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How mobile termination charges shape the dynamics of the telecom sector

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List of abbreviations used

ART	French NRA
CC	Competition Commission (UK)
CPP	Calling Party Pays
DCS 2G)	Digital Cellular System (adaptation of GSM to the 1800 MHz frequency, still 2G)
EBITDA	Earnings Before Interest, Taxes, Depreciation, and Amortization (a financial measure of profits before the deduction of interest and income taxes)
FNO	Fixed Network Operator
GSM	Global System for Mobile Communication (standard for 2G mobile networks on 900 MHz)
IRG	Independent Regulators' Group
ITU	International Telecommunications Union
LRIC	Long Run Incremental Cost
MMS	Multimedia Messaging Service
MNO	Mobile Network Operator
NRA	National Regulatory Authority
NCA	National Competition Authority
OFTEL	UK NRA
ONP	Open Network Provision
OPTA	Netherlands NRA
PDA	Personal Digital Assistant
PTT	Post, Telegraph, Telephone (an old acronym for telecommunications incumbent operators)
RegTP	German NRA
RPP	Receiving Party Pays
SMP	Significant Market Power
SMS	Short Messaging Service
2G	Second-generation mobile
3G	Third-generation mobile (equivalent to UMTS)

0 Executive summary

This paper analyses the way in which termination rates between fixed and mobile networks (the payments made by one operator to terminate a call on another operator's network) transfer resources between those networks and thus affect output levels, prices, competition and market structures in the telecoms system as a whole.

Many previous studies have addressed the question of mobile termination alone, from the standpoint of identifying the relevant market, identifying the presence of significant market power and, where it is found, considering appropriate remedies. These studies have either taken as given the regulatory package in operation from 1998, or have looked ahead to the new regime in effect within the European Union after July 2003.

By contrast, we focus on the simultaneous impact of fixed and mobile interconnection rates as they apply to fixed to mobile or mobile to fixed traffic, since these rates can transfer resources between the two sectors and thus affect their relative scale and prosperity.

The regulatory framework has been successful in ensuring interconnection among all networks, fixed and mobile, thus giving consumers the benefit of 'any-to-any' connectivity. The very fast growth of mobile connections, now as numerous as fixed lines in many European countries, has been a strong feature of the last ten years.

However, the principles governing the regulation of access to fixed and mobile networks have been quite different. In fixed networks, the dominant firm – the historic monopolist – has been obliged by the regulator to offer access to its network for the purposes of interconnection or call termination at prices which have usually been set by the regulator to equal cost, including a reasonable return on capital employed: either a direct estimate of network costs or a benchmark based on 'best practice' abroad. Other fixed networks typically have to set interconnection charges at the same level as that determined by the regulator for the dominant network. Mobile networks pay the same prices for interconnection to fixed networks as do other fixed networks.

Mobile networks, however, have not generally been subject to price control, either of their termination rates or of their outgoing call prices. As a result, they have charged termination rates which exceed estimates of termination costs by a wide margin. Where regulators have found a mobile operator to have significant market power, they have had the power to impose cost-based terminations under the 1998 regulatory arrangements, but have not generally done so. In recent years, however, many regulators have put pressure on mobile operators to bring termination rates down gradually, using so-called glide paths, but rates still exceed costs by a large margin.

These high, uncontrolled termination rates have applied almost universally to fixed to mobile calls. Practice has differed with respect to termination of calls to mobile from other mobile networks – which now make up 50% or more of all calls to mobile. In some countries, lower

termination rates have been charged on such calls than in the case for fixed to mobile calls. In others the same rate is charged on all incoming calls. In one country (France) an originating mobile operator makes no payment to the terminating operators, an arrangement known as 'bill and keep'. One possible justification for high mobile termination rates is that they have generated resources permitting operators to offer handset subsidies and low outgoing call rates, which have brought new subscribers on to the networks and benefited everyone who can call them. But this effect will only operate fully if competition in the outgoing call market is so intense that all such termination surpluses are competed away, which is not generally the case. There is no guarantee that mobile operators will choose the optimal level of subsidy; and the argument for subsidies to bring new people on to the network loses its force as mobile penetration achieves the very high current levels. Moreover, the process of driving down outgoing mobile call rates using termination revenues may have brought fixed and mobile prices into a spurious convergence, encouraging callers to use a mobile line when a fixed line would impose lower costs on the economy.

We estimate that the scale of the transfer as a result of high mobile termination charges for fixed to mobile calls from fixed networks and their customers has, over the five years 1998-2002, amounted to €19 billion. The figure is calculated as the excess of termination charges paid over costs, including a normal return on capital employed, in France, Germany and the UK alone. The precise estimate depends on assumptions about costs, but it is clearly substantial.

The effect of this transfer has been to injure fixed customers and their operators, and it is likely to have damaged competition in the fixed market. The beneficiaries have been mobile operators, which in some cases may have shared some of their gains with their customers in the form of lower outgoing mobile prices. The transfer has also distorted competition between fixed and mobile operators.

An optimal policy towards fixed and mobile termination charges will redress the imbalance by setting both on the same basis, eliminating the existing asymmetries between cost-based fixed termination rates and uncontrolled (or loosely controlled) mobile termination rates.

The new European regulatory arrangements permit a range of possible remedies to be applied once a mobile operator has been found to exercise significant market power in the market for termination on its network. These remedies include setting cost-oriented termination rates, as is the case for fixed networks. Regulators may also want to consider imposing a non-discrimination condition, which requires a network to charge the same rate for termination supplied by a mobile operator to itself (for on-net calls) and that charged to other operators, and to require that a mobile operator's retail prices for on-net calls at least cover the termination charges it levies on others. Whether concurrent price control is needed on the retail price of calls from the dominant firm's fixed network will depend upon competitive conditions in retail calls from fixed networks. We do not recommend controlling mobile outgoing prices. These policies will introduce a better balance between the fixed and mobile services, encourage competition in fixed services, promote more efficient pricing throughout the sector, and thus benefit consumers of telecoms services overall.

1 Purpose of the study

The empirical motivation for this study is the persistent high level of mobile termination rates in Europe and the resulting large financial transfers from fixed to mobile networks. The competitive consequences of these transfers are now aggravated by the overall telecoms financial crisis and the increasing head-on competition between mobile and fixed services. Consequently, mobile termination charges now top the regulatory and political agenda, as illustrated by the selected recent (somewhat contradictory!) events in Europe: the UK Competition Commission report in January 2003 which imposed a price cap on UK mobile termination charges, OPTA's decision on fixed to mobile termination overruled by court in April 2003 in the Netherlands, the Administrative Court ruling decision overturning PTS' decision on mobile termination charges in Sweden¹.

More fundamentally, this debate will carry over in the new regulatory regime for telecoms in Europe due to come into force in mid-2003². This framework foresees *ex ante* specific regulation for a set of relevant markets³. The inclusion of mobile termination in this list has led to highly controversial debate, particularly over the adequate scope and boundaries of mobile termination as a separate market. Taking up the distinction introduced in an OFTEL consultation⁴, should we consider: i) a call termination market for each mobile network operator (MNO), ii) one national market for all mobile services, iii) one national market for all termination services (fixed and mobile), iv) different markets for each MNO in the case of fixed to mobile calls, but one national market for all mobile to mobile termination? Each definition relies on a different set of characteristics, and would have different implications for the assessment of market power and the associated remedies that could be imposed by national regulators. The Commission's adoption in its recommendation of the first option is therefore likely to have a crucial impact on the telecoms industry structure and the competitive outcome in Europe for the next decade. In fact, according to ITU, since 1998 the share of the calling opportunities (i.e. total sum of possible connections on communications networks) related to mobile has exceeded 50%. This year, this figure is estimated to reach 75%, while in 1993 it was less than 10%. Accordingly, the share of mobile-related interconnection revenues and volumes has rapidly increased. Interconnection revenues of mobile operators overtook fixed ones in 2000-2001 in France and the UK.

Before going any further, it is worth illustrating the problem with some basic definitions and empirical facts starting with the definition of mobile call termination. It is recognised that while

¹ OPTA and PTS are respectively the Dutch and the Swedish NRA.

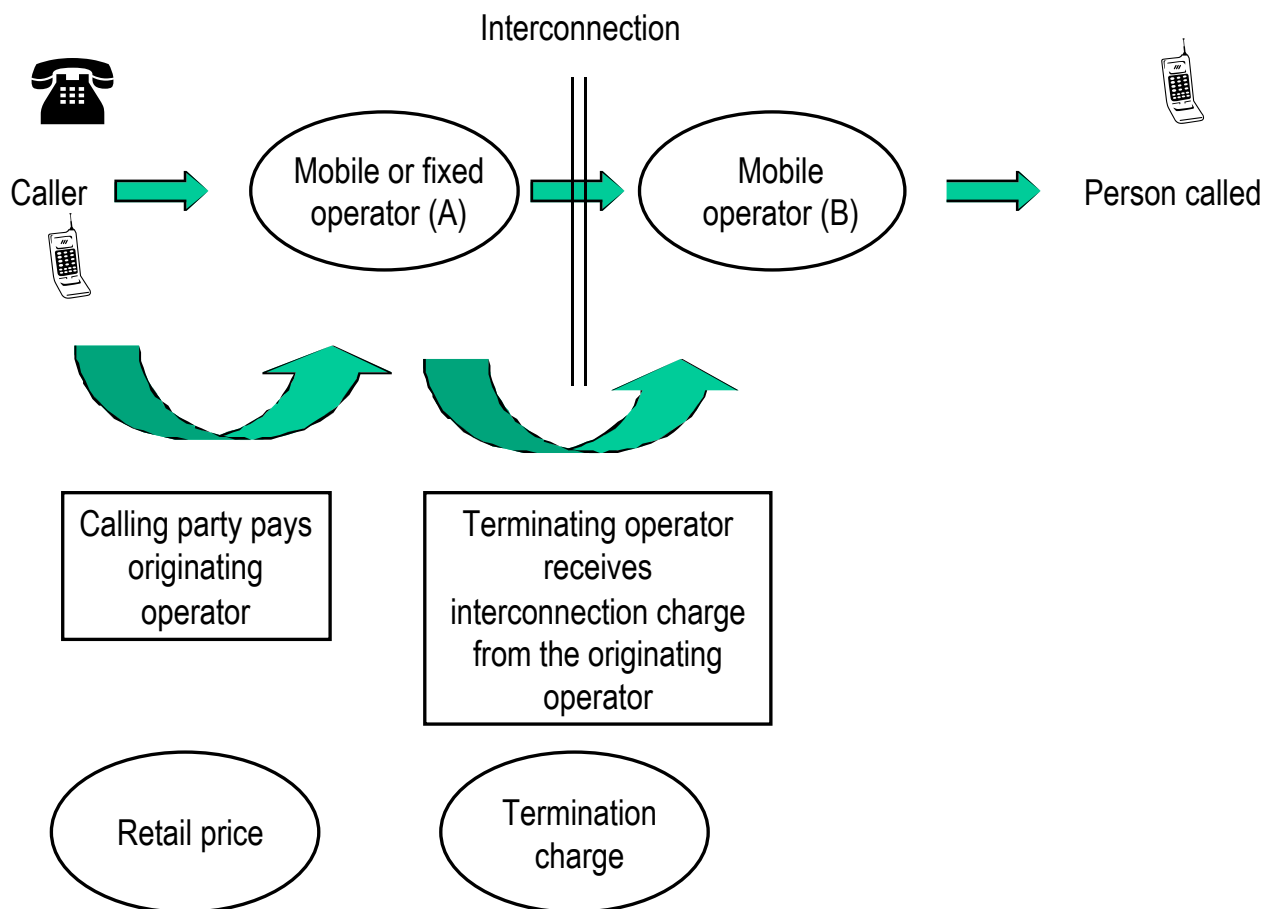
² Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communication networks and services.

³ Commission Recommendation of 11/02/2003 on relevant product and service markets in electronic communications sector susceptible to *ex ante* regulation in accordance with Directive 2002/21/EC.

