OXFORD REVIEW OF ECONOMIC POLICY, VOL. 17, NO. 3

EUROPEAN TELECOMMUNICATIONS INFRASTRUCTURES

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Since the liberalization of European telecommunications markets, regulators at European and national level have been relatively successful in forcing down the price of access to the historic monopolists' fixed network. This has led, however, to the development primarily of 'service competition' in most of Europe, while infrastructure competition has been limited. As a consequence, investment levels are significantly lower than in the United States, particularly for the provision of broadband. Mobile telephony has, however, diffused quickly in Europe compared with the United States, partly as a result of the successful second-generation Global System for Mobile Communications (GSM) standard adopted, and partly as a result of the charging systems employed. These developments have, however, been imperilled by the cost and delays associated with third-generation mobile technology. A new regime for regulating communications is currently being developed in Europe. If properly applied, it will reduce regulatory intervention and promote investment and innovation in both fixed and mobile services, but there is a risk that national regulators may thwart this outcome.

I. INTRODUCTION

In this paper we discuss the major public policy problems related to telecommunications infrastructures. These problems have been extensively discussed from a theoretical perspective (Laffont and Tirole, 2000; Mason and Valletti, in this issue), but mainly from the viewpoint of the access problems arising from the dominance of incumbent operators over existing essential facilities and bottlenecks. Most of the debate so far has been preoccupied with how best to open incumbents' networks to third parties.

We acknowledge the importance of this problem. What we would like to do here, however, is to stress the *dynamic* problems posed by access regulation, i.e. the impact of different regulatory arrangements upon network development.

This is now particularly important because:

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(i) telecommunications investment in major European countries (France, Germany, the UK, Italy, and Spain) is increasingly falling behind the USA;

(ii) the competitive advantage in mobile communications which was gained by Europe in the 1990s seems to be in jeopardy;

(iii) a new regulatory framework—where such issues have to be addressed—is under discussion within the European institutions, and should be finalized some time in 2002 and in operation in 2003.

The main point we make is quite simple: by and large, regulation in Europe has been successful in opening the incumbents' networks to competitors. According to the Commission, fixed-line tariffs were by the end of 1999 lower than in the USA for distances above 50 km and 200 km[1] (see Figures 1 and 2). Interconnection rates in some countries are lower than or at the very least comparable with the USA. However, the available evidence points to a growing investment gap between Europe and the USA. This seems to be attributable to broadband deployment, not so much in long-distance backbones, but at the local level.

How then should a balance be struck in the incentives provided by the regulatory framework to fixed line operators, both incumbents and new entrants, between access to existing networks and deployment of new facilities?

Mobiles pose different policy problems, which are more related to spectrum availability and allocation than to physical infrastructures in the strict sense. Universal Mobile Telephone Service (UMTS) licences have been sold at very high prices in most European countries. Unfortunately, this heavy financial burden was imposed upon operators as the global stock markets were turning against the sector. Over the past year, the sales of WAP (Wireless Application Protocol) telephones—which were expected to lead the migration of consumers from second-generation (2G) to third-generation (3G) mobile telephony—have been disappointing, and uncertainty reigns about General Packet Radio Service (GPRS—the next step before UMTS). On the other hand, the in-built concentration of the market, deriving from scarce frequencies, raises several regulatory worries, particularly as mobile operators are earning high profits in most countries. How should the European leadership in mobile telephony be maintained, while competition is fostered in a highly concentrated market?

These are the two broad questions we shall address here. The structure of the paper is as follows: section II briefly reviews the existing regulatory framework for access in European telecommunications; section III provides data about investment in mobile and fixed infrastructures (narrowband and broadband), while section IV examines the major issues to be addressed by the emerging regulatory framework. Section V contains our conclusions.

II. ACCESS AND INTERCONNECTION: THE EXISTING REGULATORY FRAMEWORK

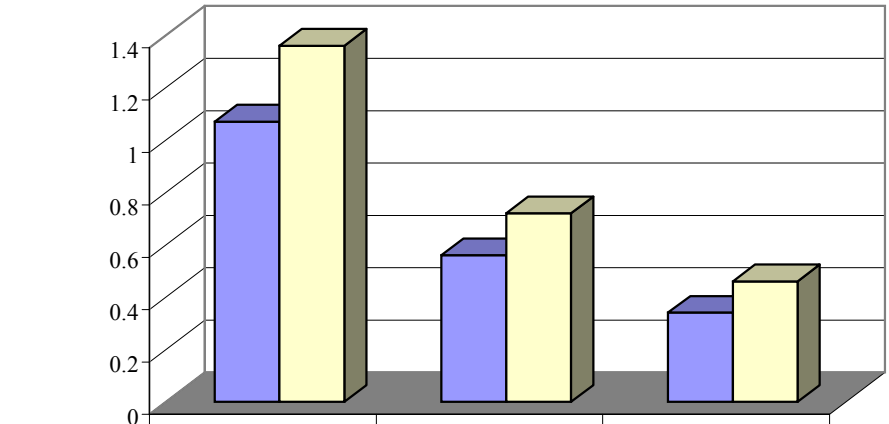
(i) Fixed Access

An important component of a policy to promote effective competition is a regulatory environment guaranteeing that competitors have access to networks which they cannot duplicate. Fair access to such facilities and, in particular, fair access prices will generally improve economic efficiency by easing competition in markets both upstream and downstream of the bottleneck. This is true whether the industry is vertically separated or not.

