

Broadband Developments in Europe: The Challenge of High Speed

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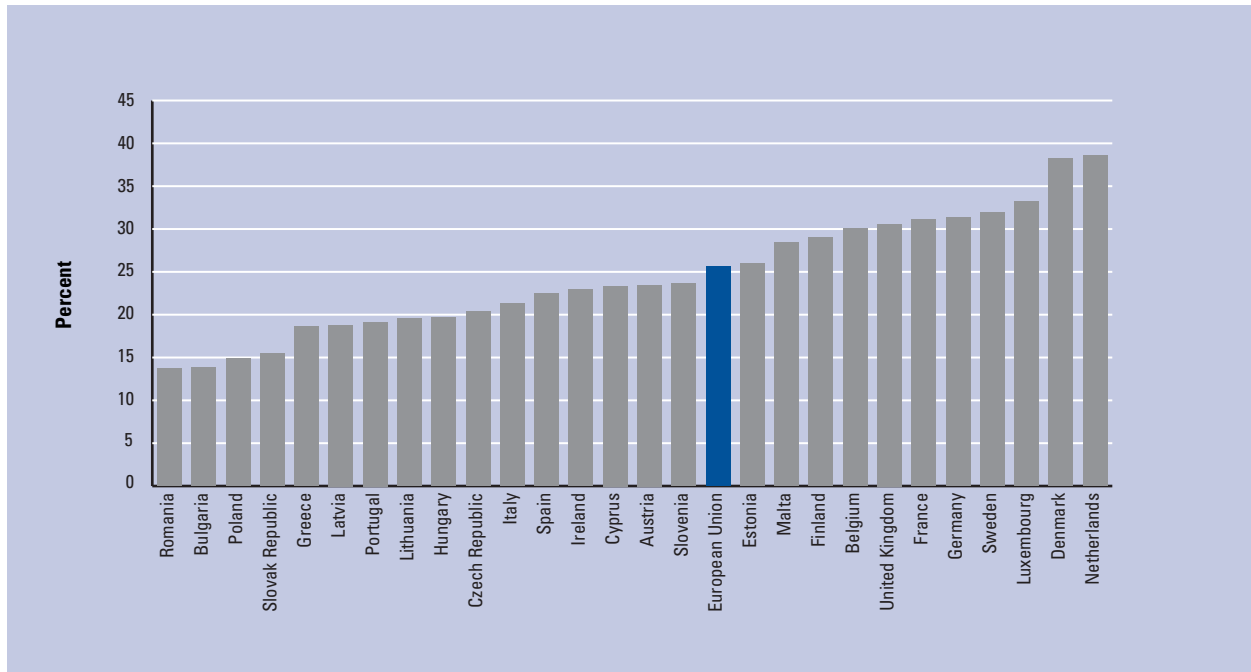
The broadband market of the European Union (EU) is the largest in the world, with 128.3 million lines and some European Member States topping the ranks in terms of penetration rates worldwide. The fixed broadband penetration rate in the European Union as a whole was 25.6 percent in July 2010 and continued to grow.¹ Most broadband lines in Europe are currently based on xDSL technologies,² but new access technologies such as mobile, cable, and fiber are emerging. The deployment of high-capacity broadband, however, is still limited in Europe, with only 30 percent of lines offering speeds above 10 Mb/s and only 0.5 percent above 100 Mb/s. To stimulate development, the European Union has committed to achieve ambitious high-speed targets. By 2020, half of European households should subscribe to at least 100 Mb/s, and 30 Mb/s should be available for all.³ These targets are enshrined in the *Digital Agenda for Europe*,⁴ the European Commission's strategy for a flourishing digital economy, as well as in *Europe 2020*,⁵ the Commission's growth strategy for the next decade.

This chapter describes the broadband developments experienced in the European Union in recent years. Its objective is to frame the current political debate and the EU broadband policy in its own context, which often differs from those of other economies. It will first look at growth in the fixed and mobile broadband markets and emphasize differences across Member States, and then frame these developments in the international context. A few challenges will be highlighted, such as the difficulties encountered in migrating toward higher speeds and the uncertainty of business models. These challenges are currently keeping investment back, but some new practices are being tried in a number of countries. The chapter will then note that broadband development in Europe has also been stimulated by the implementation of the regulatory framework for electronic communications. Since July 2003, the incumbents' market share in the fixed broadband market has been declining, stabilizing at around 44 percent in 2010, while local loop unbundling (LLU) is the principal means by which new entrants can offer retail DSL services (about three-quarters of new entrants' xDSL lines are provided through LLU).⁶ Last but not least, the matter of rural broadband and state aid issues and the ongoing political debate will be analyzed.

Recent trends in the growth of fixed broadband lines

Broadband markets in 2010 continued to grow, although more slowly than in previous years. In July 2010, there were 128 million fixed broadband lines (with 9 million new lines added during the previous year), and the average

The views expressed by the author are purely personal and do not necessarily reflect the official position of the European Commission.

Figure 1: Fixed broadband penetration, July 2010

Source: Communications Committee.

Note: The Communications Committee has been established under the Framework Directive 2002/21/EC and assists the European Commission in carrying out its executive powers under the regulatory framework for electronic communications. The committee furthermore provides a platform for an exchange of information on market developments and regulatory activities, including the collection of broadband data through National Regulatory Authorities by way of a common methodology applied across the European Union. The data are collected twice a year, and the latest publication can be found at http://ec.europa.eu/information_society/newsroom/cf/item-detail-dae.cfm?item_id=6502&language=default.