⁴ 'Review of the Price Control on Calls to Mobiles', Chapter 6 - Market definitions, a consultative document issued by the Director General of Telecommunications (February 2001).

call termination is a wholesale market/service, demand for wholesale call termination in fact derives from retail demand for calls. Mobile call termination is actually a fundamental input to the provision of calls to mobile subscribers. A subscriber to a particular network who wishes to connect to a mobile subscriber will require its originating network to buy call termination from the mobile network used by the called subscriber in order for the call to be completed. Under the 'calling party pays' regime (CPP) common to all European countries, the called network sets the termination charge. In practice, the fixed to mobile termination fee is collected from the call-originating customer by the fixed operator and passed on to the mobile operator.

Figure 1: The CPP (calling party pays) model



There seems to be little competitive constraint on any operator's mobile termination charges and this has led regulators to conclude that there exists a separate market for calls to mobile telephones for each network operator⁵.

We now present some empirical facts about mobile termination:

⁵ This conclusion will be found in various reports, e.g. UK Competition Commission (2003), Commission Recommendation on relevant product and service markets (2003), IRG (2002).

- Mobile termination charges remain high and very uneven between member states. In all but two European countries they are considered well above their cost-oriented level. Consider 1999-2000, a record year in the growth of mobile subscribers that for the first time topped the 50% penetration rate across Europe⁶. The *2000 ITU Survey* reports that the average European fixed to mobile 1999 rate was US\$ 0,21/minute, with Deutsche Telekom (0,24) and Swisscom at the high end. Norway and the UK (0,16) have the lowest interconnection rates and France is about average (0,2). The ratios between fixed to mobile (usually unregulated) and mobile to fixed (regulated) rates thus ranged from a low 8,7 in Norway to a high of 30 in Germany, 32 in the UK, and 34 in France.

- Price distortions (between national and international termination rates) have encouraged the adoption of evasion techniques known as 'tromboning', re-filling domestic traffic from fixed network to a foreign network and then back to the mobile network, or 'sim boxes' converting fixed phone lines within a building into mobile lines, and benefiting from low on-net mobile retail prices. Though there is little available data on the actual extent of this practice, it is a matter of concern for public authorities that 'gateways' result in lower communication quality⁷ and economic inefficiencies (use of two air loops).

- The reduction in telecoms growth rate since 2000 makes the relative shares in voice traffic between fixed and mobile networks much more important than anticipated during the Internet and data boom. Financial valuation of fixed incumbent and mobile operators is directly affected by the associated regulatory variables⁸. For fixed *altnets* (alternative operators) severely affected by the financial market downturn, it has become not only a matter of valuation but also of profitability.

- Data is not bringing all expected revenues, even in mobile telecoms⁹. There is in fact considerable evidence that data services will not constitute the growth engine for mobile operators initially forecasted in the 3G roll-out plans. Therefore, the voice market is likely to be considered in the near future as the main (only?) growth opportunity for mobile operators. As fixed versus mobile competition intensifies, the fixed to mobile termination rate will play an even more crucial role.

The following chart shows the per-minute interconnection charges for fixed call termination on the networks of European mobile operators. Charges are based on a three-minute domestic call at peak rate. Figures have been collected by the NRAs and give the position at August 2002. The simple EU average amounts to € 19 cents per minute. To illustrate the heterogeneity of European situations, we provide two figures for each country, corresponding

⁶ To supplement this historical appraisal, the most recent data on mobile termination charges are presented in Figure 2.

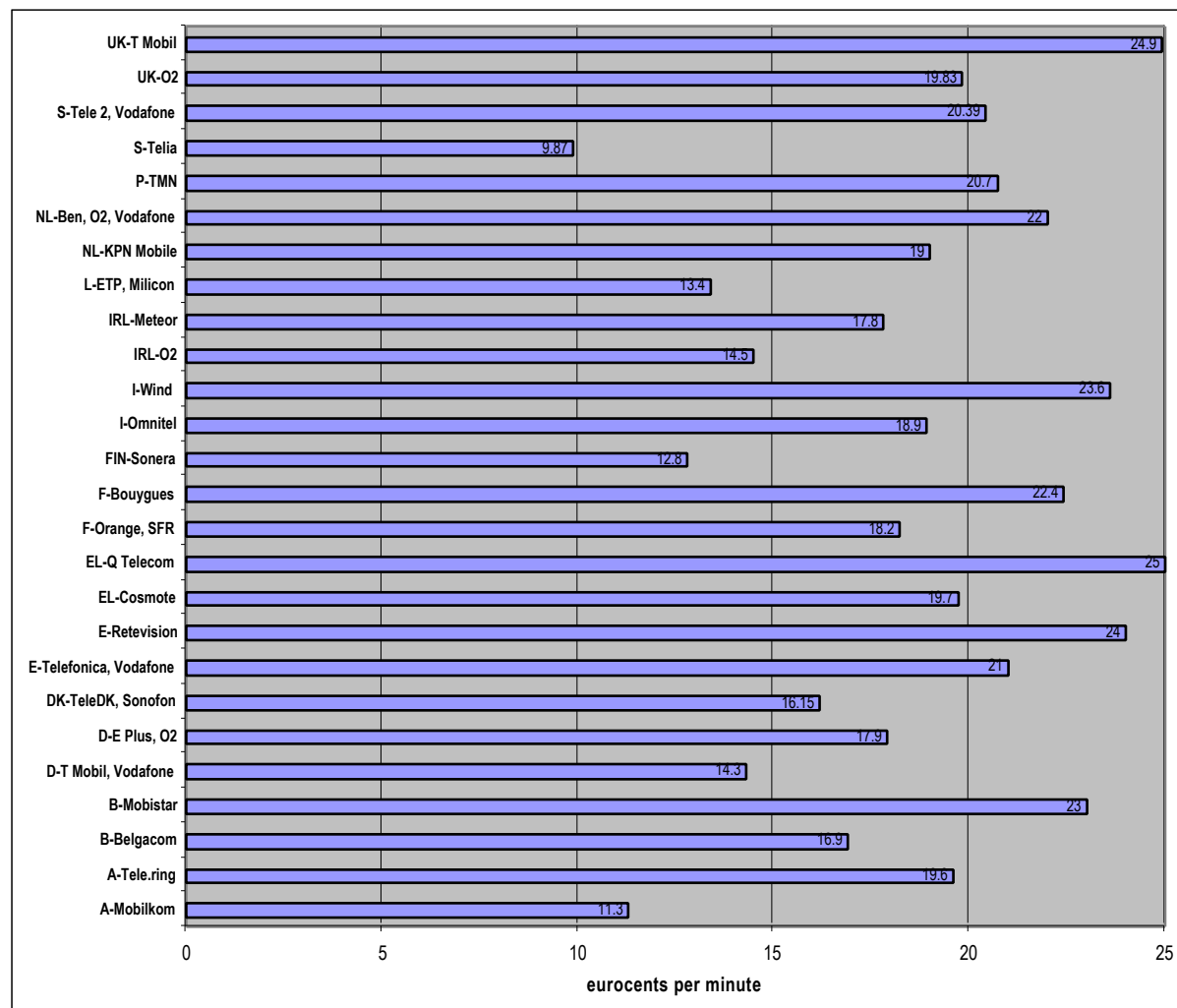
⁷ Such as the loss of calling line identification, longer dialling delays, higher connection failure rate.

⁸ See reports by ABN AMRO: 'European regulation – Friend or Foe' (16 July 2002), 'European regulation – Country profiles' (July 2002).

⁹ See reports by ABN AMRO: 'European cellular bear trap' (9 July 2002), '3G Tsunami: The revolution begins' (16 October 2002).

to mobile networks with the lowest and highest charges (except for Finland, Luxembourg, and Denmark where there are no significant differences and only one rate is mentioned).

Figure 2: Interconnection charges for call termination on mobile networks (peak) in 2002



Source: European Commission, Telecommunications Regulatory Package - VII Implementation Report, Annex I, Corrigendum March 2003, p. 42.

This study aims at to demonstrate and analyse the competitive consequences of high fixed to mobile termination rates compared to low mobile to fixed rates on the European telecoms industry. It then explores possible remedies to draw policy and regulatory Recommendations. Our approach is to consider this issue as a central policy decision, durably shaping the structure and competitive landscape of the European industry. A key lesson learnt from the liberalisation experience is that competition and growth in the telecoms industry primarily depend on regulatory decisions and their practical implementation. Accordingly, the issue of fixed to mobile termination is more than a simple cost accounting story. It is therefore

essential to put things back in the context of the specific historical fixed/mobile relationships in Europe.

A brief outline of the European telecoms liberalisation and its key features will illuminate the present problem and conflicting interests. First, the European process fundamentally involved the creation of a new competitive market for mobile services. Entry was encouraged and achieved in practice through the allocation of frequency spectrum. Such a specific process has had long-lasting effects on the nature of new firms entering the industry, the structure of their network investment, and the associated assets. Following the dramatic growth of mobile telephony penetration rate in 1997-99, this has led to the creation of a powerful European GSM industry (both on the service and equipment sides). However the mobile industry had little interest in investing in fixed networks. In the late 1990s, the lack of incentives in European fixed networks, combined with other factors, led to a gap in backbone capacity: quite paradoxically, data packets had then to be routed through the US before being delivered back to EU servers where the US-centric Internet acted a world data hub. The 1998 liberalisation allowed new investors to develop fixed networks in order to fill the gap and to increase competition in infrastructure and data services. Between 1998 and 2001, tens of billions of euros were spent in the EU fixed networks, a significant fraction by non-European investors.

This historical sketch exemplifies a crucial lesson from the liberalisation experience: regulatory decisions affect not only the competitive environment, but also directly the industry structure and its composition. Therefore, beyond a common generic objective (market efficiency through competition), one has to consider regulatory choices as a cumulative process, shaping a specific 'path'. Another key institutional element to consider here is that there is no single EU-level telecoms regulator, but generic EU Directives, which are transposed into any member state's telecoms law, and then implemented and enforced by the national telecoms regulatory authority (NRA). Therefore, while the European Commission is in charge of monitoring and, in the last resort, enforcing the implementation of the regulatory framework, the power of decision remains largely in the hands of national regulators. Hence, the wide and persistent heterogeneity across member states in the European Union, illustrated in the above chart on termination rate dispersion.

Five years after 1998, the deployment of fixed infrastructure has dramatically slowed down and business models for data services appear precarious. The high valuation given to mobile networks has led to ruinous overbids for 3G licences, amplifying the crisis in data service models. However, voice remains the current leading profitable telecoms application. In terms of revenues and profits, the mobile sector has now overtaken the fixed sector. It is significant that, in spite of the ONP (Open Network Provision) Directive 97/33/EC of the European Commission, GSM is still being subsidised through interconnection fees. Moreover, the additional spectrum granted through 3G licences will further increase mobile networks' voice capacity. More than ever, competition in EU telecoms opposes fixed and mobile operators.

This situation currently raises a set of important issues, both at national and EU levels:

How mobile termination charges shape the dynamics of the telecom sector

- What is the real magnitude and evolution of transfers from fixed to mobile networks associated with call termination? Can they be justified from an economic or social welfare perspective?
- What is the associated impact on competition in the telecoms industry? How does it affect prices, quality, incentives and investment in fixed networks?
- What remedies are required at national and/or European level to put right the identified distortions and restore a level competitive playing field?

The framework of this report is as follows: section 2 specifies the theoretical background of the study. Section 3 outlines the various relationships between fixed and mobile networks (interconnection, externalities, competition). Section 4 presents case studies on the setting up of termination rates and the implementation of the ONP Directives by the British, the German and the French NRAs. Section 5 presents a model for estimating transfers between fixed and mobile networks and the corresponding results for France, Germany and the UK between 1998 and 2002. Section 6 then considers the overall effect of these transfers on competition, industry structure and economic welfare, with a specific assessment for the following parties: consumers, mobile operators, fixed operators (distinguishing between integrated incumbents, fixed incumbents and alternative operators), and governments. In addition, we examine the possible changes brought to this picture by 3G networks and services. Finally, section 7 develops the regulatory and policy conclusions on mobile termination rates, including possible remedies within the framework of the new European regulatory arrangements for electronic communications services scheduled to come into effect on 25 July 2003. In particular, three key remedies are considered (prohibition of discrimination, cost-oriented pricing, price control) and the impact of various combinations of remedies on the relevant parties is assessed.

2 Approach of the study

The reference point of our analysis is the outcome of the competitive process in the mobile industry which leads to certain pricing behaviour of MNOs when setting rates for calls terminating in their respective mobile networks. What are the constraining factors MNOs have to take into account when setting termination rates: competition from other MNOs, the behaviour of FNOs as buyers of termination services or fixed or mobile users' behaviour? Are these constraining factors so strong that the market outcome has to be viewed as a competitive market result? Analytically this reference point is, of course, one without any regulation of termination rates.

