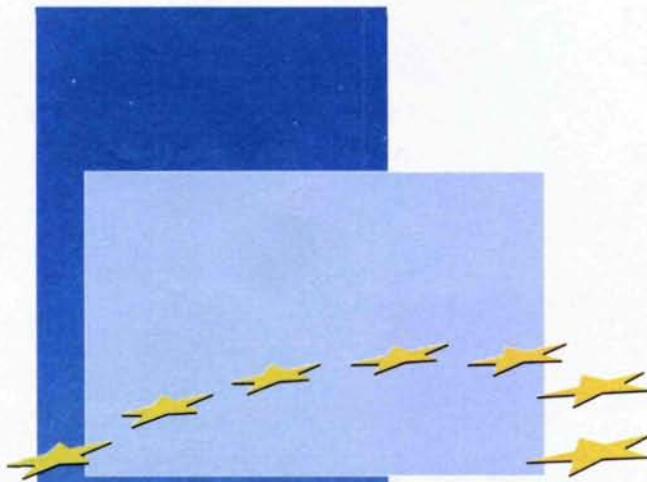


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FINANCING EUROPEAN
TELECOMMUNICATIONS:
FACING THE CHALLENGES OF
THE INFORMATION SOCIETY

European Investment Bank
Projects Directorate

Industry II Department
Harald Gruber



EUROPEAN INVESTMENT BANK

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Executive summary

- In telecommunications, sector growth is mainly driven by technology and liberalisation. Telecommunications also paves the way to the information society, which promises extensive opportunities for European economies and a significant contribution to improved living standards throughout the European Union. Europe has been slow to liberalise. With impetus from the European Commission, however, liberalisation has in recent years been one of the main success stories of the EU.
- Technological advances, in particular in microelectronics and optical fibre technology, have drastically reduced the cost of providing all kinds of telecommunications services. The cost of telecommunications varies less with distance than the costs of other forms of transport, thus giving peripheral regions better chances to compete. Technology provides also the opportunity for new types of services such as the internet and other broadband services.
- As of 1 January 1998 telecommunications markets have been fully liberalised in most of the European Union. This marks the culmination of a ten-year process of gradual market opening, set in train at European level by the Commission's 1987 Green Paper. The process was given added impetus by the entry into force of the WTO agreement on basic telecommunications services on 5 February 1998.
- Competition is considered to be the best way to mobilise economic resources for the modernisation of the infrastructure. Under the prospect of international competition, there is a trend toward convergence across countries in terms of penetration rates, tariff setting and regulatory environment.
- The public sector is retreating from the telecommunications sector and limiting itself mainly on regulatory action. The EU telecommunications regulatory package aims at market opening based on: the combined use of liberalisation measures to break down monopolies; harmonisation measures providing common rules and procedures in the market opened to competition; the establishment of national regulatory authorities; and the active use of competition rules to ensure fair competition.
- In telecommunications, there are externalities to certain investments (e.g. pump priming of the internet, universal service) which are not directly captured by the investor. The failure to internalise these benefits may induce financial markets not to fully support investment that could prove beneficial from a social point of view. This justifies public support. Furthermore, some companies may have difficulties financing profitable investment in intangibles (e.g. software and R & D) because they are unable to provide sufficient collateral. The EIB is already active in part of this field with new financial instruments supporting venture capital (ASAP SME window, European Technology Facility with EIF).
- Telecommunications provide opportunities to less developed and peripheral regions to catch up. Universal service now concerns the widespread availability not just of voice telephony, but of access to data and value added services.
- Liberalisation leads to big reductions in prices for high margin services such as international and domestic long distance traffic. These price adjustments will become more rapid compared to countries that liberalised some time ago.
- Liberalisation puts profit margins of incumbent operators under pressure. Their reaction is to rationalise operations and diversify, both across services and internationally. European operators face strong international competition from the US, where a merger and acquisition wave is under way. It is likely that this wave will also spill over to Europe and induce large scale mergers and take-overs among European operators.

- There is extensive scope to increase the efficiency of investment in Europe. In the past, Europe has had investment costs that were significantly higher than in the US. Liberalisation and international competition should help to redress this.
- The overall risk profile in the sector is increasing and so is the rate of change. Incumbents may be slow to adopt the necessary changes as governments reduce their direct or indirect support. New entrants have to face huge up-front costs (licence fees, network build-up) which entail years of negative cash flows.
- Most telecommunication services are rather homogeneous goods, resulting in intense price competition. However, there is also a high risk of temporary overcapacities through the construction of alternative networks, with the pressure of lower returns on invested capital.
- The investment prospects for the sector in the EU are promising, with total telecommunications investments around 40bn ECU per year. For fixed telecommunications there are still large requirements for digitalisation and upgrading for the provision of broadband services. Moreover, there is a strong increase in the investment for mobile telecommunications networks as a large number of entrants have to develop their networks.
- Over the last 2 years, EIB lending has represented on average 4.7% of total telecommunications investment in the EU. This is less than in other infrastructure sectors, such as water (11.2%), transport (9.5%), solid waste (5.5%) or energy (5.2%). It is low in relation to the value added which the EIB can contribute in this sector.
- The value added of the Bank in the sector includes the catalytic effects of EIB lending in raising funds for new entrants. The Bank's sector specific appraisal skills and long term view of benefits and credibility effects help to ease the difficulties that new entrants to the sector are facing. Funding to large incumbents becomes increasingly geared toward corporate financing type operations and has to be seen in the wider context of the globalisation of the sector: previously nationally based companies become multinational operators and can be a useful vehicle for the wide diffusion of sector knowledge.
- The Bank has to live up to its responsibility as a European Institution and continue to give its full support to this sector, in which decisions are being taken that will shape the future of the European society. Telecommunications have been designated as TENs by the Member States and the Bank should give telecommunications the same priority as other TENs.
- The Bank could play an increased role in the telecommunications sector, to the extent that EIB loans focus on:
 - Furthering telecommunications access for advanced services in less developed regions;
 - Projects that can be regarded as innovative for the sector;
 - Supporting new entrants.

In operational terms, the Bank's resources would be focussed on diversification, promoting competition and providing access to telecommunications services. This would require a deepening of project appraisal and probably a greater shouldering of project risk. As the average size of such projects is smaller than that of present loans, a substantially higher labour input per ECU of loan would be necessary. In any case, the Bank's growing contribution to the finance of telecommunications would continue to be focussed on the generation of value added.