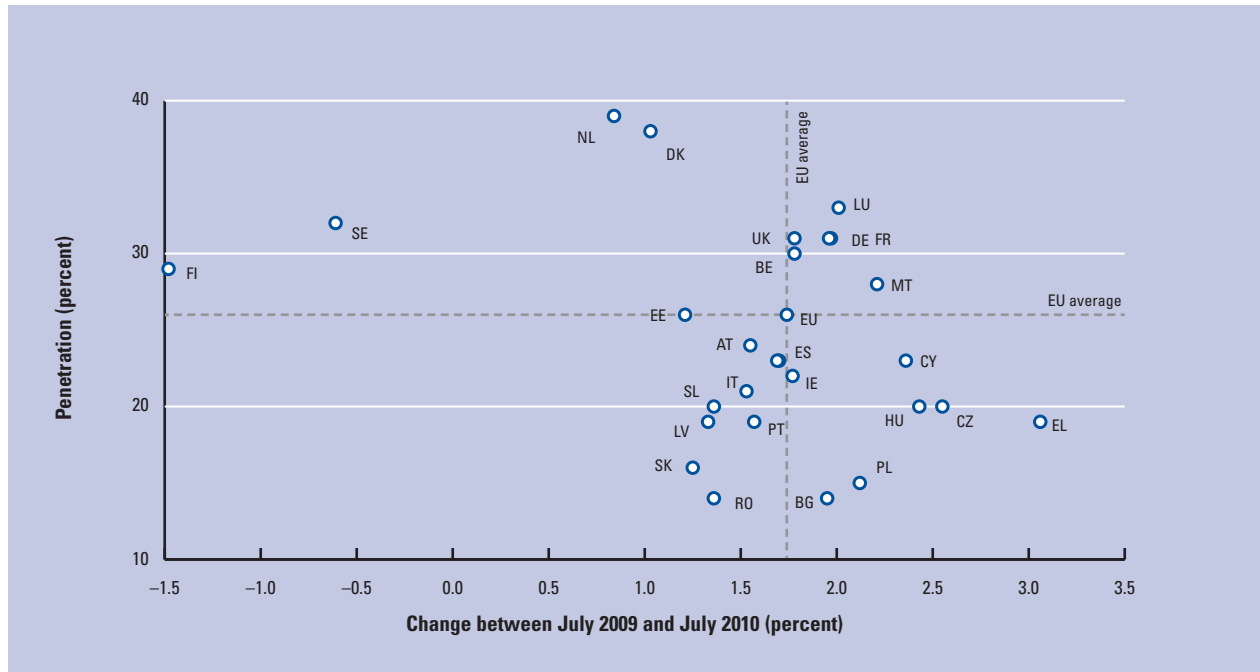
fixed broadband penetration rate in the European Union reached 25.6 percent, as compared with 23.9 percent one year earlier (see Figure 1).⁷ Nevertheless, the growth rate is slowing down and has reached its lowest point of the last five years. In a number of cases, markets appear to be approaching maturity, which sometimes is caused both by changes in the population and by consumers substituting fixed with mobile broadband access. This seems to be the case in countries such as Finland and Sweden (Figure 2). In contrast, France and Germany—which together account for 36 percent of the EU broadband market—saw an increase of 2 percentage points in fixed broadband subscribers. Hence it appears that there is still some potential for growth even in countries with relatively high penetration.

Growth in countries where broadband markets are known to be far from mature also shows a mixed picture. Greece had the highest year-on-year increase in fixed broadband lines (3.1 percentage points). Cyprus, the Czech Republic, and Hungary are also catching up with the EU average. However, growth rates in the Slovak Republic, Romania, Latvia, and Lithuania were well below the EU average, and they continue to fall further behind. Despite these disparities, the broadband gap—that is, the difference between the highest and the lowest levels of penetration in the European Union—decreased, and was 1.6 percentage points lower in July 2010 than a year earlier.

Household data, a good proxy for the growth potential of broadband markets, show that there is still a high proportion of EU households that do not have a broadband connection (Figure 3). In the Netherlands, Denmark, and Sweden, fewer than 25 percent of households have no broadband connection, but in the EU overall, on average, close to 40 percent of households do not. The most important reasons not to subscribe to broadband are little need, lack of adequate skills to use it, too high subscription prices, and insufficient availability.

Developments in the fixed broadband market are accompanied by the emergence of mobile broadband usage. Progress in the uptake of mobile broadband was significant in a number of EU countries in 2010. Although the penetration of dedicated mobile broadband cards was only 6.1 percent of the EU population in July 2010, the market is growing rapidly (over 50 percent growth in mobile broadband cards between July 2009 and July 2010). Finland and Austria have experienced particularly fast developments (with penetration rates of 21.5 percent and 16.7 percent, respectively), with users currently moving from fixed to mobile broadband. The estimated number of dedicated mobile broadband cards (30.5 million) corresponds to about a quarter of all fixed broadband connections. Meanwhile, spectrum for fourth-generation mobile Internet has already been auctioned in several EU countries, including

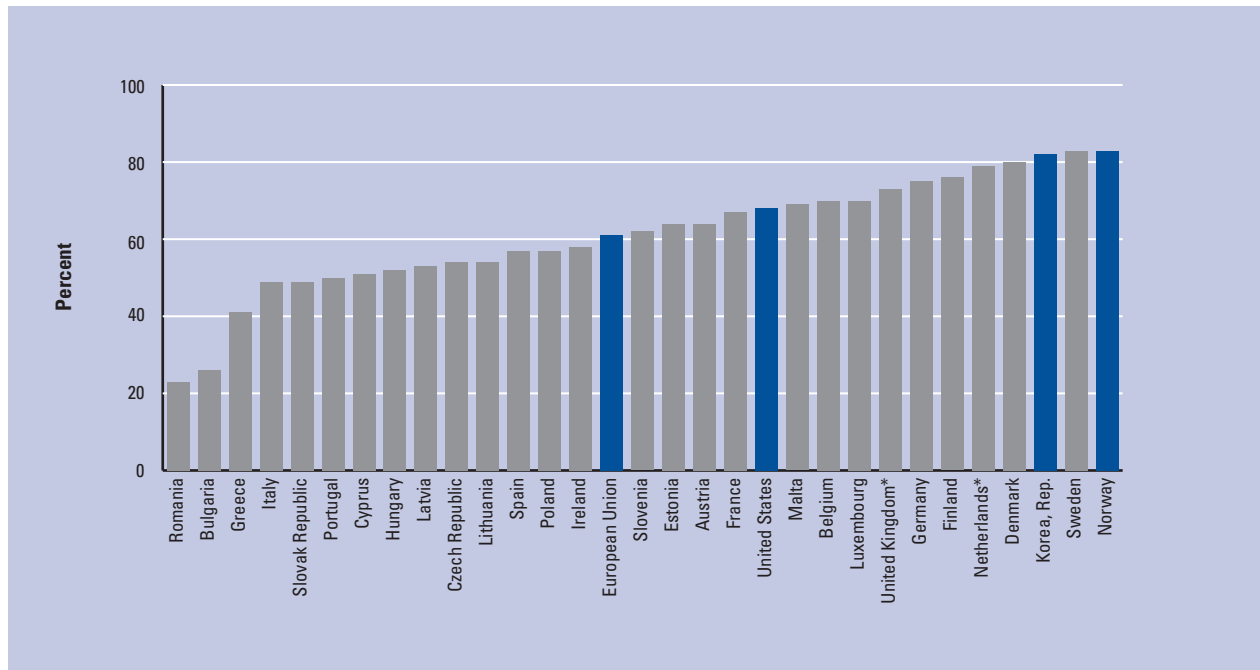
Figure 2: Fixed penetration rate and growth, July 2010