There is general agreement within the economics and regulatory literature that under CPP arrangements MNOs hold a monopoly position in delivering calls to their subscribers. The calling party in the fixed network pays for the whole call under an arrangement where the

FNO pays mobile termination to the MNO and collects the charge for the whole call from its own subscriber.

Despite this general acceptance of the monopoly position of MNOs in delivering calls, there are two areas of disagreement among economists. Some economists and, of course, the MNOs argue firstly that they are unable to extract monopoly profits from that position due to the buying behaviour of mobile subscribers, and secondly that even if MNOs are able to extract monopoly profits from mobile termination rates, these profits are eliminated in the sector due to vigorous competition in the mobile retail market. These profits are then used to keep other parts of the product portfolio, e.g. handsets, cheap or even below cost.

The relevance of the first argument depends on the degree to which demand-side substitution puts constraints on MNOs in pricing call termination. This raises several issues. Retail prices of fixed networks could have a constraining effect on termination charges. If, for instance, the price of terminating calls were raised, the calling party, who pays directly for the charge through his retail price, could switch to calling that person on a fixed line instead of the mobile line or to use a SMS service instead of making the call. Another possibility is to arrange or request the called party to call back. These possibilities do certainly exist, but they are not representative of normal customer behaviour. Therefore, we believe that the constraining effects due to these possible demand-side substitutions on pricing for termination are small. This evaluation is supported by empirical data presented by the CC in the UK.

Further competitive pressure on termination charges may arise from the reaction of mobile subscribers towards termination charges. If, for instance, mobile subscribers value receiving calls, they may regard the price of incoming calls as one of several factors to consider when making the decision to subscribe to a particular MNO. Their decision to become subscribers would then depend to some extent on the level of termination charges in that network. If the effect is sufficiently strong, users might even be persuaded to change their network. A survey commissioned by the UK CC suggested that, as an empirical matter, the strength of these effects is limited, although they do exist. Mobile users are not very responsive to the cost of incoming calls. Bouygues Telecom for instance, tried to improve its competitive position by lowering termination rates for a few months. It retracted this policy, however, when it recognised that no increase in volumes resulted: elasticities were small or close to zero.

Our general conclusion on this point is that theoretically, demand-side substitution could constrain monopoly profits on termination. How strong these constraining effects actually are remains an empirical question. Empirical evidence on customer behaviour so far suggests that these constraining effects are relatively weak. The current price-cost-margins on termination charges provide further evidence of the weakness of demand-side and supply-side substitution.

A second argument is sometimes made that high termination charges are justified by Ramsey pricing considerations. Under Ramsey pricing, mark-ups over marginal costs are inversely proportional to the own-price elasticity of demand for that service. Ramsey mark-ups are high for a service with low elasticity of demand as is the case for termination charges

where users have limited opportunity to react to higher prices, and low for services such as outgoing mobile calls, for which demand is said to be more price-elastic. Such pricing structures minimise welfare losses due to deviations from marginal cost pricing necessary to finance joint or common costs.

The outcome of Ramsey pricing is quite different from that of monopoly pricing, where a mobile operator extracts maximum profits from termination, not just enough to break even overall. Hence Ramsey prices do not emerge from the market process but have to be set by the regulator, in a process which involves estimating the own-price (and cross-price) elasticities of mobile services. This is difficult or impossible to do.

Secondly, the partial application of Ramsey pricing principles when markets are interdependent leads to inadequate and even counter-productive results. Any relevant application of Ramsey pricing principles in the fixed to mobile market environment requires optimisation across both markets.

Hence, for both theoretical and for practical reasons we have doubts about the relevance of applying Ramsey pricing principles to establish certain levels of termination charges. Long-run incremental costs, plus relevant mark-ups for network related joint and common cost, are a more appropriate starting point for determining both termination charges and the scale of transfers from the fixed to the mobile sector.

3 Relationship between mobile and fixed networks

3.1 Interconnection

This section sets out some of the basic economic features of interconnection of fixed and mobile networks. The essence of interconnection is the provision of 'any to any' service: a customer of any network can communicate with a customer of any other network. This clearly enhances the value to consumers of telecoms services as discussed in section 3.2. below.

While the public interest motive for interconnection is strong, individual operators may view it in a different light. Where two networks are vying for customers of the same service, the commercial benefits of interconnection accrue principally to the smaller network: its customers benefit more from the larger range of communication possibilities made available. As a result, some networks find it to their advantage to refuse, delay or otherwise impede interconnection, when it is mandated by regulation. A large network may also seek to foreclose entry by charging high interconnection prices which eliminate or weaken smaller competitors for the same pool of retail customers. In addition any network will, other things being equal, benefit from high interconnection charges which enhance its revenues.

The principles that firms adopt in setting interconnection charges depend on how retail prices are set. Under the worldwide system for setting prices for calls on fixed networks, and the regime for charging for mobile calls outside North America and a few other countries, the calling party pays. This is known as the CPP principle. The caller's operator buys interconnection from the receiving party's operator. Because the receiving party's operator controls the bottleneck required for the call to take place, it may exercise market power — absent alternative means of making the connection — and impose high termination charges without choking off the call. Under the alternative receiving party pays (RPP) principle, the receiving party would pay her own operator for termination of the call on her own network, and choose her operator on the basis of a combination of charges for receiving calls and outgoing call charges.

The operation of CPP for mobile networks in Europe has led the European Commission to include in its Recommendation on relevant markets, eligible for *ex ante* regulation if dominance is found, the call termination service of any mobile operator however small. More precisely, the Commission's Recommendation identifies mobile termination on any network as a market in relation to which NRAs must establish whether dominance exists. Since, by definition, a mobile operator will have a 100% market share of termination on its own networks, it is highly likely that the condition will be met. The NRA will therefore be required to impose one or more remedies. We consider what remedies in Section 7 below.

Thus, looking forward, there is likely to be a greater uniformity in the regulation of fixed and mobile interconnection, especially termination services. At present, however this does not always apply, and fixed and mobile termination rates are treated differently. Although networks of both kinds have an obligation to negotiate on interconnection, the basis on which they supply interconnection services is quite different. Accordingly, we first discuss interconnection of fixed networks, and then mobile termination.

3.1.1 Fixed interconnection

Interconnection between fixed networks occurs at points of interconnection (POI) where calls can be passed over from one network to the other. This may occur at various levels in the hierarchy of each network, depending upon the business plans of the parties concerned. Typically, a fixed telephony entrant, with limited coverage (e.g. a cable company servicing a particular set of homes, an operator providing services in a central business district, or a facilities based international operator) will be interconnecting with an historic monopolist with a ubiquitous network. In these circumstances, the tier in the latter's hierarchy at which calls are handed to or from the incumbent is determined by the competitor's investment decisions.

In view of the incumbent's incentive to set interconnection charges at high levels, regulators have found it necessary to intervene in setting the incumbent's interconnection charge, and also in mandating the range of interconnection services which must be made available. Under the terms of the 1997 Interconnection Directive, charges set by fixed or mobile

operators with significant market power¹⁰ (SMP) must be cost-oriented. In terms of implementation, a variety of methods were developed for setting interconnection rates:

- The use of cost models, based either on historic cost, or – preferably – forward-looking long run incremental cost (LRIC), as estimated using either a ‘top down’ model, based on management data, or a ‘bottom up’ engineering model.
- Where cost data were not available, the use of a benchmark provided by the European Commission reflecting the average of the lowest three rates employed in the European Union.

Competing networks’ rates were typically based on a ‘reciprocity principle’. In some countries they were effectively set equal to the rate determined by the regulator for a functionally similar service provided by the incumbent. In others, a consensus emerged within the fixed sector in favour of prices based on reciprocity.

As a result of this process, fixed interconnection rates have been, directly or by proxy, set equal to cost, defined to include a reasonable return on capital employed and a contribution to network common costs. Exceptions occur where the interconnection service in question is found to be competitive and hence not to require regulation, as may occur in the case of a range of transit services. Fixed termination rates are not treated in this way, as they are not competitive.

Although the examples of competing networks given above are of fixed networks, the same charging mechanism operates when a call on a mobile network is handed over to a fixed network. The charge depends on the interconnection service required by the operator and is the same for a mobile as for a fixed network.

3.1.2 Mobile termination rates

A call to a mobile is handed over to the appropriate mobile network, which keeps a record (constantly updated) of the location of its active handsets and directs the call appropriately. The price of mobile call termination was not initially regulated in the European Union. Instead, in the case of fixed to mobile calls, a negotiation took place on an operator-to-operator basis, facilitated in many cases by the fact that the mobile operator was in the same group as the fixed incumbent. The fixed operator was then able to factor the agreed rate into its retail charges for the call. In the case of the fixed incumbent, that price was sometimes subject to regulatory control, either individually or as part of a tariff basket. Other operators were then constrained in their retail pricing of fixed to mobile calls by the competitive pressure imposed by the incumbent’s offering. In some member states the price of fixed to mobile calls was unregulated.

¹⁰ Under the 1997 Directive, SMP in this context means having a market share of 25% or more of the relevant pre-specified market.

Under an alternative variant for pricing fixed to mobile calls, adopted in some European countries but now superseded, the mobile operator set the price of fixed to mobile calls, paying the fixed operator a pre-established 'retention'.

There thus arose, in the case of interconnection between fixed and mobile operators, a negotiation framework in which the fixed operator's rates were determined but the mobile operator's rates were not. The latter was thus able to set a rate which used whatever market power it enjoyed in call termination on its own network. The development of rates in France, Germany and the UK can be interpreted in this way, as we show below.

Fixed to mobile termination rates above cost would not necessarily lead to excessive profits by the mobile operators. If the outgoing mobile marketplace (comprising the provision of a handset, connection and access fees and call charges) were very competitive, mobile operators might choose – even be forced – to maximise their profits on call termination to compete in the outgoing mobile market. For the purposes of our analysis, however, the key point is that even in this case, fixed network customers, through their operators, would be paying elevated termination charges to mobile operators.

The situation described above emerged from the asymmetrical nature of termination rates or fixed and mobile networks – regulated in the former case, unregulated in the latter. In recent years European regulators have gradually sought to redress the balance by setting mobile termination charges on a cost-oriented basis, or by agreeing transition paths with mobile operators.

The situation with respect to termination charges for calls from other mobile networks is different in a significant way. Each operator has to buy the same termination service from the other, and this would be taken into account in agreeing rates: a high demand on one side would likely be met by a high demand on the other. If the reciprocal flow of calls were balanced (which would occur, for example, if mobile subscribers on each network made the same volume of calls and had an equal probability of calling any other mobile subscriber, irrespective of which network that subscriber were on), payments in either direction would cancel out. In these circumstances the parties might find it efficient to agree to set charges equal to incremental cost. This result would not apply if flows were not balanced, as the operator with more incoming calls would seek a higher agreed rate than its partner. In reality, mobile operators in many member states are not able to discriminate in setting termination rates between fixed and mobile operators. In such cases, the high fixed to mobile rate carries over into mobile to mobile rates. Elsewhere, mobile and fixed operators pay different rates. Most notably, French mobile operators adopt the so-called 'bill and keep' system, under which one mobile operator makes no termination payment to another.

Finally, an on-net mobile call (on the same network) like an off-net call (involving two mobile networks) also requires call origination and termination. If an operator implicitly charges itself a lower termination rate than it charges other fixed or mobile operators (for example, by charging a retail price for an on-net call which is less than the charge for call termination which levies on another operator), it will be practising a form of discrimination with respect to termination rates. This may be objectionable from a competition law or regulatory standpoint.

How mobile termination charges shape the dynamics of the telecom sector

What emerges from this discussion is the very different approach to interconnection adopted until recently to fixed and mobile termination. Fixed rates are determined by the regulator on a cost-oriented basis. Mobile rates are not generally controlled on a cost-oriented basis, even though NRAs have the power to do so if the operator has been designated as having SMP in the national market for interconnection. This regulatory asymmetry has led to an imbalance in mobile to fixed and fixed to mobile termination rates, carried over into retail prices, which has had major consequences for the development of the sector as a whole.

3.2 Network and call externalities

Telecoms networks and services are usually characterized by two types of externalities: network externalities and call externalities.