One approach would be simply to rely upon competition law. In each case the regulator or competition authority would have to consider whether the conditions for the European equivalent of the essential facilities doctrine apply. In many cases, as a result of convergence, there is a technological substitute for the asset in question. The key issue for the regulator or court to resolve thus becomes whether the alternative is commercially rather than technically feasible. Timing is crucial in almost all cases, particularly in relation to local infrastructure. If the

[1] A local call price comparison is not significant, given the large differences in the rate structures, mostly flat in the USA and usage-based in Europe.

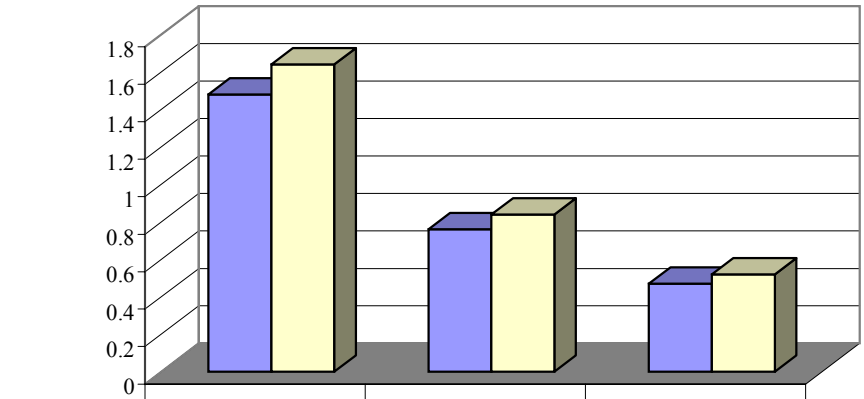
Figure 1
Actual Price of a 3-, 5-, and 10-minute Regional Call (50 km), August 1999



	3 min	5 min	10 min
EU average	1.07	0.56	0.34
US	1.36	0.72	0.46

Source: European Commission (EC, 1999*b*).

Figure 2
Actual Price of a 3-, 5-, and 10-minute Long-distance Call (200 km), August 1999



	3 min	5 min	10 min
EU average	1.48	0.76	0.47
US	1.64	0.84	0.52

Source: EC (1999*b*).

notion of a time-limited essential facility had adequate support, then reliance on competition law would be a more reliable option. Given the lack of cases in European courts, and the delays involved in developing precedents, there is case for adopting a regulatory approach *pro tempore*, in parallel with the competition law approach. However, sector-specific legislation in Europe typically requires all operators, including the incumbent, to open their networks to competition; the latter's access prices are also regulated.

The price which entrants have to pay for access to the incumbent's network is crucial to their commercial success, yet the incumbent has two motives for charging high access prices. The first is a simple

desire to maximize monopoly profits; the second, which arises if a network owner is also competing in the retail market, is the desire to raise its rivals' costs and maintain a dominant position in that market.

These considerations have meant that regulators have to intervene in access pricing either by imposing detailed prices for the use of the elements of the network, or by limiting the overall revenues which the network owner can collect to those which are necessary for the recovery of its costs. Either approach involves a detailed analysis by the regulator of the costs incurred by the network. The first-best solution would involve setting access prices on the basis of marginal cost. This may need to be supplemented by a mark-up if such pricing would prevent the incumbent from breaking even.

In Europe there is the obvious danger that new entrants will choose to enter the profitable long-distance market even though it is less efficient at providing long-distance conveyance than the incumbent. This will also deny to the incumbent the call revenues that are necessary to cross-subsidize access, where tariffs are unbalanced. One way of eliminating this possibility is by allowing the incumbent to charge new entrants for access to its network at rates which take account of the lack of balance in the tariff structure. Thus the incumbent could be allowed to make a charge for call termination which covers not only the costs of that call termination, but also includes an additional element comprising the excess profit which the incumbent *would have made* by providing the call at retail prices, and which it needs in order to cross-subsidize other services such as line rentals. This approach to access pricing is known as the efficient component pricing rule (ECPR) or 'retail minus' (see the article by Mason and Valletti in this issue).

If an interconnection charging regime of this kind were to be introduced, then an entrant would only be able to gain a profitable foothold in the industry if its costs in supplying the services that it provides itself, rather than buys from the incumbent, are less than those of the incumbent. Such a rule would, in consequence, only encourage entry where the entrant is more efficient than the incumbent—a major challenge when the incumbent has enormous strategic advantages.

For this reason, quite reasonably, the regulation of interconnection pricing in the EU has not gone down this path. The 1997 Interconnection Directive (EC, 1997) requires that charges for interconnection follow the principles of transparency and cost orientation. The first principle implies the publication of a reference interconnection offer. As a corollary, operators with significant market power are required to keep separate accounts for their wholesale or network activity and for other activities, including retailing.

'Cost orientation' turned out, however, to be excessively vague and to permit excessive interconnection charges. There are two major reasons for this. First, the Interconnection Directive took a rather catholic view of cost standards, citing 'fully distributed costs, long-run incremental costs (LRIC), marginal costs, stand-alone costs, embedded direct costs'. Each of those can be measured, according to Annex 5 of the Directive, on an historic or forward-looking cost basis. This was obviously unavoidable, as accounting standards differ rather widely across the Union (e.g. Italy relies on historic costs, where the UK has a current cost accounting system), and their differences are firmly rooted in national tax codes. Second, analysing cost data is a highly complex business for a regulator, and regulatory bodies in member countries—with the obvious exception of the UK's Office of Telecommunication (Oftel)—are recent creations. Some of them suffer also from scarcity of resources.