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Financing European Telecommunications: Facing the Challenges of the Information Society

The aim of this report is to illustrate what the EIB can contribute for the development of the information and communication technology sector in general and telecommunications, in particular. The report first outlines the main developments in the telecommunications sector and shows how the underlying driving forces, technology and regulation, are shaping their evolution. This is followed by a discussion of past investment trends and future requirements. It does this by analysing the fields where market mechanisms may not produce outcomes which are optimal from a social point of view and where therefore public action, including action by the EIB, might result in improvements. Criteria are suggested under which EIB intervention may be particularly beneficial. The main theme is that the next few years will be decisive for the development of the sector and that the Bank, in its mission to promote a balanced development of the European economy, should give its full support to the major developments which are taking place. The telecommunications sector should therefore continue to be fully represented in the loan portfolio of the Bank. The report focuses mainly on the EU, but some references are also made to the Accession Countries in Central and Eastern Europe.

1. Background

Europe, as all modern economies, is shifting towards an information-based society, where telecommunications networks and related infrastructures play as significant a role as did the rail networks in the last century. Fast, high-capacity communication facilities are being built to handle the ever increasing tide of multimedia traffic (voice, data, image, text and video).

The introduction of products and processes based on Information and Communication Technologies (ICTs) is dramatically modifying patterns of production and consumption and the modern way of life. The term "Information Society" (IS), "the society currently being put in place, where low-cost information and data-storage and transmission technologies are in general use" (European Commission DGV, 1997), suggests that what is taking place is not only a technological revolution, but also an economic and social revolution.

IS became a subject of public debate in the early 1990s when plans were formulated by the governments of some major countries and supra-national institutions (in particular the EU) to take advantage of the opportunities offered by ICTs. Leading examples were the 1993 US plan for the Information Highways, the 1994 MITI "Programme for Advanced Information Infrastructure" and the 1994 Bangemann Report.

A theme running through all these reports is a recognition on the part of the governments of the importance of promoting the start-up of the IS. The approach of the EU, which is somewhat different from that of the US and Japan, emphasises a number of points:

- The US and Japan, which started first, are more advanced than the EU in adopting ICTs. Europe risks missing out on advantages that may accrue to early entrants in multimedia services and systems.
- The IS embodies the notion of "social embeddedness" in the sense that social aspects lie at the core of the IS. The main risk is the creation of a two-tier society of haves and have-nots.
- The need for multiple ISs, which arise from the cultural, social, and economic diversity among EU countries and regions.

More recent EU documents are especially critical of a technology-driven approach to the IS. They also highlight that reliance exclusively on market forces cannot assure the proper take-off of the IS in

Europe; hence, in addition to regulatory pro-competitive measures and other actions aiming to avoid market failures, the design of appropriate fostering policies plays a crucial role.

There is consensus that private investments are the core driving engine for the start-up of the IS. Nonetheless, governments and public actions play a fundamental complementary role in:

- promoting and safeguarding competition and dealing with market failures;
- supporting the adjustment process between social institutions and technical change.

From a review of documents of the European Commission and national governments it emerges that the most important areas in which public support of investment can usefully complement private investment are the following:

- a) investments aimed at ensuring a fair and widespread access to the ICT infrastructure;
- b) investments in education and training;
- c) investments supporting the development of the European multimedia content industry.

2. Growth forces in telecommunications

The EU telecommunications sector is expanding rapidly, and the expectation is that the recent annual revenue growth rates of close to 10% will continue, at least for the next five years. The sector, which in 1997 generated revenues of almost 150bn ECU is thus becoming one of the largest sectors in the economy, with major indirect effects on complementary sectors such as information technology.

The main drivers of growth are technology and liberalisation. Technological advances, in particular in microelectronics and optical fibre technology, have drastically reduced the cost of providing telecommunications services, making the cost of telecommunications less and less sensitive to distance. Moreover, there is now a world-wide movement to liberalise a sector that in the past has been characterised by the predominance of state owned monopolies. Opening up to competition not only induces lower prices and better services, it also mobilises huge amounts of private funding.

2.1. Trends in technology

Technological advances are one of the key factors underlying the raising importance of this industry. The ultimate consequences are a significant lowering of the cost of entry into the industry for new suppliers and a drastic reduction in the price of services to the user. Technology trends have involved both switching and transmission technologies, the main building blocks of telecommunications networks. On the switching side, the migration from electromechanical devices to electronic switches has led to sharply declining prices for the equipment, similar to the computer industry. Moreover, the labour requirements for maintenance have also been cut drastically. On the transmission side, optical fibre cables have already replaced copper cables and microwave radio in a large part of the trunk network and this process is continuing. Optical fibre in combination with new generations of electro-optical devices dramatically increased transmission capacity, driving down the marginal cost of transmission of an information unit sharply. The consequence is that nowadays distance matters less for the cost of telecommunications services.

Technology also provides new solutions to the problem of local access in telecommunications. The provision of telecommunications services was in the past done by linking subscribers to a single pair of wire, which meant that the service was most efficiently supplied by a (regulated and/or state-owned) monopoly. The argument in favour of monopoly weakened therefore as new technologies became available providing alternative modes of local access for telecommunications services. This could be done in wired mode in parallel with other services, such as cable TV and electricity, or with wireless technologies such as cellular technologies and satellites.

Internet telephony is a good example of how new technology is able to introduce major changes to established pricing patterns. Instead of being handled as a signal over the circuit-switched networks of the telephone companies, voice calls over the internet are sent as 'packets', compressed, transmitted independently to their destination over the internet and then re-assembled into speech. The fact that the internet does not charge for distance or time (there are flat fees for access), makes long distance calls very cheap compared to traditional circuit-switched telecommunications operators. However, the voice quality of internet telephony is still poor, as the pricing policy of flat access fees induces congestion. But voice quality scarcely matters for data transmission (e.g. fax), which is a growing market segment and can therefore easily be captured by the internet.

2.2. Liberalisation

The liberalisation trend in telecommunications gained momentum during the mid-1980s when the US decided to split up AT&T into one long distance and international carrier company AT&T and seven regional telecommunications companies (*Baby Bells*) responsible for subscriber access and local telecommunications services. The long distance and international telecommunications service market was immediately opened to competition whereas local services became regional monopolies. The result was a sharp decrease in long distance and international tariffs as a result of the entry of new operators. At the same time the UK started also sector liberalisation, though in a different way. Instead of making BT divest itself of services, it licensed a second operator, Mercury, to provide all telecommunications services. These experiences of liberalisation turned out to be quite successful in achieving the main goals of enhancing the quality of service and lowering overall costs to subscribers.

In the light of these experiences and taking account of the importance of the sector for modern economies, the European Commission pushed for liberalisation in all member countries of the EU. Although the Commission was not first in this field, it has become one of the strongest and most consistent advocates of world-wide liberalisation. Mainly as the result of strong lobbying by the Commission, an important agreement was reached by the WTO in 1997 to promote the opening up of domestic telecommunications markets to foreign competition and the removal of restrictions on foreign direct investment.