Network externalities do exist, when the willingness to become a subscriber to a certain network depends on the subscription of other users to the same network. One reason to become a subscriber relates to the ability to communicate to certain other users. In microeconomic terms: the utility functions of network users are interrelated. In a microeconomic less precise but empirically and statistically plausible and pragmatic way, network externalities are usually defined as follows: the more subscribers join a network, the more valuable subscription becomes. More people can be reached and contacted than before. New subscribers decide to join the network because there is a larger number of people to whom they can make a call and from whom they can receive a call.

This effect does not only hold for one particular network. It is also valid over and above a number of networks, if these networks are interconnected to each other such that subscribers of one network can communicate to subscribers of the other network. This relationship is one of the reasons for mandatory interconnection, namely to maximise the value of communication opportunities for a great community of users. Not taking care of externalities within the pricing regime would imply to reach a socially suboptimal network size. In other words, there is a welfare loss of not internalising the network externality effects.

These effects are called externalities because they do not generally enter into the decision of a particular user to become a subscriber, unless the pricing regime is adopted to take account of these interdependencies.

There is another important externality in telecoms related to calls, which is often neglected although it has a high degree of relevance in our context. Normally both the calling and the called party derive utility from communicating to each other¹¹, and not only the calling party. If the general pricing principle of calling party pays is applied, it is only the welfare of the calling party which defines the willingness to pay for a particular call. In that sense, there are call

¹¹ In a more general formulation, the utility of a called party to receive a call may be negative. This, however, does not change the overall structure of interrelated utility functions in relation to calls and the existence of externalities.

externalities, which imply that the number of calls is less than would be appropriate according to normal welfare standards. The usual communications pattern and behaviour already internalise a great deal of call externalities. Communications normally is not a one-way-road. The more people communicate to each other, the more probable is the outcome that the number of calls from both sides is close to equal, which roughly internalises the externalities associated to their calls totally. Insofar as that is not the case, the pricing system may improve welfare. For our case, Armstrong (2002) has derived the following result: if mobile subscribers derive a benefit from incoming calls, then termination charges should be set below cost in order to encourage calls from the fixed networks. Unregulated operators, however, will price termination charges in excess of the socially optimal level.

The problem or issue of call externalities may also be solved by the pricing principle itself. In some countries, e.g. the United States, mobile users pay for the mobile component of calls which they receive under the receiving party pays (RPP) principle. Calls from the fixed to the mobile network are charged at normal fixed network tariffs and the called mobile party makes a payment, which is closely related to the mobile termination rate to the mobile operators. A similar pricing principle is being applied for mobile international roaming calls in Europe. To reach a mobile user who is currently roaming in a different country, the calling party only pays for a national mobile call and the called mobile user pays the charges for using the foreign network. Although the general application of the RPP principle solves SMP problems related to mobile termination charges, it has some other unwanted implications, which make it less attractive as a general pricing principle. First, there would be a relevant degree of confusion and disruption on the side of customers when end-to-end pricing no longer prevails and the calling party pays parts of the cost of a call and the receiving party pays the other part. A relevant group of mobile customers would switch off their phones to avoid paying for potentially unwanted calls. This behaviour could lead to a socially sub-optimal level of using mobile services and to a slow-down of volume growth in the market. Such effects can be observed in the US where the RPP principle is generally applied for mobile calls. If the called party pays for the call termination, however, mobile operators can no longer make use of their market power in delivering calls to their customers.

What are the implications of network externalities and how can these effects be internalised to reach the socially optimal levels of penetration? Existing subscribers benefit when new subscribers decide to join the network (or decide not to leave the network), some type of subsidy for new or more precisely, for marginal users may be a good means of reaching the optimal level of penetration. The idea behind any kind of externality surcharge is to provide a subsidy to encourage marginal (non-)subscribers to become subscribers and to encourage marginal subscribers to remain on the network. It is not only the subscribers of a particular mobile network who benefit from the stimulated growth in the number of subscribers. It is also to the benefit of subscribers of other interconnected networks. In particular, fixed network users benefit from higher mobile subscription as they can reach more users and call them or be called in situations when that would otherwise not be possible. For this reason it seems to be appropriate and efficient that fixed network users also participate in the cost of subsidising the access of mobile customers and not only mobile users. Because any subsidy is associated with a dead-weight loss, there is an optimal situation with regard to subsidising

access. According to Armstrong (2002) the optimal level of subsidies is reached when the external benefit to fixed subscribers of a marginal increase in the subsidy to mobile subscribers is equal to the dead-weight loss incurred. The policy implication of this is that the goal is not to maximise penetration but to find the optimal level.

We can observe similar considerations in the growth policy of MNOs. Up to 2000-01 the MNOs aimed to maximise subscriber numbers. Then they noticed that the customer acquisition costs of a significant number of new subscribers did not outweigh the profits to be made by calls from and to these customers over a relevant customer lifetime. Therefore they refocused their growth policy, reduced subsidies and some of them saw the number of subscribers fall. They changed their growth policy from maximisation of subscriber growth to optimisation and maximisation of profits. This suggests that we might have had a higher than optimal level of mobile penetration at that time.

The network externality has been internalised in the mobile industry by subsidising mobile handsets, for example by giving them to subscribers free of charge. Handset subsidisation as applied by MNOs is not only a means of getting marginal (non-)subscribers to the network, it is also used to keep customers tied to a particular mobile network; in this capacity, handset subsidisation is a competitive instrument which has nothing to do with getting welfare optimal levels of penetration. There are even indications of an economic waste of resources associated with this type of excessive subsidisation of equipment.

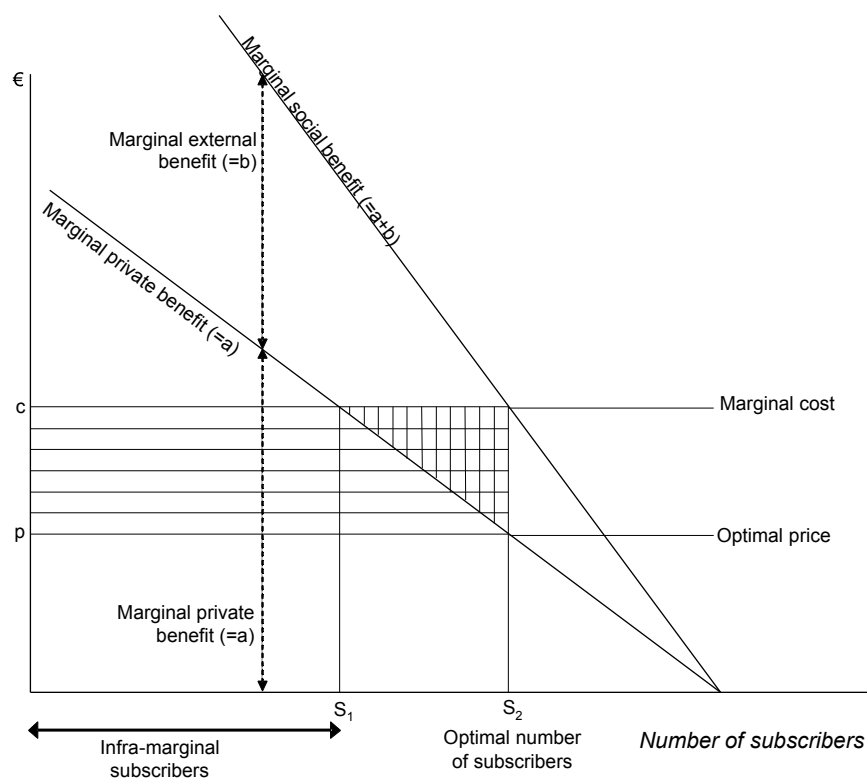
To internalise the benefits of fixed network users from a high mobile penetration, it is optimal to set the termination charges above cost to a certain degree. Higher termination charges enable MNOs to subsidise handsets and therefore to increase mobile subscription. However, according to Armstrong (2002), the optimal termination charge (taking care of network externalities) is still lower than the unregulated charge.

Mobile networks, as well as other telecoms networks, are characterised by network and call externalities. If network externalities prevail, access to the network should be subsidised in an efficient manner to internalise those effects. Handset subsidies in mobile networks partially fulfil this function. Fixed network users may contribute to that subsidy by paying termination charges above costs. On the other hand, termination charges below cost help to internalise call externalities.

Are the effects of network externality measurable? The answer to this question is important, because any regulatory approach to take care of externalities in the pricing system requires appropriate and reliable quantification. If for instance, the effects of network externalities are small and the method of quantifying them is arbitrary, then it would be preferable for the regulator to ignore the effect to avoid distorting pricing structures.

The analytical concept of the network externality and its (potential) measurement can be illustrated by the following graph being used by OFTEL and the Competition Commission¹² in the UK.

Figure 3: Network externalities and subsidies



Source: OFTEL.

The private benefit of each new subscriber derived from their joining the network is shown as the 'marginal private benefit' line. It is the classical downward sloping demand curve for network access. If the price of joining the network equals the marginal cost c , everyone up to s_1 will become a subscriber. If no externalities were present, s_1 would also represent the socially optimal number of subscribers. The value existing subscribers attribute to the addition of new subscribers is represented by the dotted line 'marginal external benefit'. The marginal social benefit of new subscribers for the economy as a whole is represented by the curve summing up marginal private and external benefits. In this case of externalities the optimal number of subscribers is at a level where the marginal social benefit and the marginal cost of subscription are equal. To reach the socially optimal number of subscribers prices have to be subsidised. If MNOs cannot discriminate in their pricing among customers, the maximum amount of subsidy S_{Max} is required:

¹² See Competition Commission (2003), Sec. 8.100.

$$S_{\text{Max}} = (c-p) s_2$$

In this case all subscribers including the infra-marginal ones receive the same below-cost-price. If subsidisation can be limited to marginal subscribers only, then the minimum subsidy level S_{Min} would be

$$S_{\text{Min}} = (c-p) (s_2 - s_1)$$

Minimum subsidies require perfect price discrimination such that each person gets exactly that amount of subsidy necessary in order to make him a subscriber.

Although the scenario of perfect discrimination is unrealistic in the real world, it is also not appropriate to assume that no opportunities for price differentiation do exist.

OFTEL as well as the Competition Commission (CC) have tried to quantify the mobile network externality effects¹³ using the microeconomic foundation set out above. CC estimated that the externality surcharge capable of internalizing the measured externality effect should be € 0.165 cent per mobile originating and terminating minute. This surcharge would generate a level of subsidy sufficient to induce on to the network all marginal existing and non-subscribers. This surcharge corresponds to a level of subsidy of €35 per marginal subscriber. If perfect discrimination were possible, the surcharge would be half of that level, namely € 0.08 cent per minute. The CC recalculated its own figures based on average handset discounts of €53 for 3 million current marginal subscribers to yield € 0.6 cent per minute as its best estimate.

The CC's calculations rest on a number of fairly arbitrary assumptions. The final numbers are very close to what MNOs were spending to acquire each new customer. Although the level of the surcharge (€ 0.6 cent per minute) seems to be low, it may still overestimate the externality effects for the following reasons:

- There are other means by which customers directly internalize the externalities which have not been taken into account.
- Even in the case where there are no network externalities, companies normally have customer acquisition costs.
- The effects measured by the CC are partially due to MNOs' efforts to prevent marginal subscribers from churning to other networks rather than keeping them as mobile subscribers.

We have discussed so far the network externality effects with regard to mobile subscription. There are also network externality effects associated with fixed network subscription. For decades they have been the reason for subsidising access from call charges. Due to liberalisation most telephone companies have to a great extent rebalanced their rate

¹³ See Competition Commission, Sec. 8.108ff.