So cost orientation in many cases turned out to be more a general philosophy than a practical approach. Until cost data were available based upon the Commission's preferred methodology—LRIC—the Commission published recommended 'best current practice' interconnection charges, based upon the average of the member states with the lowest charges. Actual values reported by the Commission for double-tandem interconnection (the ones that really matter in most EU countries, where competitive local access providers are slowly developing) are set out in Table 1, which also shows the recommended 'best prices' for 1997–2000. The data show considerable variation in charges in the period. Double transit interconnection charges dropped rather fast for the smaller countries, which in 1997 had charges considerably higher than the bench-

Table 1
Double Transit Interconnection Charges in EU Countries, 1997, 1999, and 2000
(Euro cents per minute)[a]

	1997	1999	2000
Austria	2.45	2.40	2.40
Belgium	3.02	2.56	1.92
Denmark	2.22	2.24	1.80
Finland	3.48–4.20	2.91–3.95	2.63–3.28
France	2.55	2.23	2.01
Germany	2.61	2.63	2.28
Greece	n.a.	2.83	2.76
Italy	3.97	2.58	2.29
Ireland	n.a.	2.26	2.26
Luxembourg	n.a.	2.25	1.69
Netherlands	1.61	2.03	1.70
Portugal	n.a.	11	2.58
Spain	4.22	3.07	3.07
Sweden	2.38	2.26	1.59–1.67
UK	1.74	1.62	1.71
Best practice	1.5–2.6	1.5–2.3	1.5–1.8

Note: [a] Based on a 3-minute call duration. Basic starting values in Euro cents. Prices are exclusive of VAT. The double transit rate includes a distance component for links of >200 km.
Source: EC (1998, 1999*b*, 2000).

mark values—notably in Belgium and Finland. The record of larger countries is more mixed: a substantial decrease took place in several countries. In early 2000 charges were still much higher than the benchmark in all countries, with the exception of the UK, Sweden, Luxembourg, and the Netherlands.

All in all, the benchmarking approach has been beneficial, but the largest decreases in many countries took place at the outset of its application. Furthermore, the Commission has not published any new recommendation on best-practice prices in 2001, and has no plan to do so. No official reason has been given for this, but a possible explanation could be that prices are now quite low, and neither the incumbent nor the 'older' new entrants, who have built some facilities, want to face pure non-facility-based competitors, able to compete on the basis of very low access prices to existing networks.

A recent study commissioned by OPTA, the Dutch regulator, on the relationship between access pricing in the Netherlands and the development of infrastructure competition, concluded that entrants in Holland typically adopted the policy of first replicating those assets which involved a relatively small amount of sunk costs (Cave *et al*., 2001). Thus a *de-novo* entrant may typically begin purely as a reseller, investing primarily in marketing and advertising. It may then switch to making investments in switching and conveyance at the national level, before contemplating investment in the local loop.

A cable operator entering into telephony or the provision of Internet services has a different inheritance and may adopt a different strategy. Further investment is required in the local loop, and the cable operator has to buy call termination from the incumbents—a service which is wholly non-replicable. The cable operator also needs access to long-distance conveyance, which it can either replicate itself or, for example, use facilities built by a former reseller now investing in the national infrastructure. Finally, prospective non-cable entrants into the high-bandwidth market will encounter the local loop as non-replicable asset, making unbundling of the loop indispensable.

This analysis identifies two ways in which regulatory influence can be brought to bear to affect investment by infrastructure competitors. The first relates to the relative access prices of different assets. Entrants would be less concerned about the price of replicable assets than with non-replicable assets. A regulatory policy which imposes a low price (relative to cost) for the latter thus encourages infrastructure investment. Second, because entrants take time to develop their competing asset base, and begin with those assets which are most easy to replicate, a policy of prices which rise over time will facilitate the gradual development by entrants of their own comprehensive network. The policy which induces most investment is therefore one of initially low access prices for all network services, followed by a rising price trend applied successively to assets in descending order of replicability. Although the discussion above has been couched in terms of the price at which mandatory access is available, it can be translated into the alternative dimension of the restrictiveness of the circumstances in which access is mandated.

Taken together, the data and our discussion would seem to suggest the *de-facto* existence of a 'service bias' in European telecommunications regulation. Under the guise of neutrality between infrastructure and service competition, the Commission has been in practice more preoccupied with opening existing infrastructures than with encouraging the construction of new ones. Thus, entry has been vigorous, prices have been dropping fast, but this—as we see in section III—does not seem to have provided medium-term incentives for an extensive deployment of alternative infrastructures.

In a way this is unsurprising, if we consider that existing legislation was drafted in the first half of the 1990s, when—outside the UK—all major incumbents were state-owned. The idea of having competition upon a big, publicly owned network was then quite attractive. But this choice has had significant, if unwanted, consequences.

(ii) Mobile Access

The European mobile industry has hitherto been made up of network operators and air-time sellers, some of which are vertically integrated with operators and some of which are independent resellers. The former is by far the more common situation.

Even in the latter case, network operators have not, however, sold airtime in bulk, but in packages closely mimicking, at the wholesale level, their own retail packages. As a result, they have been able to maintain tight control over the retail price structure. This control can, however, be threatened by the regulatory imposition of alternative contractual arrangements.

As with fixed networks, one method is by *indirect access*. On this basis, the service provider has a direct contractual relationship with the mobile subscriber, but, lacking a mobile network itself, purchases mobile origination and termination services from a mobile operator. In order to make a call, the customer simply dials the carrier selection code of the indirect access operator. The key issue here is how the indirect access provider remunerates the mobile network. The two major options are cost-based pricing and 'retail minus' or the ECPR (see section II(i)). Under the former, the mobile operator simply receives the costs of origination and termination, normally including some contribution to common costs. Under the latter, the mobile operator receives the retail charge (including any contribution) which it would have received if it had a direct relationship with the customer, reduced only by the costs which it saves as a result of handing over the call to the indirect access provider. European regulators have generally favoured the latter approach, which protects mobile operators from the loss of their call business to competitors who are simply arbitraging call prices, but making little contribution to the costs of customer acquisition.