The promotion of world-wide liberalisation is in line with the policies pursued for the EU's internal market. EU sector specific legislation has focussed on telecommunications where the most dramatic changes are occurring in terms of privatisation and market liberalisation. The regulatory framework of the EU is driven by the observation that the development of the sector is mainly coming from the private sector. The task of the policy maker therefore consists in providing the best possible incentives for private investment to come forward and focusing the public sector on the tasks of setting the regulatory framework and avoiding market failures.

The pressure to abolish the accounting rate system in international telecommunications is a prime example for what is happening as a result of liberalisation. This system was set up in the old days of monopoly where government decided how to split international traffic revenues. An *accounting rate* is the price a domestic carrier negotiates with a foreign carrier for handling one minute of international calls. At settlement, each carrier nets the minutes of service it originated against the minutes that other carriers originate. The carrier that originated more minutes of service makes over to the other carrier a net payment based on the minutes of traffic balance. The problem is that accounting rates, which are based on administrative agreements, are far above the cost of providing international services. For instance, the cost of terminating a call is 6-9 US cents whereas the accounting rate system treats it as if it were 36 cents. This creates two sorts of problem. First it induces bypass, i.e. the use of private leased lines outside the accounting rate system. Second, it induces inefficient traffic patterns as a result of arbitrage among different accounting rates. Ultimately, the system is expected to collapse unless it is replaced with a more market-oriented arrangement. The first step may be the unilateral decision of US Federal Communications Commission (FCC) to instruct US carriers, the world's largest out-payers of settlement payments, in future not to pay accounting rates above the FCC reference rates. This move is designed to improve the telecommunications service trade balance of the US and to reduce the tariffs for international calls (as, in principle, prices are bounded below by accounting rates). However, any rapid move in this field may prove difficult because accounting rates are an important source of foreign currency, particularly for developing countries.

3. Policy initiatives and regulatory framework

Until the telecommunications sector has completed the transition to a fully competitive industry, regulations have a fundamental importance in shaping the evolution of the market and the conditions of competition. In the past, regulation in the EU countries were the exclusive domain of the member state governments. As most telecommunications operators were actually run as administrative units of the government, regulation was an affair internal to the government. However, the establishment of an open and common market in telecommunications required regulations that were uniform across the EU member states. The EU Commission was therefore the most appropriate body to set up a common regulatory framework. It was natural that a market-oriented framework should be adopted that blended liberalisation with harmonisation.

The main direction of EU telecommunications policy was set in 1987 with the publication of the *Green Paper* on the development of the common market for telecommunications services and equipment. The Commission proposed the introduction of competition combined with a higher degree of harmonisation, in order to maximise the opportunities offered by the single EU market.

On the basis of the favourable reaction from all market participants to the Green Paper, the Commission prepared an action programme supported by the Council and the other European Institutions. The cornerstones in the liberalisation programme are two measures: open network provision (ONP) (Directive 90/387) and service (Directive 90/388). The intention of the ONP directive was to provide fair access to telecommunications networks throughout the EU, while the Services Directive removed the monopoly rights of the incumbent operators. This programme culminated in the agreement to fully liberalise the telecommunications sector from 1 January 1998, with some temporary derogation for Portugal, Greece, Ireland, Spain and Luxembourg.

This service-based approach to competition will force operators to bring prices into line with costs and thus rebalance their tariffs. However, there is no direct pressure to reduce the cost of leased lines. This can be achieved through direct regulatory intervention or by introducing infrastructure competition. This is the reason why infrastructure competition was forced on the agenda and led to appropriate amendments of the ONP Directive (97/51). From this derives the need to find appropriate regulatory solutions to issues such as universal service, interconnection and licensing.

The opening up of telecommunications service markets to competition, as well as the regulatory requirements on pricing and the availability of new technologies, requires European operators to undertake major tariff reviews to correct historical imbalances and allow development of new services.

Since May 1997, the Commission has been periodically monitoring the Member states' preparation for the liberalisation of the sector (Report on the implementation of the telecommunications regulatory package); it has singled out countries that have failed to implement the liberalisation directives on time; and it has eventually started infringement procedures in some cases.

All member states are required to establish a national regulatory authority (NRA). A crucial issue is the independence of the NRA, especially when the state owns the incumbent operators. The introduction of competition does not necessarily imply the privatisation of the incumbent telecommunications operator; it does however focus attention on the issue of privatisation.

In the past, telecommunications operators were government owned for a series of reasons, including the following:

- To provide the necessary long-term investment in infrastructure and new technology;
- To realise the benefits of economies of scale in what was seen as a natural monopoly;
- To ensure universal service.

However, these reasons have become harder to justify in recent years. It is increasingly apparent that the state is reluctant to fund the necessary investment in infrastructure; telecommunications is no

longer seen as a natural monopoly; and new approaches to universal service indicate that government is not the only solution. In addition, several countries have pursued the policy goal of reducing the role of the state in the economy by reducing public expenditure and ownership. The most important motivation, however, for privatisation has been the perceived failure of public ownership to efficiently deliver high-quality services at low prices.

In June 1997 the EU adopted a decision (97/1336) establishing guidelines for telecommunications infrastructure requirements in the context of trans-European Networks (TEN). The decision reiterates EU support for the interconnection of telecommunications networks and the establishment of interoperable services in order to facilitate the transition toward the information society; improve the international competitiveness of EU firms; strengthen economic and social cohesion and create new jobs in emerging sectors. This implies that most of the investment in infrastructure and value added services in the telecommunications sector are to be considered as of economic interest to the EU.

The regulatory context is also very important in relation to the development of the information society. There is a wide consensus that a persistence of monopoly power in network services is a major obstacle to the IS. In so far as this prevents the prices of communication services to decline, it may seriously impede the take off of the IS, because all the new services and applications rely upon cost-effective network services for successful diffusion. There is consensus that private investments are the core driving engine for the start-up of the IS. Nonetheless, governments and public actions play a fundamental complementary role. They can provide:

- regulatory measures and policies aimed at assuring that the liberalisation of ICT markets is brought to a rapid completion so as to lower the prices of products and services and to compensate for market failures. (e.g. presence of "bottleneck" facilities, public good nature of information content, information asymmetries in financial markets, "club" effects in the development of new services);
- regulatory measures and policies aimed at an even development of the IS (social and geographical cohesion). This category includes: policy actions in favour of disadvantaged citizens (i.e., low income, less educated and elderly people, people in peripheral areas, etc.), disadvantaged workers (workers in declining industries, in restructuring firms, long-term unemployed, elderly workers, less qualified young people, people in less favoured regions, etc.) as well as policy actions for employability and life-long learning. Most analyses recognise that in order for the job creating potential of the IS to be exploited, greater flexibility in the labour market is needed.