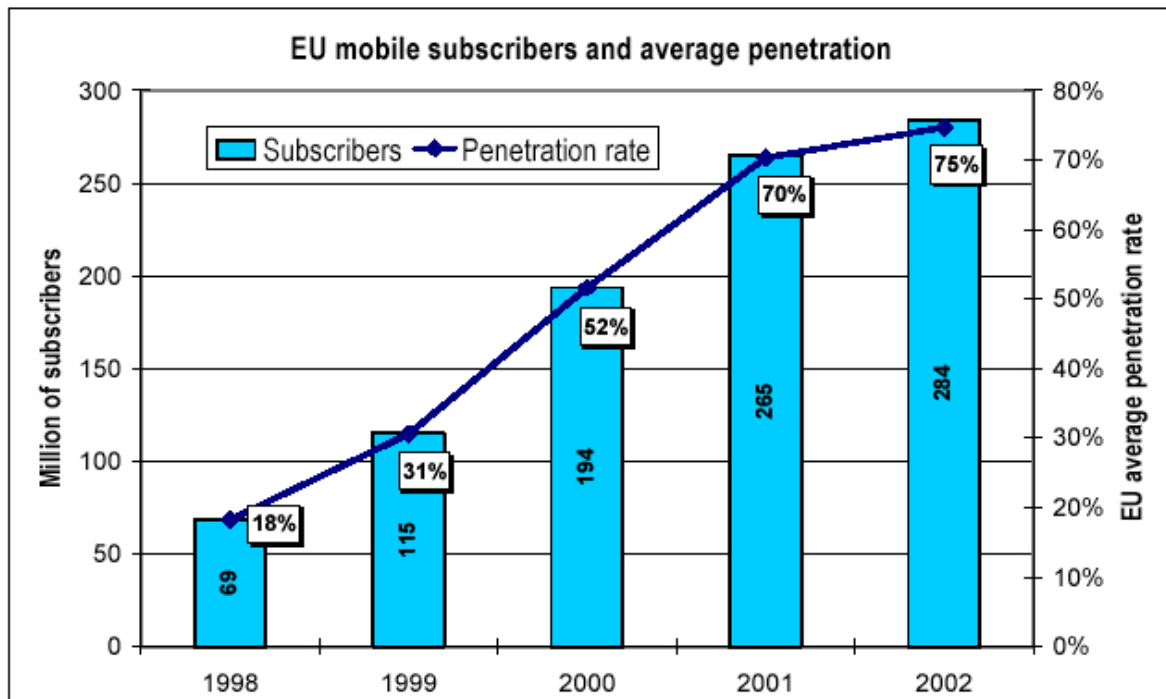
structures such that access is charged at a cost-based level. At the same time we can observe a gradually increasing trend to substitute fixed access lines by mobile subscriptions. These substitution effects can be observed all over the world; only the degree of substitution is at a different path and level. What does that mean in the context of network externalities? Mobile penetration in Europe has reached around 75% of population, whilst fixed line penetration is approximately 95% of households. Because of the different communication situations of using a mobile or a fixed line connection, these penetration rates cannot be compared directly. But overall the figures already indicate a higher penetration rate for mobile than for fixed networks on the basis of personal communications. Given the increasing trend for substitution in favour of mobile networks, network externalities should be more of a policy concern for fixed networks than for mobile networks. If that is the case, regulators should have less rationale to tax fixed network users (via higher termination rates) in favour of increasing mobile penetration at levels which are already higher in mobile than in fixed networks. Furthermore, taking account of network externalities for one type of network whilst ignoring it in another distorts competition between these two types of networks. Looking at all these effects and tendencies together, the best advice to regulators would appear to be to tax neither fixed network users for network externalities in mobile networks, nor to tax mobile users for network externalities in fixed networks, until the future trends in substitution between mobile and fixed networks become better understood.

3.3 Competitive situation between mobile and fixed networks

Mobile and fixed networks compete because mobile and fixed calls are partly substitutable. However, the interconnection regimes (inducing retail tariffs) applied to each type of network are radically different.

While many factors influence new users' choice of fixed line (voice, Internet dial-up and fax), competition between fixed and mobile networks remains focused on voice. One noteworthy observation is that mobile subscriptions substitute for fixed subscriptions whilst the reverse is less common.

Figure 4: EU mobile subscribers and average penetration



Source: European Commission, Telecom Regulatory Package – VII Implementation Report, Annex I, Corrigendum, March 2003.

The second important aspect is that fixed networks pre-existed mobiles and that the penetration of mobiles has been achieved through the creation of strong network externalities. Those externalities have contributed to an increase in overall voice traffic, but when the number of mobiles has overtaken the number of fixed lines, they will have also amplified fixed to mobile substitution. This trend is confirmed by recent academic research showing that besides complementarity, i.e. simultaneous growth in both the fixed-line and mobile networks, network effects in mobile subscription induce a significant substitution effect¹⁴.

Table 1A shows the evolution of the main telephony market indicators in France. The number of mobile subscribers is multiplied by six between 1997 and 2001, which indicates a strong dynamic of externalities. In 2001, while the number of mobile subscribers stabilises, the volume of fixed minutes starts to decline. As a consequence of this substitution, the share of fixed to mobile minutes in the fixed traffic jumps from 4.7% in 1999 to 9.6% in 2002. This trend is also reflected in UK figures.

In other words, the mechanical effect of mobile penetration is an increase of the fixed to mobile traffic. When fixed voice traffic stagnates or declines, the increase of the share of

¹⁴ Gary Madden and Grant Coble Neal (2003): 'Economic Determinants of Mobile Telephony Growth'. Forthcoming in *Information Economics and Policy*.

fixed to mobile in fixed voice traffic highlights the substitution effect. This, of course, strongly impacts the financial ratios of the FNOs (see 6.4).

Table 1A: Evolution of fixed and mobile voice domestic traffic in France

Year	Fixed-originated minutes ¹		Mobile-originated minutes ²				Total fixed lines ⁴	Mobile subscribers ³
	Total Fixed Calls ¹ Volumes ²	Fixed to mobile ²	Total Mobile to mobile ²	Mobile-to-fixed ²	On-net mobile ²	Off-net mobile ²		
1998	119.3	3,8	10				33.86	11.2
1999	118.8	5.6	20,6	11.8	4.9	3.6	33.89	20.6
2000	117	7.7	35,6	16.3	11.7	6.8	34.08	29.6
2001	114.5	9.4	44,3	17.7	16.1	9.6	34.07	37
2002	108.2	10.4	51.8	18.7	20.7	11.9	33.99	38.5

¹ Internet not included, ² in billion minutes, ³ in millions by end of year, ⁴ in millions by end of year without public phones, ⁵ extrapolated from FT mobile outgoing volumes. Source: ART.

Table 1B: Evolution of fixed and mobile domestic voice traffic in UK

Year*	Fixed Minutes ¹ Volumes ²	Fixed-to-mobile ²	All mobile minutes ²	Total fixed lines ³	Mobile subscribers ⁴
1998/99	176.7	5.6	14.09	33.0	14.9
1999/00	167.9	9.0	24.6	34.3	27.2
2000/01	172.6	12.1	36.9	35.3	43.4
2001/02	172.6	13.6	44.7	35.7	46.31
2002**	122.4	11.0	38.4	35.1	49.9

*Years run from 1 April to 30 March. **1 April 2002-31 December 2002 (9 months)

¹ Internet not included except for 1998/9, ² UK calls in billion minutes, ³ in millions by end of period without public phones, ⁴ in millions by end of period. Source: OFTEL.

Empirical substitution between fixed and mobile phones is a complex matter involving many parameters and strong demographic differences¹⁵. For the ease of the analysis, we will retain three substitution factors: convenience, quality and price. However, the competitive positions of fixed and mobile phones have not been constant over time. Fixed and mobile operators have built their differentiation strategy upon these characteristics.

3.3.1 Convenience

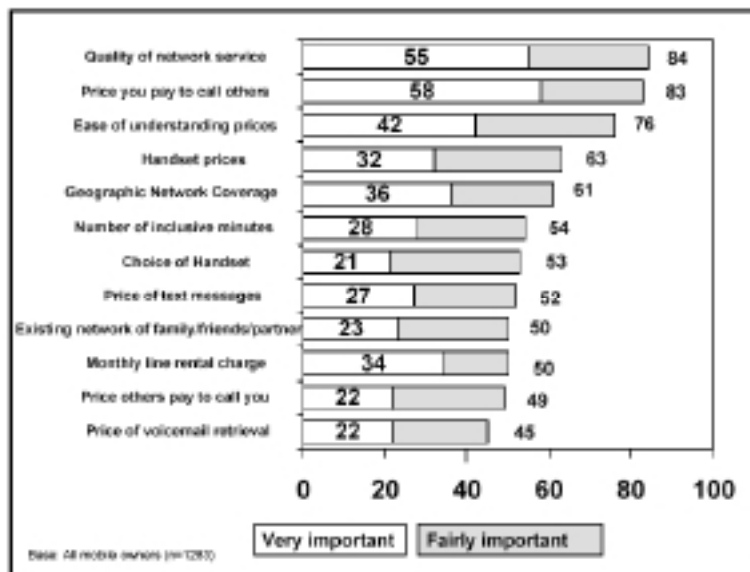
Convenience lies primarily in mobility. It is the function that has allowed mobile telephony to develop as a separate market through GSM networks. This function includes the possibility to be voice-mailed on the same number everywhere at any time. However, competition on mobility has pushed the fixed networks to promote cordless phones to provide portability, i.e. mobility within the buildings. The mobility function therefore applies uniquely to calls from outside the home or offices.

Moreover, mobility yields greater privacy. This is another convenient aspect of a mobile phone. While a fixed line is attached to the premises, a mobile phone is attached to a private person. It means, that calling a mobile is calling a person, and that the phone handset can be customized to offer greater convenience to the private owner: for example, greater autonomy (through battery improvement) allowing more extensive use, and memory capacity, enabling the handset to include more and more PDA (Personal Digital Assistant) functions.

Thus, handsets have become personal data terminals with easier keyboard functions (enabling the growth of the SMS market) and the capacity to pre-programme an increasing list of phone numbers. This service has been adapted to accommodate the increase in phone numbers following the increase of mobile subscribers and the churn of those, often to get more powerful handsets. A BMRB report states that the 'choice of handset' is, on average, very important or fairly important to 53% of mobile consumers. But for the youngest of them (aged 15-34), the figure is 68%. One consequence is that, when dialling from a fixed line, it is common to use the number saved on a mobile handset. As users increasingly take advantage of the functions of their mobile handset, fixed handsets appear less and less convenient by comparison.

¹⁵ The appendix 6.2 to the Competition Commission report on mobile call termination (BMRB report, pricing structures, July 2002) provides an analysis of the relative importance of different factors which determine choice of mobile phone package based on a sample of 2000 British consumers. Among the results are the significant differences between the various demographic classes of consumers.

Figure 5: Factors when choosing a mobile phone package



Source: BRMB report. Pricing Structures, July 2002. UK Competition Commission.

3.3.2 Quality

The quality of transmission was initially better for fixed lines, especially when GSM was only available on 900MHz with large cells and primitive encoding algorithms. Mobile quality has improved with the rolling out of DCS 1800 networks providing more capacity, smaller cells and better transmission. However, fixed voice still uses over six times the bandwidth of mobile networks and, if the operator has enough switching capacity, offers a constant quality of service. According to the BMRB report, quality of network service is the most highly rated factor when choosing a mobile phone package (valued by 84% of the sample). The next mobile generations which use more bandwidth with better encoding technologies will try to catch up on this dimension.

3.3.3 Price

In the calling party pays (CPP) system, price is the 'price you pay to call others' and the 'price others pay to call you'. While the 'price others pay to call you' appears only as the eleventh out of a twelve factor list, the 'price you pay to call others' is the second most important factor (83%) reported in choosing a mobile package.

In general, fixed voice has a cheaper cost structure. In particular, mobile termination costs include a specific component for locating the receiver before routing the call. Therefore, the price of fixed to mobile voice is highly sensitive to termination rates. A key aspect is that while fixed transit and termination rates have been oriented on costs, mobile termination rates have been kept well above.

Fixed to fixed prices have been strongly decreasing due to incumbents charging LRIC interconnection rates. This has probably given the consumer incentives to limit the duration of mobile calls, especially when calling a fixed line, which can still be done more cheaply from a fixed phone. Conversely, mobile termination rates have made fixed to mobile calls as expensive as mobile to mobile. Moreover, the bundle of minutes offered by mobile operators have, in many circumstances, made a mobile call cheaper. In such bundles, still dominant in France and quite common on the business market, the average cost of a mobile minute is close to the fixed to mobile rate, but its marginal cost may be nearly nil. Combined with the convenience of the handset, this phenomenon has provided mobile networks with strong externalities. As more people make mobile subscriptions, and as calling a mobile becomes more commonplace, having a mobile which can be called or voice-mailed (whilst not overpaying to call other mobiles) becomes more attractive. This is especially the case when the handset is subsidised and allows the user to pre-programme the numbers.