An alternative source of competition, peculiar to mobile networks, is provided by *mobile virtual network operators* (MVNOs). In effect, the MVNO purchases from the mobile operator the network elements to enable the MVNO to provide both connection/rental and call services directly to customers. On a fixed network, this is akin to local loop unbundling. MVNOs provide their own SIM cards and billing, and may also provide additional electronic services.

To date, European regulators have been reluctant to impose an obligation on mobile operators to accommodate MVNOs. In a few cases, operators have

Table 2
The Outcome of 3G Auctions

Country	Number of licences	Number of bidders	Total bid (billion Euros)	Bid per capita (Euros)
France	4	2	1.2	20
Germany	6	12	50.8	619
Italy	5	6	12.2	213
Spain	4	4	0.5	13
United Kingdom	5	12	36.8	618

Note: French data take account of the reduced price charged to the two licensees as a result of a government decision in October 2001. One or both of the remaining licences may now be taken up at the lower charge.
Source: Revised from OECD (2001*a*).

found it in their commercial interests to do so. Thus, in the UK, One-2-One provides Virgin with services which are intermediate between those furnished to an MVNO and those furnished to an airtime re-seller. One-2-One's commercial calculation is that the Virgin brand will give it access to revenues which it would not be able to gain under its own name.

In the broader sense, access problems in mobiles exist on a larger scale, i.e. in the field of access to spectrum. Spectrum allocation for mobile communications is done by national governments operating in accordance with their own national legislation but subject to agreements made through international treaty organizations, such as the International Telecommunications Union and its European-level equivalent, the European Conference of Post and Telecommunications Administration (CEPT) (see Independent Review, 2001). These bodies make an *allocation* of spectrum to particular purposes (such as radar, broadcasting, or mobile telecommunications). Governments can *assign* spectrum within these allocations to particular public or private bodies. Although the initial auctioning of spectrum is permitted under EU regulations, secondary trading is not permitted. The Commission has, however, brought forward draft legislation to permit secondary trading.

As a consequence, the structure of the mobile telecommunications industry is restricted by international allocation decisions. For example, the UK government's proposed switch-off of analogue broadcasting transmission would free certain spectrum, the technical properties of which make it suitable both for digital broadcasting and mobile communications. But the current allocation of the relevant spectrum does not permit mobile communications, and international agreement would have to be sought to change the situation. If additional spectrum were released for mobile telephony, the government would then have to decide how to assign it (for example, by auction or by beauty contest) and, if a market mechanism is chosen, whether to allow existing operators, which would value it more highly as a means of protecting their existing profits, to bid against new entrants. Further competition might come into the market through the development of wireless local area networks (LANs), which, using unlicensed spectrum, can provide a localized and portable (but not mobile) connection in areas such as airports, campuses, and shopping malls. By freeing up the allocation process it should be possible to bring supply of spectrum for mobile telephony more into line with demand, and to reduce scarcity and barriers to entry into the provision of a range of wireless services.

The assignment of 2G Global System for Mobile Communications (GSM) mobile telecommunications frequencies was done at the beginning of the 1990s on the basis of beauty contests in most countries. At the time nobody, neither governments nor operators, had an idea of the huge growth that mobile services would experience in subsequent years: indeed, the perception of having given away for free GSM frequencies that were later a source of billions of profits might have had a role in designing an auction systems for UMTS (or 3G) licences that led operators, at least in some countries, to pay very high prices for these (Table 2).

This involved the implementation of a simultaneous ascending auction, either for a specified number of licences (as in the UK or Italy) or for blocks of spectrum which could be combined by operators to make a varying number of licences (as in Germany). Not all countries adopted the auction method. Finland allocated the licences through a beauty contest, in order to accelerate development of the service. Spain also used a beauty contest, but subsequently tried to increase the annual fee. France made four licences available at a price roughly half of that yielded at auction in Germany and the UK, but only two were taken—leaving the government in an awkward predicament.

The consequences for operators and future prices for 3G services were hotly debated at the time. In particular, some commentators feared that the concentrated market structure could lead to overbidding; communications expert Nicholas Negroponte—among others—argued that the high fees paid would raise retail prices, slow penetration, and have a seriously adverse effect on generations to come. The conventional economists' response was that, as a sunk cost, an auction fee would have no impact on retail charges, except to the extent that higher gearing on the part of operators might increase their cost of capital. Overbidding was also seen at the time as unlikely, as well-informed operators were not expected to bid above expected profits.

In the light of subsequent events, however, it seems possible that overbidding has occurred at least in some cases, as a consequence of the very large downside that incumbent firms could expect from failing to obtain a licence (Bennett and Canoy, 2000). The case for permanent effects on prices seems so far somewhat weaker, although it is fairly obvious that the uneven spread of the financial burden for 3G licences across mobile operators is having an impact upon industry structure across Europe.

III. TELECOMMUNICATIONS INFRASTRUCTURES IN EUROPE

(i) Fixed Networks

Telecommunications investment in Europe was stagnant throughout the 1990s, and in 1995 began to fall behind that of the USA; the gap (Figure 3) has been widening rapidly. While in 1988–90 investment in the five major European countries was 30 per cent higher than that of the USA, in 1997 it was 30 per cent lower, and in 1999 was less than one-half.