4. Consequences of technological and regulatory changes

Since the liberalisation process began, there have been continuous improvements in levels and quality of services, with corresponding falls in prices. Liberalisation is also the driver of, and driven by, an unprecedented take-up of new services and technologies. Europe has already seen enormous growth in three areas: mobile telecommunications, data transmission (fax, file transfer) and Internet. Internet is potentially the single most important development for decades, stimulated in particular by the rapidly increasing penetration rate of personal computers in Europe.

4.1. Market trends

Fixed voice services represent 68% of the total Western European market of 150bn ECU (see table 1). Mobile telecommunications services account for 14% of the total, but were the most dynamic segment of the industry with recent annual growth rates of 33%. The remaining segments are data and leased lines (13% of total market) and cable TV network services which include telecommunications services (5%). All segments apart from fixed line services show annual growth rates in excess of 20%. A substantial part of this growth performance is due to mobile telecommunications services. Growth in the mobile sector is unprecedented since the adoption of digital (GSM) technology and competitive supply of services by two or more companies in each country.

Table 1. W.European telecommunications revenues (in ECU bn)

	1994	1995	1996	1997	1998*	1999*	2000*	CAGR** 1994-97	CAGR** 1998-2000*
Fixed voice	91.8	94.9	98.6	102.0	104.6	107.2	109.8	3.6%	3.5%
Mobile	8.7	13.6	17.4	20.5	25.4	31.5	39.1	33.1%	24.0%
Data, leased lines	11.2	13.9	16.5	19.5	23.0	27.2	32.0	20.3%	18.0%
Cable TV	3.4	4.5	5.6	7.1	9.4	12.4	16.3	27.8%	32.0%
Total	115.1	126.9	138.1	149.1	162.4	178.2	197.3	9.0%	10.4%

- forecasts
- ** CAGR Compound annual growth rate

Source: EITO, forecasts by PJ

For the next three years, the total telecommunications market in Western Europe is expected to grow at 10% per year. Fixed line services should grow at about 4%, while all other segments continue to expand at much higher rates.

International traffic, in terms of minutes, is rapidly growing as a result of the sharp price decreases and globalisation. The historic growth rate is 15% per year over the last 10 years. This makes it one of the most dynamic market segments of the telecommunications industry. Other segments of high growth are internet applications, data transmission and value added services.

4.2. Prices

Sharp price decreases for telecommunications services have been observed as a result of technological advances and liberalisation. This fall in price levels has also affected tariff structures. High prices on domestic long distance and international call charges have traditionally subsidised local calls and line rentals. This distorted pricing system, where tariffs did not reflect costs, is inefficient and not sustainable in a competitive environment. Liberalisation therefore means also "re-balancing" of tariffs, i.e. bringing them closer to cost. Practice has shown that though local and line rental tariffs have increased, long distance and international tariffs have decreased to a much larger extent, so that in the end the adjustment led to widespread net benefits to the user. From 1995 to 1997, local tariffs increased at constant prices by 1.9% a year on average in the EU, whereas long distance and international tariffs declined strongly by 7.9% and 5.4% respectively. There is however a huge difference across EU countries in terms of rebalancing, with some countries still at the beginning of the process.

Distorted prices for international telecommunications services are adjusting rapidly, as new switching technologies permit the exploitation of arbitrage opportunities arising from the price differentials. Concepts such as call back, refile and internet telephony are eroding profits in the most lucrative market segments. Artificial constructs such as international accounting rates that are not related to cost are collapsing under the pressure of competition and the US regulatory authorities.

As new competitors enter and as new means for conveying telecommunications services develop (e.g. fixed, mobile, cable TV, satellite, power cables) there is also the risk of over-capacity and the concomitant price wars. The "product" voice telecommunications service is taking on the nature of a homogeneous good with little scope for differentiation. New entrants therefore will become increasingly aggressive on pricing in order to obtain market shares. The issue is whether the revenue per subscriber will be sufficiently high to make entry profitable. It is clear that the risk is higher the later the entry occurs, as the most attractive customers have already been taken by the existing operators. However, the later entrants have the advantage of having the most advanced equipment and very often at substantially lower cost, given the steady price decline of the equipment. This should ensure lower operating cost and permit aggressive pricing.

4.3. Company strategies: incumbent operators

The incumbent operators of fixed telephony networks and services, who until recently were in a comfortable "natural monopoly" position, now have to face the impact of competition, which generally means lower prices and a reduced market share. In the EU this process is supported by the regulatory framework which favours the development of competition. The incumbent fixed line operators have to cope with significant tariff reductions on the most profitable segments, i.e. international and domestic long-distance services. These very profitable segments are also those where the market share erosion is strongest.

An example of a market opened to competition is the UK, where the market was opened in 1983. By the end of 1996, the incumbent BT retained 93% of total UK access lines, 82% of the market for UK long distance calls and 63% of the market for international calls. This shows that local access is where entry is the slowest. This is mainly due to fact that tariffs in this segment started from a low point, often even below cost. As tariffs are rebalanced and losses are not longer covered by cross-subsidies from long distance and international services, local access should become increasingly attractive for new entrants.

Because international traffic is one of the most profitable segments it has been the first to attract competition. It is however interesting to note that in countries where liberalisation occurred relatively early, such as the US and the UK, the incumbent's market share is declining only gradually. In the US it took more than 10 years to reduce AT&T's market share to 50% of international traffic. In the UK, after more than 10 years of liberalisation, BT has still more than 60% of international traffic. However in Sweden, after 4 years of liberalisation, Telia's share eroded to 69% and in Finland, Telecom Finland's share went down to 66% within only three years. The impact of competition is now much stronger than it was ten years ago and changes are accelerating in the sector.

The revenue losses of the incumbent due to lower market shares may be compensated to some extent by tariff rebalancing, i.e. increasing prices for services which often were supplied at or below cost, such as local call and line rentals. But the leeway for price increases is limited as there are regulatory constraints and threats that many newcomers will enter the market. As a result, most European telecommunications incumbent operators will sooner or later face a decline in profitability, depending on the degree of price reductions and market share losses.

The most practicable option to recoup margins is through increased operating efficiency. This entails more investment in modern equipment, organisational restructuring and, not least, staff reduction. European operators are now implementing labour productivity targets of 350 lines per employee for telephony services, against the current levels of 150 to 250 lines typical for many companies. However, efficiency gains and overall market growth may be unable to offset the whole of incumbents' revenue losses as prices fall.