However, on the other hand, average mobile calling prices per minute have remained higher than fixed voice prices, forcing the consumer to pay closer attention to the duration of the mobile call. This trend has even been reinforced by the success of 'pay-as-you go' tariffs where consumers are aware of the exact price they pay for a call. Pay-as-you-go tariffs now account for 72% of the packages in the UK and more than 85% in Italy. In other words, the consumers use their mobiles frequently, but for a short duration. In France, the principle of the first indivisible minute has allowed the MNOs to get a minimum price on each call.

If termination rates are well above the costs, and if the average price reflects the full cost of an off-net call (where transit and termination are paid to third parties), then an important part of a MNO's profits relies on the termination rate and on the volume of minutes (fixed and mobile) terminated on the network. However, the relation between market share (number of subscribers), off-net and on-net minutes is not easy to assess.

Table 2: Destination of domestic mobile voice traffic*

Mobile call volumes	to fixed	on-net mobile	off-net mobile
1999 France	58.1%	24.2%	17.7%
2000 France	46,8%	33.7%	19,5%
2001 France	40.8%	37.0%	22.2%
2002 France	37.0%	39.5%	23,5%
2001 UK	51.7%	33.7%	14.6%

*Excludes international calls, roaming out, and data services. Sources: ART, Quarterly reports on the French telecoms services market; OFTEL, UK Telecommunications Industry Market Information 2001/2002, March 2003.

Table 3: Average annual MNO market share (France)

in %	Orange (FT)	SFR	Bouygues
1999	49.5	36.8	13.7
2000	48.1	35.4	16.5

2001	48.1	34	17.9
2002	49.2	34.5	16.3

Data: ART Mobile Observatory Quarterly market shares.

Over the period in question, the share of on-net minutes has stabilised at a much higher point than would have been the case if the distribution of mobile minutes were proportional to the number of subscribers in the network. On this assumption, on-net minutes would account for 39% of mobile to mobile minutes in France between 1999 and 2002, although in fact they account on average for 62% of this traffic. Possible explanations are: the use of voice-mail services increasing on-net traffic and asymmetric distribution of mobile usage (both in volume and destinations) among consumers of the mobile networks. In the business market, company mobile subscriptions are often homogeneous and, since intra-company calls usually represent a fair share of company phone calls, such subscriptions generate higher than average on-net call proportions.

Nevertheless, a high mobile termination rate induces strong network externalities, especially when the marginal price for a mobile minute may appear very cheap. In other words, between 1997 and 2002, mobile operators have promoted the recruitment of new subscribers through contract packages and handset subsidies. This has naturally increased the number of minutes terminated on each network and its respective profits. The slow-down of the growth in subscribers and externalities should now focus MNOs' strategy on the average return per subscriber.

The case of bill-and-keep

This logic also applies in the case where MNOs negotiate bill-and-keep arrangements rather than paying each other. Under bill-and-keep principles, off-net mobile termination charges are not paid to (nor received from) other mobile networks. The financial consequences for each MNO are difficult to predict because the effective distribution of traffic is not public. However, under bill-and-keep the marginal cost of termination for each MNO is zero.

At industry level, the main visible effects are a reduction in MNOs' transaction costs¹⁶ and, according to the French MNOs¹⁷, higher financial ratios (EBITDA/Turnover) to show to the analysts. As far as transfers from fixed to mobile are concerned, bill-and-keep has no direct effect. However, by amplifying network externalities and stock market valuation, it provides MNOs with more funds to subsidise calls, the network investment and handsets which, in turn, contribute to these externalities. It can also be considered as discrimination between buyers of mobile termination services.

The suppression of bill-and-keep rules would thus reduce mobile network externalities and amplify the trend started with the saturation of the number of subscribers.

¹⁶ See Joshua S.Gans and Stephen P. King (2000). "Using Bill and Keep" arrangements to soften Network Competition.' *Economic Letters*, Vol. 71, No.3, pp.413-420, (June 2001).

¹⁷ See ART decision n°02-901 dated 10/10/2002.

The case of receiving party pays (RPP)

In this case corresponding to the US market, someone calling a mobile is billed for the part of the call on his own network while the receiving party pays the cost of termination.

The difference with CPP is that the termination rate can be used as a pricing variable for retail. Therefore, if termination costs are strongly decreasing with volumes because the operator has capacity enough to route the calls, the MNO can seek greater volume by cutting its retail prices. Section 6.3 below will illustrate how all-the-minutes-you-can-eat packages have increased mobile voice penetration in the US.

4 Case studies on mobile termination rates

Transfers from fixed to mobile networks result from the history of mobile telephony in Europe, where the de-monopolisation of the telecoms industry has coincided with the building up of the mobile market. In each country, this process has led to the construction of new assets, new firms, new markets, new regulatory institutions and policies. While the mobile industry has been subsidised by the fixed all over Europe, the modalities through which it has happened and, consequently, the process of reducing the transfers, may show significant differences. A comparison is drawn here between the mobile termination rates in three large European countries: the UK, Germany and France.

4.1 Birth, growth and stabilisation of the mobile industry

In the three countries, mobile telephony – initiated by the incumbents – was promoted during the second half of the 1980s through the grant of licences to a new entrant. While the initial licences were analogue, these were converted into GSM or DCS after 1990. Until 1999, the grant of spectrum for 2G licences ruled the entry and the consolidation of firms in the European mobile industry.

Table 4: Distribution of 1 and 2G licences in the UK, Germany and France

Licences	Method of assignment	Spectrum	Initial assignment	Duration of Licence
UK				Spectrum is renewable annually
BT Cellnet (now MMO ₂)	Beauty Contest Beauty Contest Beauty Contest Extension of licence	TACS (analogue) 2x8.1 MHz (analogue) 2x12.2 MHz (GSM) 2x5.8 MHz (DCS)	1985 Jul 1992 Jul 1992 Jul 1996	25 years same same
Vodafone	Beauty Contest Beauty Contest Beauty Contest Extension of licence	TACS (analogue) 2x8.1 MHz (analogue) 2x12.2 MHz (GSM) 2x5.8 MHz (DCS)	1985 Jul 1992 Jul 1992 Jul 1996	25 years same same
One2One (T-Mobile)	Beauty Contest	2x30 MHz (DCS)	March 1993	Renewable annually
Orange	Beauty Contest	2x30 MHz (DCS)	Feb 1994	Renewable annually
GERMANY				
DT Mobil (D1)	Extension of licence Auction	2x5.6 MHz (analogue) 2x12.5 MHz (GSM) 2x5.0 MHz (DCS)	1986 Feb 1990 Oct.1999	20 years 20 years 10 years
Mannesman	Beauty Contest	2x12.5 MHz (GSM)	Feb 1990	20 years

Mobilfunk (D2)	Auction	2x5.4 MHz (DCS)	Oct.1999	10 years
E-Plus Mobil	Beauty Contest	2x22.5 MHz (DCS)	May 1993	19.5 years
Viag Interkom (O2)	Beauty Contest	2x22.5 MHz (DCS)	May 1997	19.5 years
FRANCE				
FT Mobiles (Orange)	Extension of analogue authorization	Analogue authorization 2x10.8 MHz (GSM) 2x13.2 MHz (DCS)	1987 Mar 1991 Nov 1998	15 years Duration of GSM licence
SFR	Extension of analogue authorization	Analogue authorization 2x10.8 MHz (GSM) 2x13.2 MHz (DCS)	1987 Mar 1991 Nov 1998	15 years Duration of GSM licence
Bouygues Telecom	Beauty Contest Beauty Contest	2x23.2 MHz (DCS) 2x3.1 MHz (GSM)	Dec 1994 Nov 1998	15 years 15 years

Source: European Commission.

An important difference concerns the status of the former PTT. In the UK in the early 1980s, the incumbent was a commercial company competing on the fixed market and regulated through a national authority (OFTEL was created in 1984). In the late 1980s, Germany and France still had to set up reforms for separating their PTT from the state. The grant of the first mobile licences was part of this process. In both countries, regulation was at a very infant stage and there was no experience of competition in telecoms.

During the first years of operations, the new MNOs had to lease all their transmission capacity from the incumbent who was also their main competitor on the mobile market. In the early 1990s, the main concern of these MNOs was to bring down leased lines and interconnection rates. The UK was in the lead in setting up competition. In Germany, the Ministry for Post and Telecommunication made the decision in June 1991 to cut leased lines rates by 54% and interconnection by 21%. Fixed interconnection was then subjected to a gliding price cap regime. In France, SFR claims that, in 1993, it had to pay 40% of its turnover for leased lines and interconnection while in the UK, Vodafone was paying less than 15%. In 1994, the French Minister for Industry wanted to impose a 41 to 62% cut in leased lines and a 50% cut in interconnection to the fixed network. France Telecom sued him for power misuse, won the first round (July 1996) and lost on appeal after the French telecoms code was revised. Following this revision, the ART (French NRA) became operational in 1997. The fixed interconnection rates then caught up the European average.

The other important aspect of the start of the mobile industry was its largely unexpected growth. Initially, handsets were cumbersome (mobile was the synonym for car-phone), prices were high, and mobile telecoms were confined to price-insensitive business areas. In Germany, the most optimistic forecast at the time of licensing estimated 4 million users by the end of the 1990s. The range of expectations was between 1 and 4 million users which meant 3 to 10% of fixed line customers and less than 10% of the emerging reality. The effective growth provoked the grant of new licences to new entrants, and then, in most cases with no counterpart, additional spectrum allocation to the first entrants.

In each country evidence suggested the absence of price competition during the 'duopoly' period which came to an end with the second wave of licensing. In the UK, subscriptions reached one million in 1990, split fairly equally between Cellnet and Vodafone. Prices were unchanged for six years after 1987, and profits were high. The anticipated arrival of new entrants in 1993 and 1994 (by which time there were two million subscribers) precipitated a

variety of new tariffs from Cellnet and Vodafone. This situation also occurred in Germany and France. The new entrants had to establish themselves by tariff innovations, operating under the handicap of geographical coverage which was less than their rivals. In every country, this was perceived as a risk of rolling-out new infrastructures without enough demand for payback. In Germany and France, the new entrants did not manage to catch up the dominant operators.

This first period of the mobile industry was dominated by asymmetric competition between incumbent monopolies and mobile new entrants; interconnection, cross-subsidisation and legal separation of fixed and mobile activities were the main regulatory topics. In each country, the licensing process combined with substantial ownership changes (stimulated by the European expansion of national monopolies) shaped the national landscapes of the mobile industry. In the UK, the fixed incumbent withdrew from mobiles while it remained dominant in France and strong in Germany. In the UK, the four mobile operators (of which two are owned by the French and German incumbents), have stabilised on similar market shares in subscribers (around 25%) with Vodafone dominating in revenues (34%). In France and Germany the new entrants still lag behind the two leaders who have accumulated about 80% of the subscribers.

In 1998, while the mobile market was growing healthily and dominant MNOs were repaid for their investment, the liberalisation of the fixed networks brought in a new agenda. The rapid growth of the Internet increased the market valuation of the fixed networks and raised new regulatory issues. It was often said that voice should become marginal compared to data. MNOs were willing to pay to become data-compatible and governments had spectrum to sell. 3G auctions diverted regulatory attention from termination rates and increased differences in asset creation in each country. In 2000, the UK Government auctioned five licences for £38 billion. Four of these went to existing operators, the fifth to a new entrant, Hutchison. In Germany, the existing MNOs plus two new entrants paid €50 billion to acquire 3G licences. In France, only the two major players agreed to buy the 3G licences issued by the government in June 2001. They would be joined in May 2002 by the third after the government launched a new tender with new pricing and duration conditions.¹⁸

In the years 2000-2002, the purchase of the 3G licences was presented as a necessary effort of the MNOs to keep efficient and competitive. The write-down of those licences by some of the MNOs shed more light on this issue. We will come back in section 6 to the impact of the 3G licences on the competition between fixed and mobile networks.

¹⁸ The lump sum of €4,95 billion is reduced to a set payment of €619 million and a percentage (between 1 and 2%) of the 3G services' annual revenues. The validity of licences is also extended to 20 years instead of 15.