This fall can be attributed to a variety of factors. Differences in the starting point might have been relevant. It seems likely that the (chiefly publicly owned) European incumbents were over-investing at the beginning of the 1990s. As well as gold-plating, as state companies are prone to do, they were also preparing for the coming competition. The relative decline of investment in Europe has, however, been too continuous to be attributed to differences in starting point. Besides, the number of fixed telecommunications access lines in Europe peaked around 1995. It is relevant here that EU5 has witnessed a far faster development of wireless communications than the USA (see Table 5 below).

If narrowband (i.e. voice) does not appear to account for the relative decline of European investment in telecommunications, then the answer should be sought in broadband. It is difficult to obtain comprehensive data about actual broadband deployment in Europe. While company announcements of roll-out plans can be easily gathered, the actual completion of such plans is hard to assess, especially since companies have since 2000 been quickly revising downwards their investment plans, owing to the stock-market collapse.

A recent report to the European Commission has usefully put together plans relating to Pan-European Networks deployment by major new entrants on continental routes by the end of 1999. As we can see from Table 3, these are patchy at best. Total contracted route-kilometres in Europe at the beginning of 2000 according to another source were about 150,000 (Schroder Salomon Smith Barney, 2000). This compares with a total of 257,000 deployed by inter-exchange carriers in the USA in the year 1998 alone (FCC, 1999).

We have no consistent data about local deployment of infrastructure by new entrants in Europe, but non-systematic evidence suggests it is quite limited, being concentrated—in continental Europe—in the larger business centres, such as Brussels and Frankfurt.

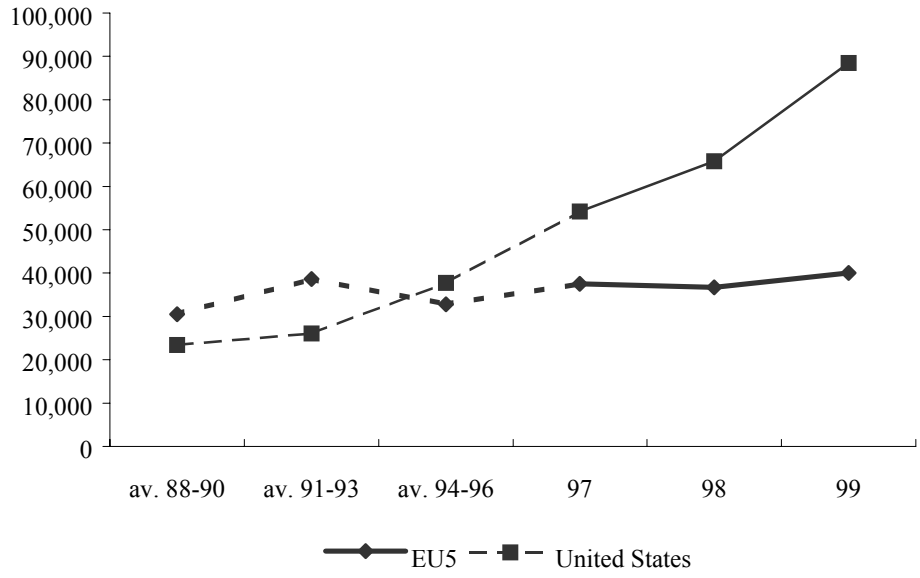
Table 3
Broadband Deployment Over Major European Routes

Route	GTS Hermes	MCI WorldCom KPNQwest	Versatel	Viatel	Level3	BT Pen	Euro.map	Pan European Crossing Carrier One	Flute	Flag	C&W	iaxis
London-Paris-Amst.-Bruxelles (NW Europe)												
NW Europe <---> Frankfurt												
NW Europe <---> Stockholm												
Paris (London, Amsterdam) <---> Geneva												
Frankfurt (Paris, London) <---> Milan												
Paris (London) <---> Madrid												
Frankfurt (Milan) <---> Vienna												
Vienna <---> Eastern Europe												
NW Europe <---> Athens												
NW Europe <---> Lisbon												

Active
Planned
No, or long-term plans

Source: Logica Consulting (2000).

Figure 3
Telecommunication Investment in EU5 and the USA (US$ millions)



Source: OECD (2001*a*).

Table 4
Broadband Penetration in EU5, USA, and in the OECD, in 2000

	EU5	USA	OECD
DSL	0.14	0.89	0.57
Cable modems	0.05	1.36	0.69
Total	0.20	2.25	1.26

Note: Broadband penetration is defined as digital subscriber lines (DSL) plus cable modems per 100 inhabitants.
Source: OECD (2001*b*, p. 12).

There seems, therefore, to be a gap between Europe and the USA as far as broadband backbone deployment is concerned. According to the latest data produced by the OECD, however, the gap is even larger in the access network: broadband[2] penetration in Europe is estimated to be about one-tenth that in the USA (Table 4).

Some portion of this gap obviously reflects different macroeconomic growth rates in the two areas, and the greater orientation of the US economy towards telecommunications-intensive products and services. Another portion reflects the greater penetration of cable in the USA; however, very large differences persist, even if we ignore cable modems. Therefore, in the light of our discussion in section II(i), we are inclined to attribute such a gap also to the unintended consequences of the 'service bias' of European regulation.[3] Investment has lagged, as incumbents did not have sufficient incentives to upgrade networks that they would be obliged to open at cost-based prices; nor did investment come from new entrants, who were able to provide a cheaper service to their customers with less risk over somebody else's network. In such a regulatory regime, both the incumbent and the new operators have a rational incentive to invest to supply services only to high-volume customers, such as large corporate customers.