Diversification is another option open for large incumbent operators. Diversification has several dimensions: it can be across sectors that are related to telecommunications, across international borders or both. The risk deriving from diversification is that the profitability will decline either because there is too little scope for synergies or that diversification is used to cover up inefficiencies.

In the fast changing technological and regulatory environment, the market structure is subject to rapid changes as well. The consequence is a succession of making and unmaking international alliances, fierce take-over battles and large corporate mergers. The size of these operations is of global nature and dwarfs previous merger and acquisitions activities. The six largest corporate mergers ever undertaken were carried out in 1998 and three of them concern the telecommunications sector: *SBC-Ameritech*, *Bell Atlantic-GTE* and *AT&T-Telecommunications of USA*. The largest merger in 1997 was the dramatic battle of *Worldcom* for *MCI*. It is interesting to note that all these mergers involve US companies, and in particular the regional operating companies ("*Baby Bells*"). European companies have undertaken operations of much smaller scale and are often limited to cross-shareholding (e.g. *Deutsche Telekom* and *France Telecom*) or agreements on swapping assets (e.g. *Telecom Italia* and *Cable and Wireless*). The more typical means of collaboration concern joint ventures among large operators for the supply of international telecommunications services, such as

Global One, Unisource, and, as announced very recently, AT&T-BT. Some of these alliances have proven to be rather unstable and it is difficult to make predictions on their long term future. It is however likely that over the next year European companies too will be involved in a wave of mergers and acquisitions.

4.4. Company strategies: new operators

Mobile telecommunications is the context in which new entrants first challenged incumbents on a large scale by providing new networks. Mobile telecommunications used to be very profitable, especially when they were operated as a monopoly by the incumbent fixed line operator. However, with the digital GSM mobiles system in Europe, in several countries there are now three or more operators and profitability of the sector is declining rapidly as a result. There is also the risk of overcapacity and price wars could take place because we deal with a homogeneous good with little scope for differentiation. New entrants in mobile telecommunications therefore will become increasingly aggressive on pricing in order to obtain market share.

In general, for both fixed and mobile telecommunications one can distinguish two types of new entrant: first, companies that have a very limited ownership of networks and base their services mainly on leased lines; second, fully fledged network operators with their own infrastructure. The first type of entrant does not incur major up-front payments and the main purpose is to exploit arbitrage opportunities that are represented by distorted pricing policies (e.g. international accounting rates, unbalanced tariffs). For these companies, the entry cost need not be very high, the payback relatively rapid and therefore the commitment to stay on the market during adverse spells may not be very strong either. By contrast, the second type of entrants, has to incur large set-up costs as they have to roll out large infrastructure. These are often telecommunications subsidiaries of large utility companies with a strong cash flow (e.g. energy, railway, road) that are trying to diversify into high growth business. They often have a cable network and the rights of way to lay cables. In many cases, the sector-specific technological and marketing knowledge is provided by a foreign telecommunications company, in the role of minority shareholder. This kind of partnership provides new entrants with strong financial and operational credibility, which is necessary to sustain long and uncertain payback periods and high risks of failure.

A large number of small companies have sprung up to supply value-added services utilising advanced infrastructure. The investment requirements of these companies are mainly of intangible nature in the form of R&D. This makes it difficult to obtain outside financing. Since the venture capital market is underdeveloped in Europe, these firms are faced with serious financial constraints that hinder their development. Once successful, these companies are often taken over by large operators.

4.5. Telecommunications and regional development

A number of European regions have traditionally lagged either because of long-standing poverty and underdevelopment, or because of their geographical position at the periphery of the EU. Today, however privatisation and liberalisation imply a withdrawal of central governments from information and communication matters, and new services are being developed which provide less favoured regions with opportunities to pursue their own development paths and to overcome some of the barriers that historically separated some of them from more advanced regions. At the same time, the regions are also recognised as appropriate agents for administering detached regulations and policies, drawing on their local information and proximity advantages.

Some less favoured regions are densely populated. As a consequence, insisting on universal service may not be necessary, as sufficient revenues can be generated locally to pay off investments. By contrast, a new concept of "universal community service" could help remote and scarcely populated regions to experience the benefits of ICTs: given a basic level of access to new information services, universal access might be made mandatory for the educational, cultural, medical, social and economic institutions of local communities. Accordingly, the universal service concept should be reviewed: public funds should support well-defined functional targets for specific rural or remote areas.

The Commission sees the telecommunications industry as a means of promoting regional convergence in economic development (e.g. Regional Information Society Initiative, RISI). As information becomes more and more important, its physical location becomes less and less relevant, provided local personnel have the required skills. For example call centres can be located in peripheral regions (see box below), taking advantage of lower labour cost. The prerequisite for peripheral regions to benefit from this technological revolution is an advanced infrastructure and the presence of skilled labour force.

Two examples for IS start up as a tool for regional development

The inner city of **Glasgow** has been suffering from depopulation and social problems since the decline of traditional manufacturing activities. In order to sustain the recent employment increase in service activities and to revitalise the urban area, the Scottish Enterprise (the regional development agency) and the Glasgow Development Agency have promoted a number of IS-related projects:

- **transport strategy**, based on the use of telematics to enhance the city's transport infrastructure;
- **broadband telematic pilot projects**, which promote the use of ICTs by the city firms by using seven small and medium size enterprises as demonstrators;
- **Smart Partnership Across Networks (SPAN)**, which encourages the use of IS tools by business users in lowland Scotland.

The diffusion of ICT was facilitated by the fact that Glasgow had about the same level of telecommunications provisions as the most developed are of the UK, namely the South-Eastern Region.

In the **Scottish Highlands** the telecommunication system is less advanced than in the Glasgow area due to the low concentration of business users. However, Highlands & Islands Enterprise (HIE), has fostered the development of IS as a means of creating employment, reducing the dependence on agriculture, and stopping migration out of a remote area. A number of projects were set up:

- **British Telecom's Thurso Help Desk**: with the financial support of HIE, British Telecom opened one of its three national help desks in Thurso, resulting in 300 new jobs by the end of 1997. The project is a show-case of the possibilities to relocate on-line service activities to remote regions thanks to advanced communication systems.
- **Business Information Source**: it offers a business library and an on-line brokering service to local businesses.
- **Networked university for the Highlands & Islands**: this project aims at connecting ten local colleges via broadband networks in order to provide local students with high-quality and cost-effective tele-education.
- **LAMBDA project**: launched in 1994 under the EU RACE programme, the project aims at the remote delivery of public services.
- **Community Telecottage Centres**: launched in the early 1990s, the project represented an attempt to raise the local communities' awareness of the employment opportunities offered by teleworking. The results of the project demonstrated the importance of managers' ability to secure self-financing after the initial public subsidy has ended.