Source: Communications Committee.

Note: AT = Austria, BE = Belgium, BG = Bulgaria, CY = Cyprus, CZ = Czech Republic, DE = Germany, DK = Denmark, EE = Estonia, EL = Greece, ES = Spain, EU = European Union, FI = Finland, FR = France, HU = Hungary, IE = Ireland, IT = Italy, LT = Lithuania, LU = Luxembourg, LV = Latvia, MT = Malta, NL = Netherlands, PL = Poland, PT = Portugal, RO = Romania, SE = Sweden, SI = Slovenia, SK = Slovak Republic, UK = United Kingdom.

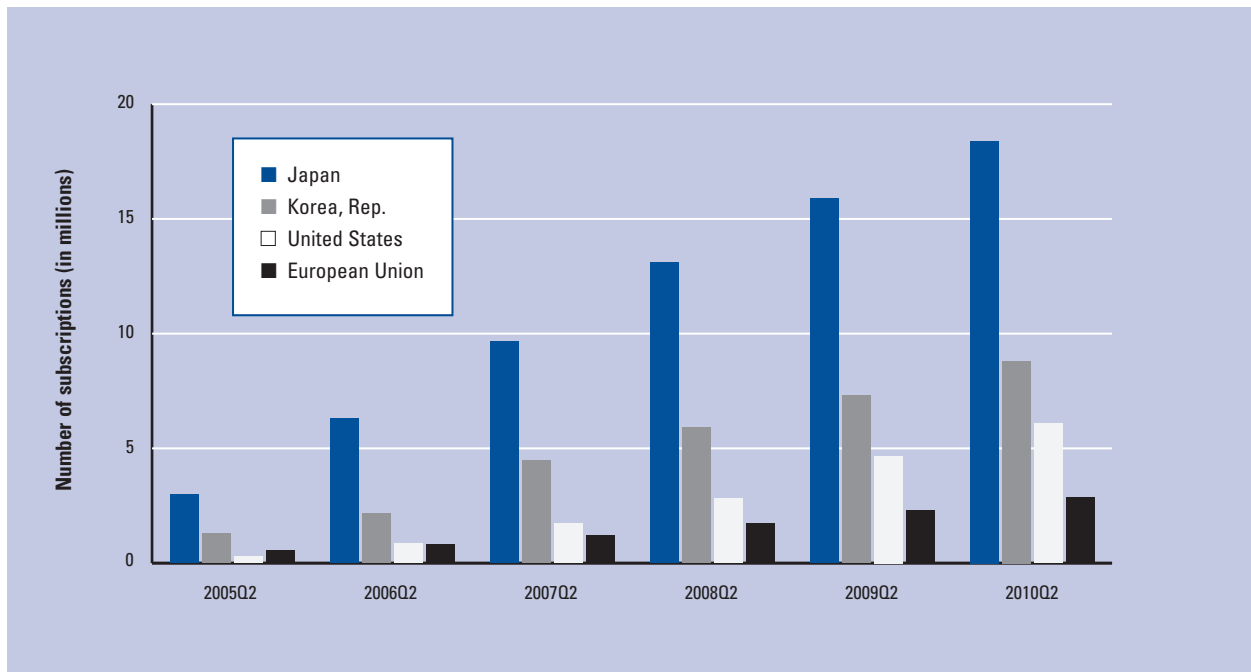
Figure 3: Fixed broadband household penetration, Q2 2010



Source: Eurostat Community Survey on ICT usage by Households and Individuals, 2010. Available at http://epp.eurostat.ec.europa.eu/portal/page/portal/information_society/introduction.

Notes: Data for the United States, Norway, and Korea refer to Q2 2009. Blue bars indicate the EU average and non-EU countries.

* Estimated data.

Figure 4: FTTx deployment in the European Union, the United States, Japan, and Korea, Rep.

Source: European Commission services on the basis of Point Topic database.
 Note: Figures include FTTH and FTTB + LAN.

Sweden, Finland, Germany, Austria, the Netherlands, Denmark, and Estonia.

An international comparison of European uptake

Both in fixed and mobile broadband, the European Union continues to be the largest broadband market in the world, and some EU Members exhibit the highest penetration levels worldwide. The Netherlands and Denmark continue to top the league, followed by Sweden and Luxembourg, along with a group of four non-EU countries—Switzerland, Norway, Iceland, and Korea, Rep. (Korea). On average, the European Union is catching up with the United States in terms of uptake (1.6 percentage point difference in January 2010 compared with 2.7 percentage points one year earlier). This is the result of a strong reduction in the uptake experienced by the United States in 2010.