Available evidence, although somewhat scanty, further suggests that investment has been particularly lacking in the access network. New entrants have concentrated on serving large businesses with 'seamless' networks, and have therefore invested in fibre-to-the-headquarter and in backbones. Small businesses and households were sold voice products over the incumbent's network by firms which very often obtained substantial profits by arbitraging between cost-oriented access charges and final tariffs which were not rebalanced by regulators.

Hence, the 'service bias' of European regulation seems to have had major dynamic effects, upon investment, network technology, and Europe's economic potential. We believe that this problem should be taken very seriously by European policy-makers, and that the new regulatory framework for communications in Europe should contain measures able to restore balanced incentives to access and deploy facilities.

(ii) Mobile Networks

Mobile technology is generally regarded as an authentic success of European industry compared with the United States. Penetration levels, especially in the Nordic countries, have far outstripped US levels, and the adoption within Europe of the 2G GSM standard has both permitted international roaming and generated economies of scale in equipment manufacture which have facilitated the exporting of the technology throughout the world (see Pelkmans, 2000).

Notwithstanding its recent successes, mobile technology got off to a slow start. In Europe, the first-generation licences were typically issued in the

[2] There are several ways of defining 'broadband'. Here it means a transmission speed in the down-channel at least equal to 256 kbit/sec. The up-channel can be much slower, down to 128 kbit/sec or below.

[3] Quantitative evidence on the link between access prices and investment is analysed by Cave *et al.* (2001), who find some further support for a negative relationship postulated here.

Table 5
Cellular Mobile Subscribers in Europe and the USA

Country	1990	1999
EU5	1,990,509	112,941,207
USA	5,283,055	86,047,003

Source: OECD (2001*a*).

1980s, normally to the fixed incumbent; handsets were expensive and cumbersome and call prices high. The UK experimented with a network duopoly, combined with a regime which required retail sales to be made through competitive service providers. However, the experiment was largely a failure as each of the networks soon tied a group of service providers to itself, either through ownership relations or contractual arrangements, and a period of close parallelism in pricing ensued. The emergence of digital technology in the early 1990s promoted the licensing in most EU member states of a second entrant, as well as reducing costs and improving quality of service. An influential study by the OECD (1996) demonstrated a strong inverse relationship between the number of licences available and mobile prices. The second half of the 1990s thus ushered in a period of massive expansion in which penetration rates grew from 5 per cent to, in some cases, over 70 per cent. A major engine in this growth was pre-paid subscriptions, which allowed mainly youthful subscribers, without access to credit, to enter the market. This factor, combined with falling prices arising from greater competition, led to a continuing decline in average revenue per subscriber. This has recently encouraged some operators to move away from the dominant pricing structure throughout the period of mass market growth, in which subscribers receive substantial handset subsidies, which they repaid through relatively expensive call prices.

Part of the superiority in performance of European mobile telecommunications compared with North America (Table 5), is the adoption in Europe of the calling party pays (CPP) system, under which callers to a mobile number bear the costs not only of call origination on their network, but of call termination on the mobile network. In North America, by contrast, under the receiving party pays (RPP) principle, the person called pays the cost of termination (see Kim and Lim, 2001). There is evidence that this chokes off incoming calls. CPP has disadvantages, however. If mobile subscribers take little or no account of the retail price paid by those calling them and/or callers are ignorant of the prices of calls to mobile, mobile operators may be able to raise termination rates above costs. Regulatory proceedings to control mobile termination rates have been launched both by the Commission and by regulators in many member states (Oftel, 2001).

Mobile markets in Europe at the moment are characterized by a small number of players (normally 3–6), of which the fixed incumbent is typically the largest, and by absolute legal barriers to entry based upon limited spectrum assignments. There is considerable controversy over the degree of competition exhibited in the market. An Irish court has recently made a finding that in the Irish market, then consisting of two operators, the larger with the market share of 65 per cent, there was neither single nor joint dominance, in the sense of Irish (and European) law. In general, call termination on mobiles may be seen as posing access problems. The extent to which regulation is required to deal with them depends on short- and long-term opportunities for consumers to switch supplier in response to high termination rates, which itself depends on the interest which subscribers take in retail prices paid by those who call them, as well as the knowledge such callers have of the relevant charges. A case-by-case analysis is required.

IV. THE EMERGING REGULATORY FRAMEWORK

The overhaul of the EU regulatory framework officially began in 1999 with the publication of the 1999 Communications Review by the Commission (EC, 1999*a*). This was followed by a broad discus-

sion, and led to the presentation of a package of Draft Directives in July 2000. The two Draft Directives which concern us here more directly (the Framework and the Access Directives) have been examined and amended by the European Parliament, and examined several times by the Council of Ministers: amended versions were submitted by the Commission in July 2001 (EC, 2001*a*,*b*). Several issues are still pending, and we can thus have no certainty as to precisely when, and in what form, such Directives will be enacted. Therefore we shall base our discussion here on the Commission's versions of July 2001.

The key problem is access. Our interest is focused on whether the proposed measures would restore the balance between incentives to build new networks and to access existing ones. Will they help in redressing Europe's delay in broadband deployment?

(i) Intervention Triggers for Access Obligations

Precursors

Under the current regime, described in section II, a telecommunications operator is deemed to possess significant market power (SMP) if its share of a prescribed market is above 25 per cent. Market share is strictly neither a necessary nor a sufficient condition, as national regulatory authorities (NRAs) can issue or withhold the SMP designation below or above the 25 per cent threshold, taking into account the firm's 'ability to influence market conditions, its turnover relative to the size of the market, its control of the means of access to end-users, its access to final resources and its experience in providing products and services in the market' (EC, 1997). One operator has been SMP-notified with an 18 per cent market share, while France Télécom's mobile subsidiary was not notified with a share around 40 per cent.