4.6. Employment

The liberalisation of the telecommunications sector has also had a very important impact on employment, both directly in the sector and indirectly in other sectors. The evidence from studies that have been undertaken is that the number of jobs involved is substantial. Employment with incumbent operators was bound to fall as new technologies permitted higher labour productivity. However, other sectors such as mobile telecommunications and value added services for telecommunications are large job creators. It turns out that on balance liberalisation is an important job generator, the new jobs being mostly created outside the telecommunications sector, particularly in SMEs. In other words, the jobs created indirectly generally outweigh the jobs destroyed in the telecommunications sector. Nevertheless, there may be temporary net losses in employment because of skill mismatch. The cost of this transition depends on the flexibility of labour market and other social institutions. In general, the more flexible they are, the less costly is the reshuffling of jobs.

5. Investment trends

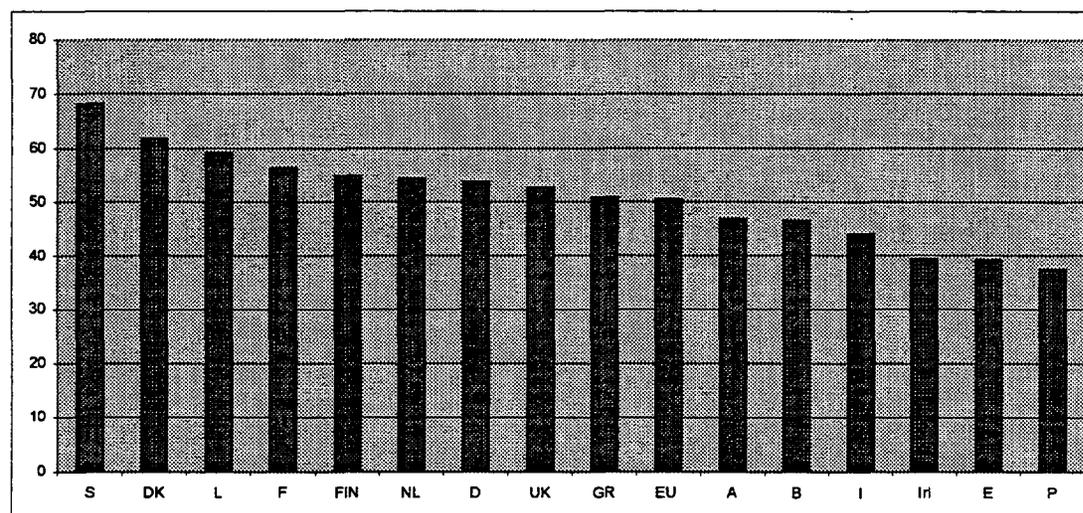
5.1. Past trends and network size

Fixed network

In the EU, there were some 195 million fixed mainlines in 1997 and about 7 million new lines were added during the year. This gives a total penetration rate for fixed lines of 52 lines per 100 inhabitants in the EU. By comparison, the US have penetration rate of 64 mainlines per 100 inhabitants. This would suggest that there is still scope in the EU to expand the fixed network.

Although telecommunications is widespread in all countries, there are significant disparities across countries, both for the fixed telecommunications network and the mobile telecommunications network. Sweden is most advanced in terms of fixed lines per 100 inhabitants: it has 68 mainlines per 100 inhabitants (see figure 1), followed by Denmark (63%) and Luxembourg (59%). The countries with the lowest penetration rates are Portugal and Spain with 37 and 39 mainlines per 100 inhabitants respectively.

Figure 1. Penetration rates for fixed telecommunications in EU countries (mainlines per 100 inhabitants in 1997)



Source: PJ estimate on ITU data

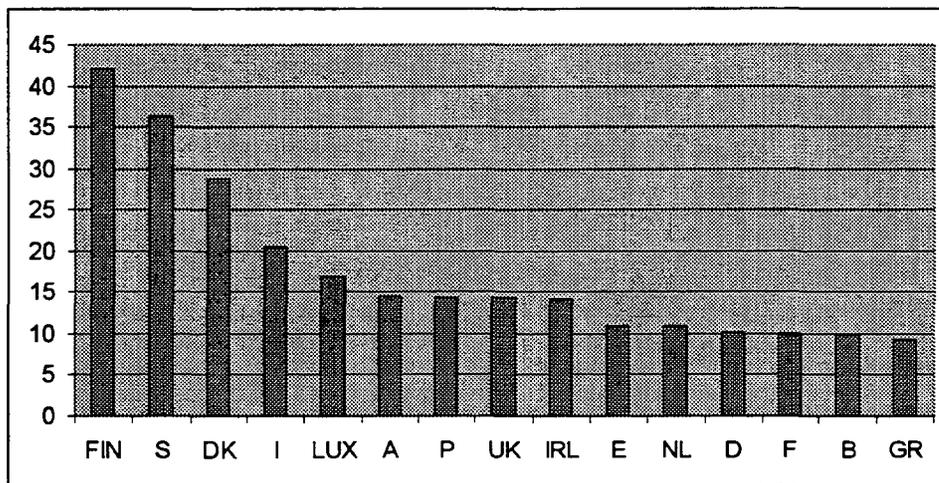
These disparities in terms of penetration rates are large, with the cohesion countries (except Greece) considerably below the EU average. However, this disparity has steadily declined during the 1990s. This would suggest a trend to converging penetration rates as the overall penetration rate increases. In 1990 the average penetration level in the EU was 42 mainlines per 100 inhabitants, with a standard deviation of 10.8. This standard deviation has declined to 8.5 in 1997. Overall this would suggest that countries with lower penetration rates are catching up by expanding their network more rapidly than countries with more advanced penetration rates. Investment in telecommunications infrastructure therefore seems to present a convergence pattern across countries.

Mobile network

For mobile telecommunications, the subscriber growth is very impressive. In 1997, 19 million new subscribers were added which was almost three times the increase in fixed telecommunications lines. By the end of 1997 there were 52 million mobile subscribers in the EU, which is a penetration rate of 14 subscribers per 100 inhabitants.

For mobile telecommunications, the dispersion in the penetration rate is much larger than for fixed telecommunications. Here too the Nordic countries are leading the way, Finland being top of the table with 43 subscribers per 100 inhabitants (see figure 2). The lowest penetration rate could be observed in Greece with 9 subscribers per 100 inhabitants. It is interesting that the ranking of penetration of mobile and fixed telecommunications may not necessarily match. This means also that there could be some degree of substitution between the two types of networks.