Despite the satisfactory penetration rates, most EU broadband lines are based on xDSL technologies, and average speeds are usually lower than in other developed countries with high broadband penetration rates. Fiber technologies have been spreading at a very low pace in the European Union compared with the United States and especially with Korea and Japan, where more than half of users already subscribe to fiber-based access technologies (FTTx; see Figure 4).⁸

The pattern of high-capacity broadband deployment appears different in advanced markets relative to

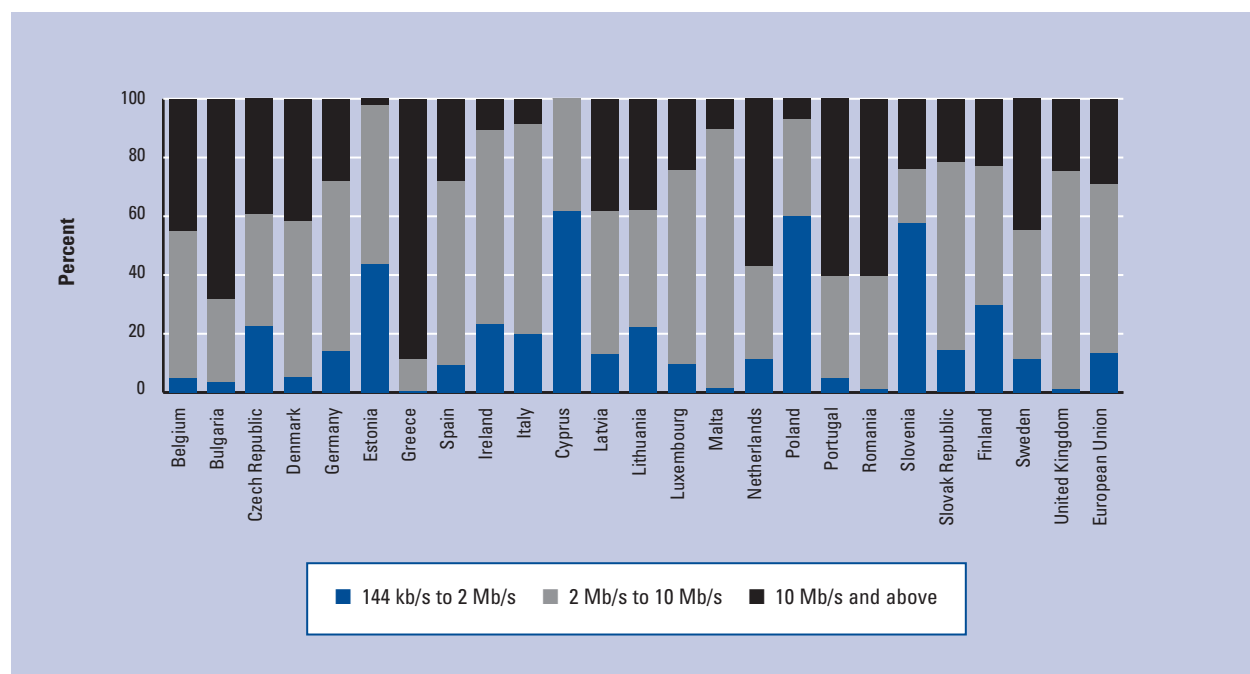
emerging markets. In Japan, the United States, Korea, and Taiwan, growth appears to be largely driven by operators' efforts to persuade DSL and cable subscribers to switch to FTTx, whereas in less-developed markets such as Russia and China, large numbers of first-time broadband customers have signed up for FTTx, often because it is the only technology available to them. This pattern may enable currently less-developed markets to leapfrog the advanced broadband economies.

The emergence of high-speed broadband

xDSL continues to dominate the EU broadband market, although its share of the market in January 2011 had slightly decreased to 78 percent from 80.8 percent in January 2006. In the first half of 2010, 65.5 percent of new lines were provided by means of xDSL technologies and 35.5 percent were connections using other types of technologies, an increase of 5.7 percentage points over the year before.

In the fixed broadband market, the largest relative growth was experienced by broadband lines based on fiber-to-the-home (FTTH), fiber-to-the-building (FTTB), and fiber + LAN, which together increased by more than 25 percent, admittedly from a lower base than xDSL or cable modem lines. DOCSIS 3.0 has also emerged as a powerful driver of high-speed broadband and is acting as a competitive threat to incumbents. The cost of upgrading cable capabilities to DOCSIS 3.0 is

Figure 5: Share of fixed broadband lines by speed, July 2010



Source: Communications Committee.

Note: Data for France, Hungary, and Austria are not available.

lower than the cost of upgrading to other access technologies, and this offers cable a competitive advantage in areas where it is already deployed. The reach of cable in Europe, however, is limited; in areas where cable is not present, the search for competitive threats to the incumbents' business model is open.

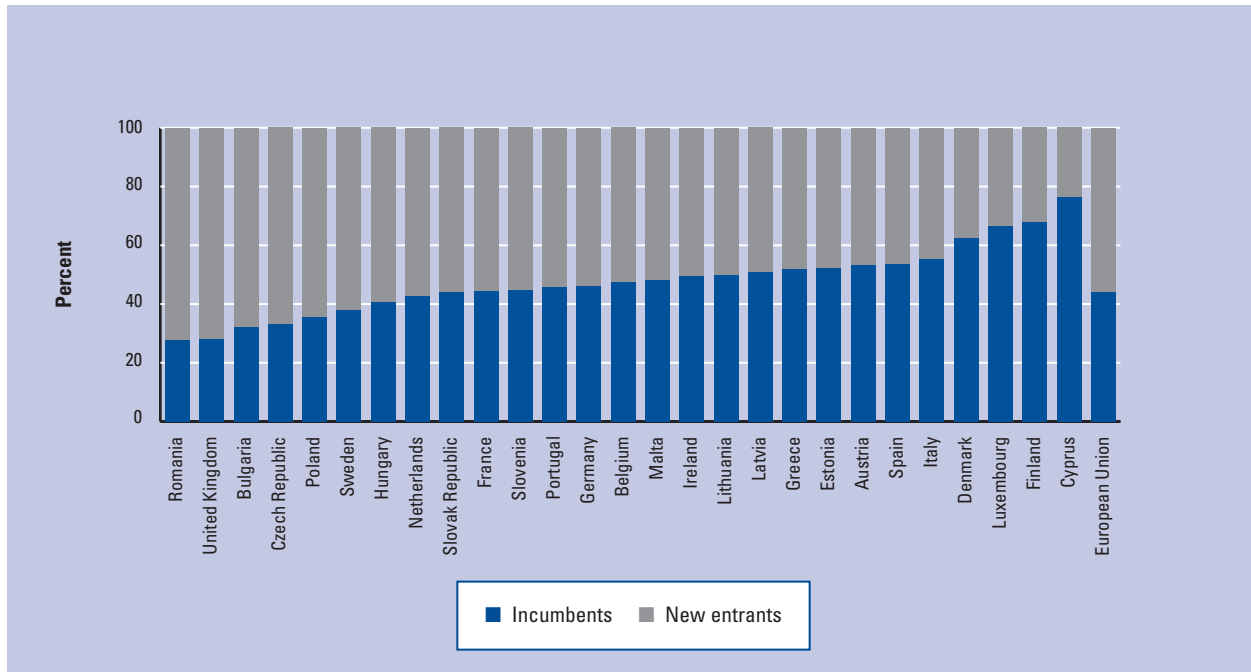
The deployment of high-speed broadband across EU countries is likely to follow completely different patterns. In Romania, Bulgaria, Lithuania, and, to a lesser extent, in Estonia, Latvia, the Slovak Republic, and the Czech Republic, the deployment of fixed broadband lines is very much based on fiber access and confirms the propensity of new Member States to leapfrog more mature markets in terms of technology.