4.2 The termination rate issue

In the three countries, interconnection charges to the fixed network were orientated on costs during the 1990s. This move was completed in 1998 when alternative fixed networks started to expand on the continent. Commonly, interconnection with mobiles was unregulated and subject to non-public agreement between the parties with, however, the possibility for the NRA to settle conflicts. The regulatory process of mobile termination charges reduction started in the early 1990s in the UK and spread out everywhere after 1998. The British case is exemplary because it involved at various stages both the NRA and the Competition authority (Monopolies and Merger Commission, then the CC) to solve the conflicts with the MNOs. This process produced detailed economic analysis on the topic. The German process relied on the discretion of the NRA to regulate mobiles and on the fear of the industry of being regulated. The French case reveals the bill-and-keep agreement between MNOs.

4.2.1 The UK case

Early mobile termination rates

In the UK in 1990, BT's fixed line competitor Mercury adopted a full allocated costs (FAC) methodology to negotiate the interconnection charges which Cellnet and Vodafone proposed to make. This determined charges at 70 pence per minute in 1991. Under this determination, charges were updated annually on the basis of cost and volume data. By 1997/8 the rate had fallen to 12.3 pence per minute. This determination only covered 11% of calls to mobile. BT, responsible for 76%, continued to negotiate with the operators. After separate negotiations at the end of 1996, it agreed average outpayments of 19.7 pence per minute to Cellnet and Vodafone, 15 pence per minute to Orange and 13 pence per minute to One2One.

The 1998 mobile termination price control

In March 1997, OFTEL published a paper expressing concern about the cost of calls to mobile. Its emerging conclusion was that: 'Prices of calls from BT to Cellnet and Vodafone look to be too high mainly because the mobile operators charge too much for delivering calls to customers on their networks'.¹⁹

OFTEL reverted to the use of licence conditions to control both Cellnet's and Vodafone's termination charges and BT's retention rate (the component of the retail price of a call to a mobile which BT kept). OFTEL proposed reducing the price of a daytime call to a mobile from 32 pence per minute to less than 20 pence per minute. Unsurprisingly, the operators did not accept OFTEL's proposed conditions, and the matter was accordingly referred to the Monopolies and Mergers Commission in March 1998.

¹⁹ OFTEL The Price of Calls to Mobile, p1 (March 1997).

The MMC report,²⁰ delivered in December 1998, broadly endorsed OFTEL's proposals, but disagreed significantly with some of OFTEL's reasoning on a range of issues. It concluded that termination charges should be regulated, on the basis of cost orientation. But the MMC chose to assess termination charges on the basis of FAC rather than LRIC, as recommended by OFTEL, on the grounds that LRIC cost estimates required further consultation and development.

On this basis, the MMC computed a termination charge benchmark of 11.7 pence per minute in 1999/2000, taking account of unanswered and directed calls. The Commission recommended, and OFTEL accepted, this rate for 1999/2000, with real price reductions of 9% (RPI-9) in the following two years.

The 2003 price control

In 2000, OFTEL began a review of competitive conditions in the mobile industry, both of outgoing calls and of termination. In September 2001, it published its conclusions – that the outgoing mobile market was not fully competitive and that mobile call termination required continuing price regulation in the form of a significant cut in termination charges followed by a price cap, for the first time bringing Orange and T-Mobile within the scope of the price control. The control also covered termination rates for calls to mobile from other mobile as well as fixed lines. To allow further time for implementation, the termination price control on Cellnet and Vodafone was extended for one year at the current rate of RPI-9, to March 2003.

The mobile operators did not accept OFTEL's proposal, and in January 2002 OFTEL referred the matter to the Competition Commission, which reported to OFTEL in December 2002.²¹

The Commission addressed a range of wider questions relating to the mobile industry. It agreed with OFTEL that there was less than effective competition at the retail level, noting that while there was intense competition to attract and sign up subscribers, there was less intensive competition for call origination, shown by high margins on off-net calls, a substantial level of unused free minutes in mobile packages and the bundling and complexity of call tariffs.

In relation to mobile termination, the Competition Commission concluded that each operator had a monopoly of call termination on its own network, for which, under the calling party pays principle, there was no adequate substitute at either the wholesale level or the retail level, such as using a fixed line or SMS.

The Commission concluded that termination rates set in these monopoly markets were too high, leading to the following detriments expected to apply to the following three years at least:

²⁰ Monopolies and Mergers Commission, *Cellnet and Vodafone* (1998).

²¹ Competition Commission, *Vodafone, O₂, Orange and T-Mobile* (2003).

- Excessive fixed to mobile retail tariffs, penalising those making such calls and distorting the pattern of telephone use.
- Unfair subsidies from fixed to mobile or off-net mobile callers to other mobile users.
- Distortions of competition through the use of mobile termination profits to subsidise handsets, leading to an inefficiently speedy replacement cycle for such handsets.
- Excessive use of high cost mobile technologies as against lower cost fixed technologies.

To deal with these detriments the Commission proposed a cost-based termination charge to come into effect on 1 April 2003, reducing charges by 15%, followed by further declines in each of the next three periods (July 2003 to March 2004, April 2004 to March 2005 and April 2005 to March 2006) of 15% for O₂ and Vodafone and 14% for Orange and T-Mobile.

In setting the initial level of charges, the Commission sought to implement a long run incremental cost approach to setting prices, augmented by an appropriate mark-up to cover common costs. The Commission did, however, permit an uplift of 0.45 pence per minute on termination charges in respect of network externalities – the benefits existing telephone subscribers gain from the addition of new mobile subscribers, attracted by subsidised handset prices. OFTEL had estimated this uplift at 2 pence per minute. The Commission however, was sceptical about whether a subsidy would significantly affect the behaviour of existing (infra-marginal) subscribers, preferring to focus on the behaviour of marginal subscribers, and reduced the figure accordingly.

Three of the operators sought Judicial Review of the Competition Commission's conclusions and its implementation by OFTEL. This was heard in June 2003, and rejected by the High Court of Justice. Moreover, the Competition Commission recommendations relate directly only to the period before 25 July 2003, when the new European regulatory arrangements come into force. On 15 May 2003, OFTEL published a 'market review' of mobile termination proposing two price caps until 20 March 2006, very similar to those recommended by the Competition Commission. One relates to fixed to mobile termination, the other to mobile to mobile termination.²² Separate caps permit a situation to develop in which mobile operators negotiate lower rates for mobile-to-mobile termination than those set by OFTEL for fixed to mobile termination, in the light of the different bargaining framework for the two types of rates described in Section 3.1 above.

²² Review of mobile wholesale voice call termination market, OFTEL (May 2003).

4.2.2 The German case

The development of interconnection principles

Mobile competition in Germany started in a quite monopolistic environment. The only regulatory concern at that time was how leased line rates, as well as interconnection rates for using the PSTN, could be set such that a new mobile operator had a chance to survive in the market. In this environment, there was no regulatory concern that mobile termination rates may be too high in the future. Termination rates were simply set by the MNOs. In the beginning they could even set the retail rates for fixed to mobile calls. In the first years MNOs did not interconnect directly to each other's network. They used the incumbent FNO's network as a transit network between their mobile networks.

Early mobile termination rates

The first termination rates were set at a similarly high level as mobile outgoing call rates. The average rate was about € 60 cents per minute. Originally, the structure of the market setting these rates was a bilateral monopoly: the second MNO set these rates against the monopoly FNO. Immediately after liberalisation in the fixed-line market, alternative FNOs had access to these rates because initially they were not directly interconnected with the MNOs. Instead, they purchased from Deutsche Telekom (DTAG) a service and price bundle consisting of a fixed-line transit interconnection service plus a mobile termination service. Only the transit part was regulated. Whilst RegTP set the price of the transit plus termination bundle (known as the Telekom 0.3 service), it simply passed through the cost of termination charged by the MNO. In Table 5 we estimate the termination rates, which are not in the public domain in Germany, by subtracting the transit interconnection rate from the Telekom – 0.3 service charge. The transit part was calculated under reasonable assumptions. The estimates reveal that the rates charged by E-Plus, the third MNO, were persistently considerably higher than those charged by D1 and D2. DTAG reduced termination rates in 2000 significantly and exerted pressure on the other MNOs to follow. In the case of E-Plus, DTAG even initiated a regulatory proceeding against E-Plus' rates. D2 and in the end E-Plus followed in 2001 with significant reductions. Since 1998, German MNOs' termination rates have been reduced by more than 50% (in nominal terms). The major reductions in 2000/01 were mainly brought about by reducing peak rates to (former) off-peak levels.

Since the early days of liberalisation, several more FNOs have interconnected directly with MNOs. Normally, direct interconnection only makes economic sense for FNOs with relative high traffic volumes. These rates charged by MNOs to directly connected FNOs are not publicly available but MNOs typically offer them discounts against standard normal termination rates.

When mobile number portability was introduced in Germany in December 2002, mobile termination rates for ported calls were increased by about 10%.

Table 5: Development of termination rates in Germany (in nominal € cent per minute)^{1) 2)}

	1998	1999	2000	2001	2002
D1	27,86	27,86	17,09	14,39	14,30
D2	28,44	28,44	28,51	15,42	14,30
E-Plus	42,60	42,60	42,68	19,03	16,94
Viag Interkom / O₂	29,24	29,24	29,32	18,77	17,88

¹⁾ Calculated from Telekom – 0.3 interconnection rates minus transit part (own calculation).

²⁾ Till 31.01.2000 rates are differentiated between peak and off-peak, weighed average (70% peak, 30% off-peak) reported here.

Termination rates under the Telecommunications Act of 1996 and market liberalisation

During the years 1999/2000 the German regulator had to deal several times with interconnection requests relating to mobile networks. In several cases the request to make a regulatory determination resulted from disagreement of the interconnecting parties on the termination rates within the mobile networks.²³

- At the end of 1999 the fourth mobile operator VIAG Interkom²⁴ applied for a regulatory determination against DTAG. DTAG rejected interconnection because it did not want to accept the level of termination rates which VIAG Interkom requested.
- In parallel to (1) the regional fixed line operator NetCologne requested a determination to directly interconnect with D2. Once again NetCologne did not want to pay the (high) termination rates of D2.
- DTAG itself requested a regulatory decision because it could not come to agreement on termination rates with E-Plus.

In all three cases the regulator would have had (for the first time) to make decisions on interconnection involving carriers which were not considered to be dominant in their respective end-user markets. In the end this did not happen. In the DTAG versus VIAG Interkom and DTAG versus E-Plus cases, the disputing parties agreed termination rates during the regulatory procedure and withdrew their respective applications. In the NetCologne versus D2 case, RegTP declined to make a decision on interconnection and termination rates on the basis of a technicality, namely, that negotiations had not failed.

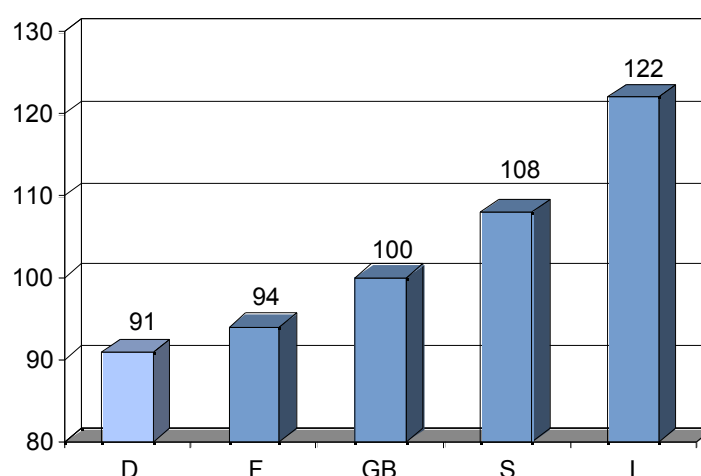
In April 2002, a fixed-line operator pursued an interconnection determination with D1, with the aim of starting a carrier selection business on D1's network. Once again RegTP declined to make a determination on the basis of legal technicalities and because it saw no (legal) justification for the call originating service which was requested from the D1 network.

²³ See Tätigkeitsbericht 2000/01 RegTP, p 86 f (December 2001).

²⁴ Which is now a subsidiary of O₂.