SMP status implies different obligations in the four markets identified by the 1997 Interconnection Directive: public switched telephone network (PSTN) services, leased-line services, mobile services rendered to consumers, and national market for interconnection.

For PSTN and leased-line services the SMP provision is of limited relevance, as they are subject to a number of obligations with respect to access, non-discrimination, cost orientation, and accounting separation, which derive from other articles of the Directive.

Mobile service operators are also subject to obligations in the area of access and non-discrimination in the sale of final services to consumers, quite independently of their market power, by other articles of the Directive. But they have to provide call termination at cost-related prices if they enjoy SMP, although this requirement has not generally 'bitten' outside the UK.

The Commission's first Communication on the 1999 Review, published in November 1999, proposed a reform of the original SMP arrangements in a number of important respects (EC, 1999*a*). It introduced two thresholds for regulatory intervention. The first was triggered by a 25 per cent market share, and imposed an obligation to negotiate access; the second, which invoked other sector-specific obligations, in particular cost orientation and non-discrimination, was triggered by dominance, as defined under competition law.

A further key difference from the previous regime was that—in keeping with the intended approximation to competition law—the relevant markets would not be the broad national markets specified rather arbitrarily in the Interconnection Directive, but 'antitrust' markets defined in accordance with ordinary competition law principles. To the extent that these are likely to produce much narrower markets than those specified previously, the proposal would have had the effect of extending rather than curtailing regulation.

The dominance test

The Commission, having received considerable criticism of its original ideas in respect of the 25 per cent threshold, amended its views in 2000 and proposed sole reliance upon the higher 'dominance' threshold, which, confusingly, was also called significant market power. Article 13 of the Framework Directive states that an undertaking will be considered to have SMP if, individually or jointly, it 'enjoys a position of economic strength affording it the power to behave to an appreciable extent independently of competitors, customers and ultimately consumers'—the classic formulation of dominance in competition

law. SMP can also be enjoyed in a vertically related market. In addition, Article 14 contains a prohibition on intervention in markets which are effectively competitive; in other words, regulators' ability to intervene in markets in which firms exercise some market power, but are not dominant, will be curtailed.

Much discussion of the draft has focused on joint dominance, which is one of the most elusive or unstable components of European competition law. Traditionally, joint dominance was considered to require the existence of some kind of formal 'economic link' between the firms in question—for example, some degree of common ownership. Recent judgements have expanded the interpretation of economic links to include the interdependence which exists in a tight oligopoly, where firms are in a position to anticipate one another's behaviour and are therefore drawn to parallel conduct.

This appears to suggest that, in order to demonstrate collective dominance, it is necessary to show that firms are tacitly coordinating their conduct on the basis of explicit expectations of rivals' responses. It would not be enough, for example, to show (*à la* Cournot) that each firm was operating in a way which accepted its rivals' current behaviour as a 'given' facet of competitive conditions. In relation to an actual concentrated market, rather than in a merger proceeding where the focus is inevitably on the hypothetical consequences of the merger, the prospects for proof of joint dominance are weak.

Although the draft legislation contains terms familiar from the application of competition law, its *modus operandi* will be quite different, in the sense that the regulation is applied in an *ex-ante* manner, rather than *ex post*, as is normal with competition law in case of abuses of dominance.

The system will therefore operate as follows (EC, 2001*a–c*): the Commission will publish a list of relevant communications markets, using standard methods of market definition. NRAs will then conduct a competition analysis of these markets—varying the definition where appropriate. Dominance of some form (single, collective, or vertically leveraged) is necessary for intervention (save in exceptional circumstances).

(ii) Remedies

Where an NRA finds SMP, it has to invoke at least one remedy. In relation to access to electronic networks, the six remedies listed in the amended Draft Directive are: transparency, non-discrimination, accounting separation, mandatory access, and price control and cost accounting. The remedies are subject to the standard proportionality test, and should also take account of the continued availability of standard *ex-post* competition law. For example, it might be inappropriate to impose a separate accounting procedure on the off-chance that it might assist the NRA, or the national competition authority, in investigating a price squeeze, when an Article 82 investigation would need and could yield more focused data.

The regulatory interventions should also take account of the policy objectives specified in Article 7 of the Framework Directive. This requires NRAs to promote open and competitive markets by, *inter alia*, encouraging efficient investment in infrastructure, and facilitating market access for new, innovative services.

Seen in this light, three of the five interventions—separate accounting, mandatory access, and cost-oriented pricing—seem to us to be appropriate only for dealing with persistent network monopolies. This suggests the need for a high degree of forbearance by NRAs, except in the case of the historic fixed-link operator.

(iii) Local-loop Unbundling

Local-loop unbundling (LLU) is in the course of being implemented in most European countries, as a consequence of a European Parliament and Council Regulation adopted in December 2000 (EU, 2000). While LLU had been discussed for some time before this, it was made compulsory in a somewhat sudden way, after the Lisbon Summit, and with a legal instrument—a Regulation—very seldom used in Brussels, which, however, has the property of coming into force very quickly.

The reason for such haste was a sudden perception by EU governments that Europe was falling behind the USA in terms of Internet development. This had

encouraged NRAs to look to LLU as a means of introducing competition into the market for access, especially the market for high-speed Internet access for both residential subscribers and small and medium enterprises (SMEs). The Commission's 1999 Communications Review (EC, 1999*a*) indicated that this was an item on the agenda, but opinion hardened around the view that more urgent action was required.