As of July 2010, 87 percent of the broadband lines in the European Union were above 2 Mb/s, up from 81 percent a year earlier (Figure 5). There is a clear trend toward higher speeds. The Member States that made faster progress toward speeds greater than 10 Mb/s were Greece, the United Kingdom, and Luxembourg. Only 4.5 percent of the broadband lines in the European Union are at least 30 Mb/s, while 0.5 percent of the lines are at least 100 Mb/s.

New services such as high-definition television, videoconferencing, and cloud computing need much faster Internet access than is now generally available in Europe. Households making simultaneous use of multiple video Internet channels, with a young generation permanently connected and an increased uptake of

image-based public services, characterize tomorrow's needs. To satisfy needs and match world leaders such as Korea and Japan, Europe should be equipped with download rates of 30 Mb/s for all its citizens, with at least 50 percent of European households subscribing to Internet connections above 100 Mb/s by 2020. The *Digital Agenda* aims to turn this ambition into reality by stimulating investments and proposing a comprehensive radio spectrum plan. It sets very specific targets to equip Europe with 21st-century infrastructure by 2020.

With regard to broadband retail prices, higher speeds are accompanied by a general trend toward more affordable prices. The median price for standalone services with download speeds between 2 and 4 Mb/s in the EU27 countries slightly decreased in 2009. For broadband lines with speeds between 4 and 8 Mb/s, prices decreased significantly in the newer Member States while remaining more stable in the rest of the European Union. The trend is accompanied by a rise in the number of bundled offers, which often have the advantage of putting a cap on retail prices but risk locking in customers and reducing churn. As of December 2009, it was estimated that 38 percent of households subscribed to bundled services (up from 29 percent two years earlier). Bundled service packages are especially popular in the Netherlands, Denmark, Estonia, and France, with more than 50 percent of subscriptions. In December, 2009, 57 percent of Internet access services were provided by means of a bundled package.⁹

Figure 6: Fixed broadband lines, operator market shares (July 2010)

Source: Communications Committee.

Selected European experiences in fiber-based access technologies

Italy is currently one of the largest FTTH markets in Europe, with more than 2.5 million homes passed and 348,000 fiber subscribers at the end of December 2010.¹⁰ Two important recent initiatives radically increase FTTH penetration: Fibre for Italy—a co-investment partnership among Fastweb, Vodafone, and Wind—and Telecom Italia's plan. The Fibre for Italy project is aimed at reaching 20 million people in Italy's 15 largest cities by 2015, and a pilot including 7,000 households has been launched in Rome. Telecom Italia is planning to connect 138 cities with FTTH/B by 2018. Furthermore, seven Italian telecommunications operators (including Telecom Italia) are also slated to partner up to create a national open access FTTH network in areas where no operator has yet scheduled fiber roll-out.

In the United Kingdom, BT plans to invest up to £2.5 billion in fiber broadband covering two-thirds of premises until 2015, through both very high speed DSL (VDSL) and FTTH. BT declared that there was a need for public-sector funding to cover the final third of premises, and the plan was not viable otherwise. Virgin Media has started to roll out DOCSIS 3.0 at 100 Mb/s on their existing cable network to 12.7 million homes. In the first phase, they aim to cover parts of London, southeastern United Kingdom, and Yorkshire by mid 2012.

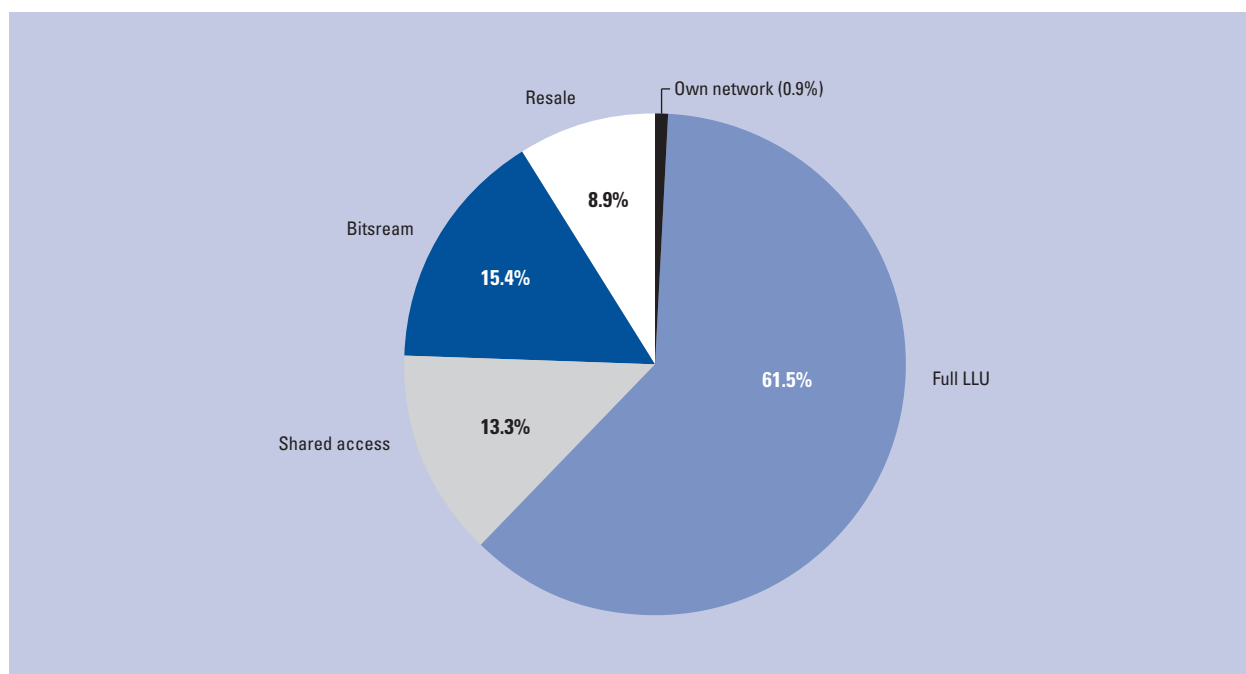
Portugal aims for 100 percent fiber penetration. The Portuguese government has reached an agreement with three of the country's main telecommunications operators on the deployment of FTTH, and a line of credit has been made available by the government to support the operators' investments. In addition, public tenders have been launched to ensure that rural areas will be covered, and they have recently been cleared under EU state aid rules. Portugal Telecom, the incumbent operator, plays a key role in fiber deployment and covered 1 million households by the end of 2009.

