed, catering for private users’ needs. Public debate over the pros and cons of internet telephony alone is causing people to re-examine established voice telephony structures. Internet telephony, which makes real sense only in always-online mode with a flat rate, could put pressure on minute-based voice telephony tariffs.⁵

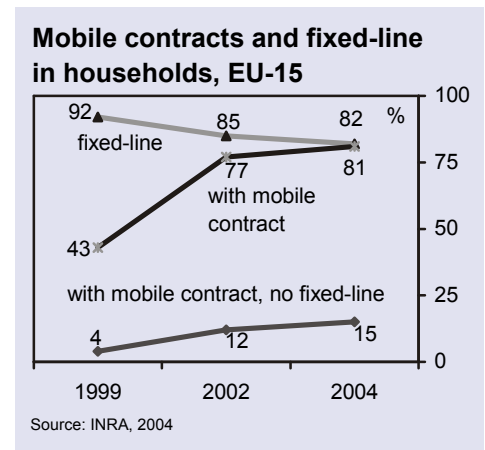
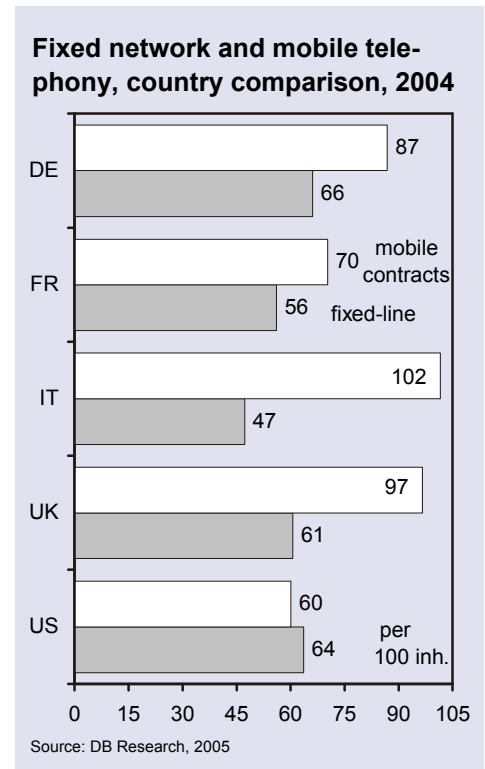
Under no circumstances does internet telephony herald the imminent end of analogue voice telephony. That said, internet telephony is a prominent illustration of how the convergence in telecom technologies is increasingly forcing a response from competition policy and demanding new delineation of the relevant markets from regulators.

Mobile telephony stirring up fixed wire business

Besides the convergence of fixed network technologies, social trends, especially the desire for individuality and mobility, are also shaking telecommunications to the core. Empirical evidence argues against modern-day consumers wishing to pin their communication requirements to a landline. The number of wired telephone lines in Germany, France, Italy, the UK and the USA will continue to drop accordingly.

With the exception of the USA, there are already more mobile telephone customers than landlines in all the countries examined. More and more users are dispensing entirely with landlines and relying on mobile telephony alone. Italy and France are the trailblazers: in 2004 17% of households in both countries no longer had a landline. Broadband mobile technologies such as WLAN, UMTS and WiMax⁶ are increasingly rivalling fixed line networks. Through specially tailored services mobile telephony addresses the needs of the nomadic user and will thus capture significant market share from the fixed network. Further market penetration of broadband mobile technologies will reduce the importance of fixed wire business, robbing the incumbent of its de facto market dominance. In this respect technological progress is encouraging

VoIP too small to be analysed



⁴ ERG (2005). Broadband Market Competition Report, Brussels, p. 22.
⁵ See Heng, Stefan and Dorothe Singer (2005). Internet telephony: media darling still a far cry from the mass market. Deutsche Bank Research, Talking point, Frankfurt am Main.
⁶ See Heng, Stefan (2003): Mobile telephony – cooperation and value added are key to further success. Deutsche Bank Research, E-economics No. 42, Frankfurt am Main.

liberalisation of the broadband market. Regulators should seize on this to achieve the goal of liberalised markets more quickly.

Conclusion: broadband communication is waiting for stimulus

Telecom markets differ considerably by country and technology. The transmission technologies ISDN, cable modem and DSL meet with very different acceptance from country to country, with a particularly sharp distinction between the big European countries on the one hand and the USA on the other. Whereas marked progress is being achieved with the liberalisation of voice telephony, broadband communication, which is particularly interesting commercially, has not yet made the real breakthrough. Politicians all over the world are hence seeking suitable strategies to encourage the dissemination of economically pivotal broadband technology while at the same time driving ahead the liberalisation of telecommunications as a whole. In practice the two objectives often clash with one another. Public broadband offensives giving one-sided preference to DSL over alternative broadband technology are highly questionable in terms of competition, given the former monopolist's dominance in this sector.

Empirics show that the increasing penetration of broadband and the spread of attractive digital content and services go hand in hand. In public the appeal of internet telephony is therefore persistently emphasised. In fact internet telephony holds out very little market potential as a stand-alone product. Instead, the opportunities of this application lie in triple play multimedia packaging. Here, internet telephony does indeed offer the leverage to unhinge the conventional structures of voice telephony, especially minute-based tariffs. Together with the convergence of fixed network technologies itself, socially required mobility is also driving change in telecommunications. Broadband mobile telephony technologies such as WLAN, UMTS and WiMax are increasingly liberating broadband from the restrictions of fixed-line business, which is dominated the world over by the former monopolists.

When it comes to broadband communication, European economic policies and regulatory authorities in particular should start looking beyond DSL to pave the way for technology competition. The prevailing ownership structures in fixed wire business mean that proper competition without regular intervention by the supervisory authorities will not unfold until alternative transmission technologies are established. Technology competition should significantly spur growth in broadband communication and, in so doing, make a substantial contribution to macroeconomic development.

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DSL offensives are questionable in terms of competition

Mobile telephony liberating broadband from the restriction of fixed-line business

Technology competition spurs growth in broadband

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