It is interesting to notice that the Commission's analysis, while noting that the proposed recommendation would not in any way reduce the force of competition law, adopts a rationale for LLU which makes no appeal to standard competitive analysis. Under that competitive analysis, the natural way to proceed would be to define the market, identify dominance, and consider whether specific forms of behaviour are an abuse of dominance. A natural outcome of this analysis might be the following.

- The relevant market is the market for the provision of access to the main distribution frame and the twisted copper pair leading to the subscriber's home.

- In particular geographic areas, the historic operator may have a degree of market power which goes beyond simple dominance, and may extend through what is sometimes called super-dominance to *de-facto* monopoly. This situation may be due to inherited monopoly advantages, including vertical integration, monopoly in the provision of infrastructure, dominance in the provision of services, ubiquity, and brand awareness.

- Barriers to entry in the local loop are such that market power is likely to be non-transitory.

- In such circumstances, refusal to grant unbundled access to the local loop may constitute an abuse of the dominant position; it has the effect of eliminating a competitor's ability to compete in down-stream markets with the owner of the facility; it involves tying access to the main distribution frame and the copper wire with access to switching capacity; it has the consequence of limiting markets and technological development, preventing the emergence of new services.

A corollary of this analysis is that there may be circumstances in which unbundling of the local loop is inappropriate, because the competition in the local loop among competing infrastructure providers is already adequate. However, an overall obligation was imposed by the European institutions.

There is currently a great diversity of opinions about the actual chances of LLU ever becoming a major development in European telecommunications. Its fortune depends on several variables, such as:

- consumer demand for broadband applications;

- the current lack of investment funds for firms to develop services based on LLU;

- the relative price of LLU elements *vis-à-vis* final prices and the unit cost that would be incurred when delivering the service via a new infrastructure;

- barriers imposed by incumbents, in particular concerning the timeliness and availability of co-location spaces in their switches.

As Table 6 shows, LLU is really in its experimental stages in every major EU country but Germany. Available data on the take-up by new operators show a very slow development. On the basis of the above discussion we believe it appropriate to suspend judgement about the practical impact of LLU upon competition in telecommunications. *If* LLU develops, however, it should be emphasized that this will have broad effects upon regulation: from an economic point of view, LLU provides new entrants with a chance of forming (by investing and leasing network elements, including LL elements) their own virtual network. We feel, therefore, that LLU needs further justification as a panacea.

V. CONCLUSIONS

In this paper we have argued that telecommunications regulation in Europe faces a difficult task. When the current framework was evolved, Europe was not too far from the USA in terms of investment, network characteristics, and services. Now a gap has emerged. While it would be unwarranted to attribute such a gap to regulation alone, as very

Table 6
LLU in Selected European Countries, April 2001

	Monthly rental	One-off fees	Availability	No. of lines
France	14.5 euros per line	108 euros per subscriber	First 30 sites: August 2001	n.a.
Germany	12.48 euros	92.59 euros (line transfer) 38.07 euros (cancellation fee)	Since 1998	450,000
Italy	11.5 euros 12.6 euros (if loop is used for ADSL)	90 euros (active loop) 106 euros (non-active loop)	Since January 2001; 52% of Telecom Italia customers covered by end-2001	1,000
Spain	12.9 euros (2001) 12.6 euros (2002) 12.3 euros (2003)	103.9 euros	Trial phase	n.a.
UK	16 euros	138 euros	Since January 2001	n.a.

Source: Cullen International (2001).

different growth rates in the two areas have obviously had an impact, it is likely that the former factor has indeed played a role: over-generous access terms to the incumbents' networks have discouraged investment in fixed networks, both by new entrants and the incumbents themselves. The new regulatory framework must address this problem, placing adequate weight upon both the static *and* dynamic aspects of the access issue. In fixed networks, this will entail a re-evaluation of the regulatory asymmetries that have been built into the system. Access should, in particular, be mandated with moderation. The Commission's proposals for the new regulatory framework in this respect have varied from an original version—which was highly interventionist—to the current one, under which intervention can only occur in the presence of some form of dominance—single, joint, or leveraged from vertically related markets.

There have been, however, considerable debates about what this means, and whether it is adequate. Many communication markets are characterized by competition between a small number of firms, where the risk of tacit collusion is considerable. European jurisprudence on joint dominance is in a state of flux, and is largely confined to cases under the merger regulations, when—of necessity—the Commission or the Court has to speculate about how the market will operate in circumstances which do not yet exist. This has inevitably led to emphasis upon structural rather than behavioural features of the market. Anxieties about joint dominance might be justified, but the problem of achieving an oligopoly from the current fixed monopoly deserves more attention.

Second, we believe that in wireline communications, a close monitoring of the development of LLU should be maintained: were the take-up of this to be substantial, the consequences upon the regulatory model would be far-reaching, as new operators would have the possibility of 'building' a virtual network.

As far as mobiles are concerned, regulation has to tread a narrow path. Obtaining UMTS licences has turned out to be very expensive for European operators, and the overall burden has been unevenly spread across firms; outlays for the roll-out of 3G networks are also going to be enormous. On the other hand, the profits obtained by national operators of 2G are very large.

In summary, regulation in Europe faces difficult problems in balancing short-term and long-term objectives; networks should be open, but new broadband infrastructures need to be built quickly; excessive profits should be avoided, but the financial health of the European mobile industry—the only major telecommunications segment where Europe has a clear world leadership—should not be jeopardized. The proposed regulatory arrangements provide a framework for doing this, but one which gives NRAs a lot of scope for intervention. This must be resisted.

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