Lithuania is the European leader in FTTH penetration. As of June 2010, more than 20 percent of households were connected. As for uptake, penetration stood at close to 16 percent. In addition, Lithuanian operator TEO LT is planning to invest €27.8 million to extend fiber coverage to half of the population.

Competition dynamics in the DSL market

The market share (determined by the number of subscribers) of the incumbent fixed operators since July 2003 has followed a downward trend, which is now stabilizing around 44 percent of the broadband market. In some cases, incumbents are even regaining market shares.

The smallest incumbent's market share is in the United Kingdom and Romania. Despite the general

Figure 7: New entrants' xDSL lines by type of access in EU countries, July 2010

Source: Communications Committee.

Note: In the case of fully unbundled lines, a copper pair is rented to a third party for its exclusive use. In the case of shared access lines, the incumbent continues to provide telephony service, while the new entrant delivers high-speed data (Internet) services over that same local loop.

downward trend in the European Union, incumbents did increase their market share by more than 2 percentage points in Malta, Portugal, Austria, Latvia, and Belgium between July 2009 and July 2010 (see Figure 6).

In the EU xDSL market, the incumbents had a market share of 55 percent in July 2010. Local loop unbundling (fully unbundled lines and shared access) has recorded growth and has become the main form of wholesale access for new entrants, with 74.9 percent of DSL lines, up from 71.4 percent in July 2009. New entrants' use of bitstream access for local loop unbundling in the provision of broadband services has gone down by only 1.5 percentage points since July 2009.¹¹ The share of lines based on resale, a type of access suited to new low-investment entrants, has shrunk by 2 percentage points over the last year (Figure 7).

Along with platform-based competition, effective sector regulation has been a key factor in driving competition in Europe, in particular in those countries where DSL is the predominant technology. Sector regulation has fostered competition and growth in the DSL market, thus significantly lifting the broadband market.

Resale (the sale of repackaged services by entrants) is nowadays used only in a limited number of Member States (in particular in the United Kingdom, Germany, and Luxembourg, but also in Belgium, Sweden, Denmark, and the Netherlands). In almost all other EU countries, local loop unbundling or bitstream is the predominant

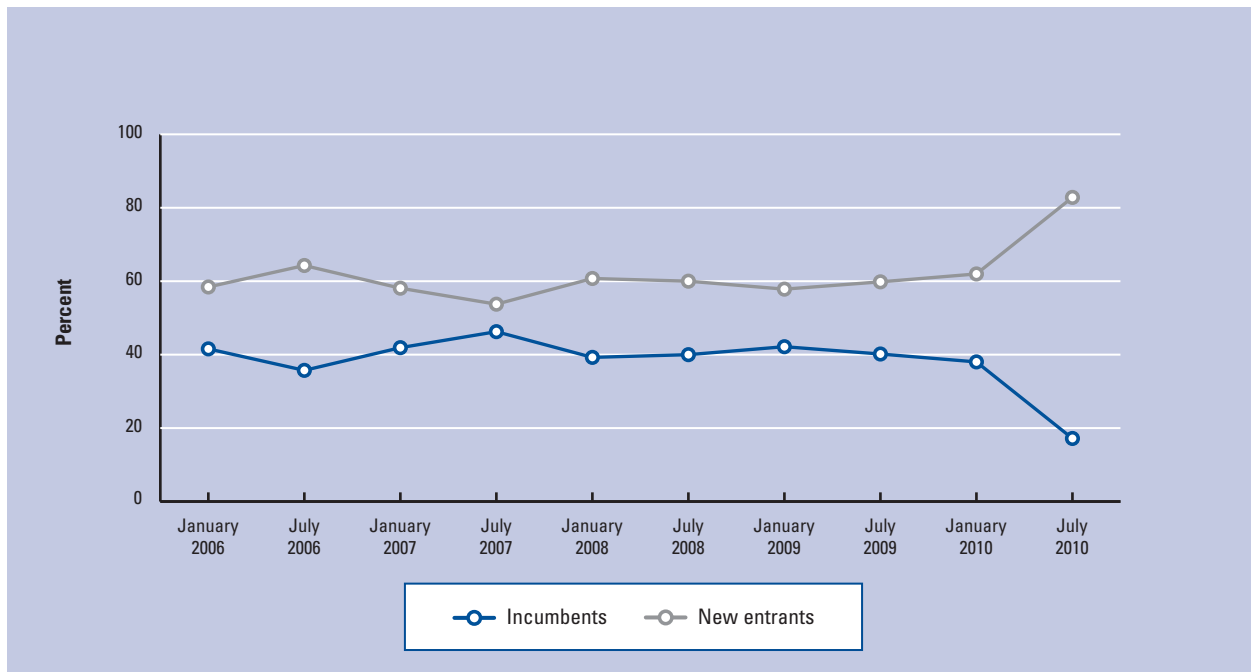
means of access. The EU average hides large differences between EU Member States, which is partly caused by diverse regulatory approaches in the broadband wholesale market but also by different patterns of infrastructure deployment.