Figure 2. Penetration rates (mobile telecommunications subscribers per 100 inhabitants at end of 1997) in EU countries



Source: PJ elaboration of ITU data

Table 2 shows annual investments in telecommunications in the EU. At the beginning of the 1990s annual investment peaked at around 39bn ECU. Since then there has been a slight decline to 36bn ECU, mainly because of the completion of the large investment programme of Deutsche Telekom in the new Länder. In other countries too, investments were reduced as digitalisation programmes neared completion and the expansion of the basic network to provide universal service was no longer a major driving force. The decline in fixed telecommunications investment was in a large part compensated by the strong increase of investment for mobiles telecommunications.

In the past, investments were mainly undertaken by the fixed line monopolist. However, with market liberalisation, the investment of alternative operators (e.g. fixed, mobile, cable TV) is increasing rapidly.

Table 2. Annual investment in telecommunications in the EU (in constant 1995 ECU)

	1986-88	1989-91	1992-94	1995	1996	1997*	1998-2000**
Fixed	30.1	37.0	35.3	29.0	27.0	25.0	26.0
Mobile	0.4	0.9	2.0	6.6	8.8	12.6	14.0
Total	31.4	38.6	37.4	35.5	35.8	37.6	38.0

Source:OECD; PJ estimate (*) and forecast (**).

5.2. Future investment requirements

The primary objective of the investment programs of incumbent operators is to increase switching and transmission capacity of the network. Investment increasingly focuses on applications for new services such as software and broadband services to facilitate increases in traffic. In the future, incumbents will compete against state-of-the-art networks which have invested in new technology designed and built to serve particular market niches. These networks will be cost efficient and capable of delivering advanced services. High digitalisation provides greater network reliability and lower fault rates, which is critical as a means of enhancing customer satisfaction.

There is still substantial room for further growth in both mobile and fixed telecommunications. For fixed telecommunications, the average penetration rate of 52 lines per 100 inhabitants for the EU, as compared with 64 mainlines per 100 inhabitants in the US, suggests a large catch up potential on the part of laggards in the EU. For mobile telecommunications, there are also huge differences in penetration rates. Scandinavian countries have penetration rates close to 40% or more. Most other EU countries are expected to achieve a comparable penetration rate well within the next 5 years.

For the next two years the investment in fixed networks is unlikely to fully match that of previous years as digitalisation programmes are completed and the rate of network expansion size slows down. This means that investment for fixed telecommunications should be around 26bn ECU per year (see table 2). The slowdown in investment for the fixed line network is however expected to be fully offset by an increase in the investment for mobile telecommunications networks, with an annual investment of 14bn . Existing operators are still expanding their network as subscribers increase and licences for new DCS 1800 networks are issued in all countries (9 licences in 1997 and 8 in 1998) . It is thus expected that total investments for the years ahead should be around 40bn ECU per year. In the future, the distinction between fixed and mobile telecommunications will become blurred as more and more operators offer both services jointly.

5.3. Efficiency of investment

In 1996, the telecommunications sector accounted for about 2% of the total GDP of the EU, whereas in the US this figure was 2.4%. However, in the EU the share has been increasing over time whereas in the US it has remained constant, which suggests that there is scope for further development in the EU.

Consistently with this, the EU is investing a great deal more than the US as a proportion of GDP: telecommunications account on average for 0.60% of the EU GDP, whereas this is 0.34% for the US. In terms of the efficiency of investment however the EU compares poorly with the US. For example, in the EU the investment cost per new line during the 1990s was consistently and substantially above that in the US.

Compared with the US, the EU is therefore investing proportionally more resources in the sector, but getting less out of them. This would suggest that there are still large inefficiencies in EU investment, which translate themselves in high investment costs per new line. The high investment costs can be linked to the fact that the internal market is still incomplete as well as to widespread monopoly practices in procurement and project implementation. Sector liberalisation should increase efficiency and lower the investment cost per line.

5.4. Accession Countries

The Accession Countries in Central and Eastern Europe have been expanding their telecommunications networks since the fall of the planned economy. Under the past regime which gave priority to material production, telecommunications was assigned a marginal role. As a result, years of underinvestment and poor organisation led to a very poor service and huge latent demand, demonstrated by very long waiting lists. Large investment programmes have therefore been launched to upgrade the basic telecommunications network. These programmes were in part financed by foreign capital, either through private foreign direct investment or loans or financial support from international financial institutions (EIB, World Bank Group, EBRD).

During recent years, in addition to the priority of accession to the EU, sector policy has emphasised liberalisation and privatisation. A regulatory framework is being developed that is consistent with that of the EU. Liberalisation should be completed by the year 2003. This is also in conformity with the WTO agreement, which most of the countries have signed.

The telecommunications sector can provide good opportunities for growth, given the already high skill level of the population. It may become much easier to relocate services supplied via ICT than material production and the scope of creating new value added services is large. However, this requires a high performance telecommunications infrastructure.

The restructuring of the fixed network takes time and is very costly. The adjustment process, which is much more profound than in Western Europe, has to take account of several constraints, such as tariff rebalancing (lowering domestic long distance and international call charges, raising tariffs for local calls and line rental) and skills mismatch of employees. Some countries, such as Hungary and the Czech Republic have taken early the necessary steps for reform and have managed to attract foreign capital for urgently needed investment.

Mobile telecommunications networks are doing remarkably well in the area. Most of the countries have adopted the duopoly model (i.e. two competing operators are granted licence at equal terms) for the supply of services (with the digital standard GSM 900 adopted by the EU). Foreign capital has been eager to enter this business as the sector is liberalised, and there are now very few restrictions for operations. Mobile telecommunications turned out to be a very efficient device for providing telecommunications access rapidly to users willing to pay market prices. Mobile telecommunications have therefore had the merit of introducing competition into the telecommunications sector.

6. Implications for EIB

In the words of the Commission (Com (1998) 80 final): "Telecommunications are at the heart of the Information Society, which promises extensive opportunities for European business and a significant contribution to improved living standards for European citizens." Given this, it is natural that the EIB as a European Institution should play its full part in the financing of the telecommunications sector where decisions are being taken that will shape the future of the European society.

Over the last 2 years, EIB lending has represented on average 4.7% of total telecommunications investment in the EU. This is less than in other infrastructure sectors, such as water (11.2%), transport (9.5%), solid waste (5.5%) or energy (5.2%). It is low in relation to the value added which the EIB can contribute in this sector.

6.1. Past lending activity and justification

The EIB has long been a regular provider of financing for the telecommunications sector (see table 3). Lending to the sector fluctuates a great deal because of the bunching of big projects from time to time. For instance, in 1998 PM telecommunications loans could amount to more than 5% of EU investment in the sector.