For example, in the cases of Bulgaria and Romania, because of the absence of PSTN-based infrastructure, competition is based on cable modem networks and in fiber + LAN. xDSL lines represent only around 30 percent of all broadband retail lines, and new entrants rent hardly any PSTN lines from the incumbent. In the Czech Republic, only 38 percent of broadband lines are based on xDSL, with fixed wireless access and cable modem predominating. Alternative operators rent only 5 percent of all fixed broadband lines from the incumbent operator. Similar situations are found in Latvia, Lithuania, Estonia, the Slovak Republic, and Malta, where the incumbent operator largely controls the xDSL market. With the exception of the Slovak Republic, in none of these countries is xDSL the predominant technology.

As for the total fixed broadband market, the new entrants have provided over 80 percent of net additions in the first half of 2010 (Figure 8).

Broadband coverage in rural areas

One of the reasons why xDSL is the dominant access mode is that plain old telephone service networks, on

Figure 8: Net additions of fixed broadband lines by operators in the European Union, January 2006–July 2010

Source: Communications Committee.

which xDSL technologies operate, are very widely available. For this reason, xDSL coverage has been considered a fair proxy for broadband coverage in Europe.¹² At the end of 2009, xDSL access was available to 94.4 percent of the combined urban and rural EU population, up from 92.7 percent of the population one year earlier. xDSL coverage in rural areas alone, on the other hand, reached only 80 percent. Only six Member States had xDSL coverage below 90 percent (Figure 9). In Bulgaria, Romania, and Cyprus, rural coverage was still below 50 percent at the end of 2009, although Romania and Cyprus have made significant progress since the previous year.

Although investments for high-speed and very high-speed broadband networks should primarily be driven by private operators, public funding can play a crucial role in extending broadband coverage in areas where market operators have no plans to invest. The European Commission has adopted “Community Guidelines for the application of State aid rules in relation to rapid deployment of broadband networks.”¹³ The primary objective of these Guidelines is to foster a wide and rapid roll-out of broadband networks while at the same time preserving the market dynamics and competition in a sector that is fully liberalized. The Guidelines also specify that whenever state aid is granted to private operators, the aid must foster competition by requiring the beneficiary to provide open access to the publicly funded network for third-party operators. They also contain specific provisions concerning the deployment

of next-generation access (NGA) networks, allowing public support to foster investment in this strategic sector without creating undue distortions of competition.

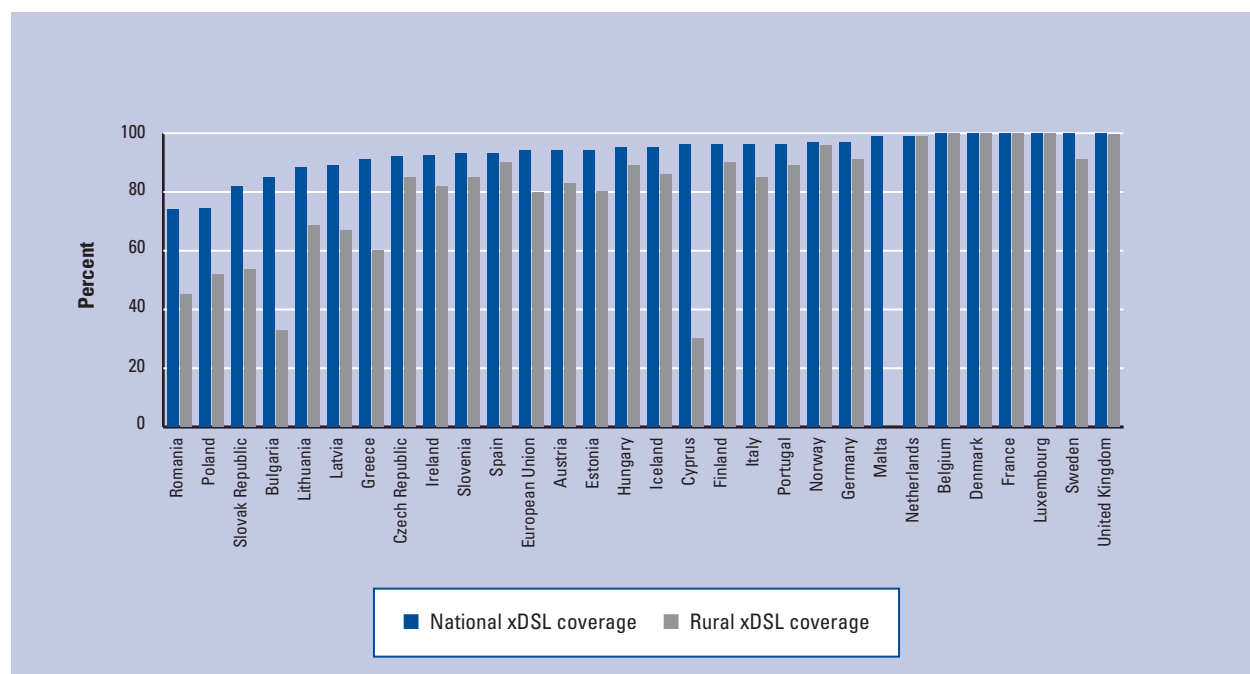
In particular, the Guidelines explain how public funds can be channeled for the deployment of basic broadband networks as well as NGA networks to areas where private operators do not invest. They outline the distinction between competitive areas (“black” areas) where no state aid is necessary, and unprofitable or underserved areas (“white” and “gray” areas) in which state aid may be justified, if certain conditions are met. This distinction is then adapted to the situation of NGA networks by requiring funding authorities to take into account concrete investment plans by telecommunications operators to deploy such networks in the near future. A number of crucial safeguards (such as detailed mapping, open tender, open access obligation or technological neutrality, and claw-back mechanisms) are laid down in the Guidelines in order to promote competition and avoid crowding out private investment.

In line with the Guidelines, in 2010 the European Commission has approved the use of over €1.8 billion in public funds for broadband development through 20 decisions in, among others, Catalonia, Finland, and Bavaria.

The political debate

In the past few years, the political debate in Europe has evolved around the desirability of an advanced,

Figure 9: xDSL national and rural coverage, December 2009



Source: European Commission Services on the basis of a study by Idate for the European Commission.

high-speed broadband infrastructure fit for the 21st century. Most of the investment needed is expected to come from the private sector. In reality, the market has been very cautious about the move because the costs of deployment are significantly higher than they are for legacy broadband.

Several operators blame uncertainty surrounding regulatory approaches and uncertainty about demand to justify lack of investment. Most revenues are currently raised through voice traffic, and business models regarding data are not yet clear-cut. In a flat-rate-based Internet protocol environment, an increase in traffic does not automatically translate into an increase in revenues. This has an impact on operators' profitability and their capacity to invest in expanding their network capacity. Operators are thus searching for new and sustainable business models—not only through traffic management and/or by modifying price schemes, but also by focusing on applications, services, and content.

Meanwhile, the European Commission has taken active steps to clarify the regulatory environment as well as to propose concrete measures to stimulate the deployment of high-speed broadband. It has adopted a comprehensive package comprising:

- A Commission Recommendation on regulated access to NGA networks that sets out a common regulatory approach for access to new high-speed fiber networks.¹⁴ This Recommendation requires national telecommunications regulators
- A Broadband Communication that sets out a coherent framework for meeting the *Digital Agenda's* broadband targets and, in particular, outlines how best to encourage public and private investment in high- and ultra-high-speed broadband

to ensure an appropriate balance between the needs to encourage investment and to safeguard competition, and will provide increased regulatory clarity to all market players, which is necessary to stimulate investment in high-speed and ultra-high-speed broadband. The Telecommunications Framework Directive (2002/21/EC) requires Member States to ensure that their regulatory authorities take the “utmost account” of the Commission Recommendation, justifying any departure from it.

- A Commission proposal for a Decision by the European Parliament and Council to establish a five-year policy program to promote efficient radio spectrum management and, in particular, to ensure that sufficient spectrum is made available by 2013 for wireless broadband (which will significantly contribute to bringing fast broadband connections to people in remote areas and to making innovative services available across Europe).¹⁵ Efficient and competitive use of spectrum in the European Union will also support innovation in other policy areas and sectors, such as transport and the environment.

networks.¹⁶ It calls on EU Member States to introduce operational broadband plans for high- and ultra-high-speed networks with concrete implementing measures. It also provides guidance on how to cut investment costs and indicates how public authorities may support broadband investment, including making better use of EU funds.

While commercial players are expected to invest in more densely populated urban areas, public authorities can support development with subsidies in more rural areas and, most importantly, by considering cost-cutting measures. Given the high costs of civil engineering, the European broadband policy emphasizes ways to facilitate investment and remove bureaucratic obstacles to achieve more with less. Possible cost-cutting measures include, among other things: (1) mapping the suitable infrastructure; (2) ensuring that civil engineering works involve potential investors and exploit synergies among all network infrastructures; and (3) clearing rights of ways.

To maximize the policy impact, European Member States are expected to develop national plans focusing both on the cost-cutting measures above as well as on the use of community funds (such as regional and rural development funding) in disadvantaged areas. Finally, other important *Digital Agenda* policies are crucial for strengthening developments in digital skills and the single digital market, which states that demand must be in place to ensure a vibrant digital future for Europe.

Conclusions

Europe has experienced extraordinary growth in broadband roll-out and uptake in the last decade. More than 60 percent of households and 90 percent of enterprises are connected to broadband, enjoying the Internet experience. Despite these good results, fostered also by a favorable regulatory environment, recently uptake has been slow and deployment of NGA has only begun. The *Digital Agenda* has set Europe up to make a quantum leap to equip itself with the 21st century infrastructure it needs. To reach its ambitious targets, it has called for the development of a comprehensive policy, based on a mix of technologies, that focuses on achieving universal broadband coverage (with Internet speeds gradually increasing to 30 Mb/s and above) and on fostering the deployment and uptake of NGA networks, allowing connections above 100 Mb/s.

In 2010, the European Commission published a broadband Communication that laid out a common framework for actions at the EU and Member State level, including the strengthening of the regulatory framework through an NGA recommendation, the proposal of a European Spectrum Policy Programme, the rationalization of the funding instruments, and the definition of national targets through comprehensive broadband plans.¹⁷ The Commission will monitor

developments through the *Digital Agenda Scoreboard*, to be published in June 2011.

Notes

- 1 Penetration rate based on population.
- 2 *xDSL* is the family of digital subscriber lines, technologies that provide digital data transmission over the wires of a local telephone network. The *x* summarizes different characteristics: ADSL (Asymmetric DSL), SDSL (Symmetric), VDSL (very fast), and so on.
- 3 EC 2010a.
- 4 EC 2010a.
- 5 EC 2011.
- 6 *LLU* is the process where incumbent operators make their local network available to other companies. Alternative operators or "entrants" are then able to upgrade individual lines using *xDSL* technology to offer broadband services directly to the customer.
- 7 Number of fixed broadband lines per 100 population.
- 8 *Fiber-to-the-x* (FTTx) is a generic term for broadband architectures that uses optical fiber to replace all or part of the metal local loop used for last-mile electronic communications. The generic term generalizes several possible configurations of fiber deployment (*FTTN* = fiber-to-the node), *FTTC* = fiber-to-the curb, *FTTB* = fiber-to-the building, *FTTH* = fiber-to-the home . . .), all starting with *FTT* but differentiated by the last letter, which is substituted by an *x*.
- 9 EC 2006.
- 10 FTTH Council Europe 2011.
- 11 *Bitstream access* refers to the situation where an incumbent makes an access link available to third parties, to enable them to provide high-speed services to customers. This type of access does not entail any third-party access to the copper pair in the local loop.
- 12 The term *DSL coverage* refers to the percentage of the population that depends on a local exchange equipped with a digital subscriber line access multiplexer, or DSLAM.
- 13 European Union 2009.
- 14 EC 2010d.
- 15 EC 2010b.
- 16 EC 2010c.
- 17 EC 2010c.

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