The majority of EIB loans have been granted for upgrading and extending national trunk networks. A great deal of this financing was done on the basis of ongoing investment programmes and the soundness of the operators' balance sheets. EIB financing was to support the construction of information infrastructures of Community interest and in many cases also for regional development. In all these cases EIB loans contributed to the lowering of the operators' capital cost.

The European interest in financing telecommunications was strengthened in June 1997, when the EU adopted a decision (1336/97 of 17.06.1997) setting out guidelines for the telecommunications infrastructure requirements in the context of trans-European Networks (TEN). Emphasis was placed on the interconnection of telecommunications networks and the establishment of interoperable services in order to facilitate the transition towards the information society; improve the international competitiveness of EU firms; strengthen economic and social cohesion and create new jobs.

Since the emergence of GSM networks, the Bank has financed a series of mobile telecommunications networks in the EU. During the last three years, total lending amounted to 1.3bn, which corresponds to close to one third of the Bank's lending in the telecommunications sector in the Union. Because this is a segment which is more open to competition, the risks are larger than with the old monopoly-style fixed networks. The funding for these mobile networks often takes the form of project finance. The EIB acted in several cases as catalyst for financing consortia: its wide-ranging experience in financing the sector allows the Bank to process information that is not always available to commercial banks. Thus decisions made by the Bank concerning the viability of a project convey important signals to providers of funds and reduce the funding cost to the promoter.

Table 3. EIB financing of EU telecommunications (signatures, at current prices)

	1990	1991	1992	1993	1994	1995	1996	1997
ECU bn	1.7	1.9	2.0	2.1	2.2	0.9	1.6	1.9

PA lending for telecommunications is concentrated in Central and Eastern European Countries. The Bank has provided close to 1bn ECU of loans for telecommunications to the region over 1990-97. Most of this has been for the upgrading of fixed telecommunications, which is the foundation on which other types of telecommunications services in the area are built. During the past two years, the focus of intervention has shifted to mobile telecommunications, as this is the sector which is likely to contribute most to the introduction of competition in the telecommunications sector.

Lending in the region is justified by the fact that the state of the fixed network inherited from the communist regime was appalling. Upgrading the existing network had priority and particular care was taken that any loan from the Bank should be conditional on an obligation to implement EC/WTO policies, in particular to relate tariffs more closely to cost. The projects financed by the Bank are generally parts of ambitious investment programmes that aim to raise the presently low teledensity levels (23 mainlines per 100 inhabitants in 1997) closer to EU levels. For the mobile telecommunication sector, liberalisation is already a fact and therefore lending has been undertaken on the same basis as for comparable projects in Member countries.

Given the continuing need to modernise the telecommunications sector and to prepare these countries for entry into the EU, lending for telecommunications in Central and Eastern Europe could increase significantly. EIB lending is valued in the host countries for its long-term nature and EU-perspective.

6.2. Future lending and EIB value added

The liberalisation trend will also have important implications for EIB lending to the sector in the EU. The overall risk in the sector is bound to increase as incumbents' market shares and profit margins are eroded. Incumbent operators however also have new opportunities as, with lessened state involvement, political constraints on pursuing efficiency goals are relaxed (e.g. on reducing staff, setting tariffs, providing service that is uneconomic). The Bank therefore has an interest in financing

incumbent operators' efforts to rationalise their operations. A large part of the investment coming forward will in any case be devoted to the upgrading of the existing network to provide advanced services. EIB funding would help to improve the terms and conditions of borrowing. This may be increasingly attractive for incumbents as many of them are being downgraded by credit rating agencies as implicit government guarantees are falling away and/or competition is reducing the profitability of operations. EIB long-term funding could cause the basic infrastructure to be upgraded faster. Such an acceleration benefits not only network owners but also newcomers accessing the established network to provide new services. These third party benefits are expected to increase with the growth in the number of services that are supported by the network and which are not directly supplied by the incumbent operator.

With the globalisation of telecommunications, European operators have to devise international strategies. Most of the operators in Europe are still nationally based. First steps in the globalisation are the setting up of joint ventures among national operators for the supply of international telecommunications services (e.g. Global One, Concert, Unisource). These have been followed by (limited) cross-shareholding as in the case of Deutsche Telekom and France Telecom. One can however expect much more extensive ownership changes, either through mergers among European companies or through outright acquisition. The merger wave in telecommunications that is currently under way in the US is likely to engulf Europe before long. Additional lending on part of the Bank would be justified on the grounds that there is European-wide interest in fostering the international competitiveness of the operators and the creation of seamless European-wide services.

Support for alternative telecommunications networks helps to implement EU policies by inducing network competition in the telecommunications sector for the benefit of users. As the increasing lending to new entrants especially in mobile telecommunications shows, the Bank can play an important role in helping new entrants to compete effectively with incumbents and thereby to promote competition in the sector. These projects may be characterised by more risk than traditional operations concluded with incumbent operators and their appraisal requires particular care. The value added of the Bank includes the catalytic effects of EIB lending in raising funds for new entrants. The Bank's sector specific appraisal skills and long term view of benefits and credibility effects help to redress some of the possible market failures new entrants to the sector are facing.

The slow emergence of a venture capital industry in Europe makes it more difficult for developments in telecoms to spawn new companies to exploit the new facilities becoming available. To alleviate this problem, the Bank has already started in a limited way to provide venture capital to high technology SMEs (ASAP special window), through global loans for venture capital operations and in collaboration with the European Investment Fund (European Technology Facility). Experience with these initiatives will equip the Bank to take forward its operations in this sector.

Although universal service has already been achieved in almost all EU countries, access to each home in terms of voice services will not be enough by itself to deliver broadband value added services. This is even more the case for remote geographical areas, where telecommunications is a substitute for other means of access. The provision of advanced telecommunications in less developed and remote regions may therefore constitute an essential part in the context of catching up. The provision of these services in less developed areas are less profitable and therefore less sought by traditional operators. The role of the EIB lending should be to make sure that these regions are not left behind in the provision of advanced services.

The Bank could play an increased role in the telecommunications sector, to the extent that EIB loans focus on:

- Furthering telecommunications access for advanced services in less developed regions;
- Projects that can be regarded as innovative for the sector;
- Supporting new entrants.

In operational terms, the Bank's resources would be focussed on diversification, promoting competition and providing access to telecommunications services. This would require a deepening of project appraisal and probably a greater shouldering of project risk. As the average size of such projects is smaller than that of present loans, a substantially higher labour input per ECU of loan would be necessary. In any case, the Bank's growing contribution to the finance of telecommunications would continue to be focussed on the generation of value added.

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