The regulatory decisions referred to above are examples of RegTP's broad policy towards mobile communications, which is not to regulate it at all²⁵. The only regulatory interventions in the mobile market are defined in the MNOs licences and have (so far) not led to any regulatory intervention. One reason why RegTP has abstained from regulating mobile communications is its general satisfaction with success and progress of competition in the market. Another major argument relates to the high level of handset subsidies in Germany. It is generally assumed that these subsidies cannot be reduced significantly in the short term and to keep them at current levels, MNOs need to charge above cost for termination in order to finance those subsidies. Furthermore, international price comparisons, which include handset subsidies end-user prices in Germany to be below average. OFTEL's (November 2001) price index for instance, shows that prices in Germany are 10% below those in the UK. Many arguments – not only from the MNOs – are made that regulatory intervention e.g. on termination rates may endanger the existing market structure. There is special concern that E-Plus and O₂, which incidentally charge the highest termination rates, would face significant revenue if these rates were to be regulated. Because of their relatively weak competitive position and their small market share, the regulator is concerned about unwelcome implications for market structure and competition if he were to regulate termination rates on the basis of their costs. Insofar and to the extent this argument is valid, D1 and D2 generate an additional market structure rent through the reluctance of regulation.

Figure 6: Mobile communications price index*



*Average prices for end-users (Great Britain = 100)
Source: OFTEL, November 2001.

Other competition issues

Besides the general level of termination rates, there is another competitive problem between MNOs and FNOs. Some FNOs claim there is anti-competitive behaviour mainly by integrated MNOs. They mention examples where mobile end-user rates as part of price bundle offers have lower end-user rates than the corresponding mobile termination rates. Alternative FNOs

²⁵ This policy is best described by RegTP's President Matthias Kurth (2003).

cannot compete on a profitable basis against such price offerings which represent a form of a price-cost-squeeze.

RegTP also dealt internally with the question whether or not the mobile operators are dominant in their respective end-user markets. It studied this issue twice: in October 1998 and in May 2000. RegTP identified two relevant markets: the end-user market for (all) mobile services provided by the MNOs and the mobile switchless resellers on the one hand, and the wholesale market for mobile services provided by MNOs to the service providers for resale purposes on the other hand. Concerning the end-user market, RegTP came to the conclusion that neither a single MNO had a dominant market position nor a group of MNOs had a dominant position jointly as an oligopoly. It is important to remember that two MNOs have nearly equal market shares of about 40% each, where the remaining MNOs share the remaining 20%. RegTP came to the same conclusion for the wholesale market.

In 1999, RegTP dealt with the question whether or not MNOs are dominant in providing termination services. The procedure and the decision was taken independent of a concrete regulatory case although several cases emerged in that year. Despite the internal nature of the decision, RegTP published its decision²⁶ because of its general nature and guideline for any regulatory case relating to the mobile market brought to its attention. The German regulator came to the conclusion that under no relevant definition of the market is there a dominant position of any MNO regarding termination services. RegTP considered two relevant market definitions: i) each mobile network forms a relevant market; ii) all mobile networks together form a market for termination. For both definitions of relevant markets no dominant position was identified. RegTP argued that even under the narrow market definition there are competitive forces which prevent a MNO to act independent of its competitors. Therefore end-users indirectly put pressure on termination rates and limit potential market power. According to the broader market definition, RegTP could not identify the absence of effective competition. Price setting opportunities are limited by competitive pressures.

The German Monopoly Commission developed a different view on the market position of MNOs with regard to mobile termination services compared to RegTP. In its 2000/01²⁷ report the Monopoly Commission also studied and made statements regarding the mobile market concerning potential substitution effects between fixed-line and mobile services. The Commission came to the following conclusions:

- In general, fixed-line communications and mobile services are not (yet) substitutable alternatives.
- Fixed lines as well as mobile subscriptions were growing steadily over the last years. Therefore fixed-line connections are not (yet) substituted for mobile lines.

²⁶ Vfg 21/2000 in Amtsblatt of Regulierungsbehörde für Telekommunikation und Post, p. 879, Bonn (8.3.2000).

²⁷ Monopolkommission: Wettbewerbsentwicklung bei Telekommunikation und Post 2001: Unsicherheit und Stillstand, Sondergutachten der Monopolkommission, Bonn (December 2001).

- Partial substitution can already be identified at the level of communications traffic. Functional substitutability currently only prevails for voice communications and not for narrowband or even broadband data communications.
- Following from the above: fixed line telephony and mobile communications represent different relevant markets.
- The competitive impacts from mobile competition to the competition of the fixed-line market so far has been very limited. The relationship between the two markets is more complementary compared to the very limited substitution effects.

The Monopoly Commission also dealt with termination rates in mobile networks. The Commission did not follow RegTP's view on the competitive pressures on termination rates. It clearly regards termination services as a monopolistic service provided by each individual MNO. The Commission also does not subscribe to the argument of indirect competitive control via competition on the mobile end-user markets. On the contrary, it regards the joint agreements on mobile termination as a relevant basis for collusion among the MNOs to reduce competition in the mobile end-user markets. The resulting consequence of the Commission's analysis is to regulate termination rates on an *ex ante* basis. Without further analysis of implications, the Commission presents the provocative proposal to set termination rates at a level of zero. The costs of termination under that scenario would then be allocated to monthly rentals on the basis of some calculations of average use.

The Monopoly Commission has no formal involvement in regulatory decisions such as the competition authority. It is simply presenting an opinion to the government and the general public. Because of its high reputation as an official governmental advisory body, its opinions, however, have a great impact in the policy debate.

4.2.3 The French case

Early mobile termination rates

The French case is characterised by bill-and-keep agreements between the three MNOs. This means that since the birth of the industry there has been no monetary transaction between mobiles. Therefore the French interconnection market is practically limited to intra-fixed and fixed to mobile calls. Moreover, until 1998, French Telecom was the only player in the fixed market: there is little transparency, nor controversy, on the fixed to mobile interconnection market.

After 1998

In November 1998, in accordance with the ONP Interconnection Directive 97/33/CE EC, the French Competition Commission identifies the mobile retail and national interconnection as relevant markets. It recommends declaring SMPs on these markets, operators with market share over 25% in value. While their share on the retail market has exceeded 25% since the

launch of the GSM, the threshold floor of 25% of the interconnection market was reached both by FT Mobiles and by SFR in 1999. It is often suggested that if mobile interconnection had been charged, this floor would have been reached as of 1998. In September 1999, ART declared FT Mobiles and SFR SMPs and recommended that their termination rates should be progressively orientated upon costs. The decision came with a threat of increasing competition, notably through pre-selection, on the retail mobile market.

At the same time, a round-table was organised with the three MNOs, where ART imposes a first 20% cut in termination rates.

The next step was launched by MFS Communications, an *altnet* (alternative fixed network) complaining against his rival France Telecom about transit and termination rates on FT Mobiles. MFS declared paying € 28.5 cents per minute on average in 1998 and 1999. This rate included a first indivisible minute. Following the ART decision on SMPs, MFS requested to pay a cost-oriented rate, estimated by a bottom up model, between € 12.7 cents and € 16.9 cents and the suppression of the indivisible minute. In October 2000, ART imposed an immediate 20% cut in termination rates applying also to the indivisible minute (Decision 00-1092). In November 2000, the FNOs got out of the retention system and were allowed to fix their own fixed to mobile tariffs. The carrier selection choice was then extended to the fixed to mobile calls.

The key variables of the mobile termination costs then were then analysed closely: first indivisible period, different low-fare periods for each MNO, discrimination upon the national versus international origin, carrier selection... In May 2001, ART published guidelines concerning termination charges for SMP MNOs. The appendix of the 01-458 decision lists the main cost elements of the interconnection charges.

In November 2001, ART imposed a 3-year glide path for a cut of 40% of the average termination price of the SMP MNOs. This cut is aimed at being passed on to the consumer. Average rates stepped down from € 20.1 cents on 1 March 2002, to € 17.1 cents on 1 January 2003 and € 14.9 cents on 1 January 2004. Meanwhile, the first indivisible period should step from 60 seconds in 2001 down to 50 seconds in 2002 and 40 seconds in 2003. Such a period should be suppressed in 2004.

In October 2002, ART validated the rates applied by the SMP MNOs in 2002 and their forthcoming offer for 2003. By the end of the year, 20 interconnection agreements were signed for fixed to mobile carrier selection.

Other competition issues

In September 2002, Orange France (the new brand of FT Mobiles) issued a bundle offer in which on-net calls were offered between € 18 cents and € 30 cents per minute while off-net calls were billed between € 30 cents and € 42 cents per minute. Both Bouygues Telecom and consumers associations complained, alleging discrimination. The ART decision (02901) highlights the contradictions of the bill-and-keep system (lack of transparency) as well as the difficulties to get out of it. The determination of ART demanding the withdrawal of Orange's

offer, points out that even in the case of an exit of the bill-and-keep, discrimination between on-net and off-net calls would be unjustified.

However, this case reveals the rising tensions between mobile operators in the context of termination rates decreasing and declining externalities. These tensions may even be amplified by the introduction of mobile number portability after 1 July 2003.

Moreover, the bill-and-keep issue also appeared in the September 2002 ART round table on mobile interconnection. Some FNOs complained that 'bill-and-keep' creates discrimination and might be not fiscally legal. In fact, if each SMP network termination is a relevant market, fixed and mobile customers are not treated in the same way. Moreover, the keeping of the interconnection payments and revenues has VAT implications for each MNO and for the state. While all participants are favourable to removal of 'bill-and-keep', ART requests more time to study the issue.

5 Transfers between mobile and fixed networks

This study is concerned with financial transfers between fixed and mobile operators at the macro level, not about the structure of prices of individual services or individual networks. We therefore need a means of measuring the transfer. The natural measure is the net excess of aggregate interconnection revenue over costs, taking the flows of interconnection services in both directions together.

In symbols:

$$NF_{mf} = (P_m - C_m) I_m - (P_f - C_f) I_f$$

where NF_{mf} is the net financial flow from fixed to mobile

P_m is the price of termination on the mobile network, per minute

C_m is the cost of mobile termination per minute

I_m is traffic in minutes from fixed to mobile networks

P_f is the price of termination on the fixed network, per minute

C_f is the cost of fixed termination per minute

I_f is traffic in minutes from mobile to fixed networks.

For the purpose of calculating costs in the above expression, a fair rate of return on capital employed is included.

As noted in Section 3 above, the regime for setting interconnection charges for fixed operators, for services provided both to other fixed and to mobile operators, is a cost-based one. The methodology employed over the period 1998-2002 varied from country to country in Europe. In the UK it relied upon an estimate of long run incremental cost, plus an equal

proportionate mark-up to cover network common costs. A LRIC model was used to set fixed interconnection rates in France from 1999 and in Germany from 2000.

These procedures do not rule out the possibility that $P_f > C_f$ for at least part of the period. The magnitude of the excess was, however, limited by the low level of fixed termination charges, relative to mobile charges (the former being roughly one-tenth of the latter)²⁸. In other words, even a large proportionate error in estimating fixed termination costs would only cause a small transfer of resources between the two sectors. Accordingly, in the study we approximate $P_f - C_f$ by zero.

The notion of the cost of mobile termination has to be addressed. A key issue is how to allocate costs which are common to termination and other services. Here it has been suggested that the Ramsey principle should be employed, which would lead to a relatively high mark-up over cost of fixed to mobile termination charges, reflecting low price elasticity of demand for fixed to mobile calls.

We do not think this approach is appropriate in measuring financial flow. If it were adopted for mobile services, it would also have to be adopted to establish 'efficient' levels of fixed charges, including fixed termination rates. In fact, it might even be argued that prices should be optimised over the whole sector, fixed and mobile; all common costs would be recovered according to relatively priced elasticities of demand for all services, fixed and mobile, the implied transfers among fixed and mobile firms being achieved through appropriately chosen interconnection rates. But this is clearly not practicable. In any case, the volume of common network costs is relatively low (less than 10% of the total) so that Ramsey mark-ups make relatively little difference.

Mobile costs will also legitimately include spectrum costs where spectrum charges are made or amortisation of licence fees.

In order to calculate transfers in the three countries considered, namely France, Germany and the UK, one basic input is the cost of mobile termination per minute. So far, there are only cost calculations, which fit with the appropriate regulatory economic standards, available for the UK²⁹. In our estimations, we will use these data as a proxy for the other two countries as well. We feel that this approach is justified for the following reasons:

- a) We are only interested in the macroeconomic level of transfers and do not aim to quantify price-cost-margins for regulatory interventions against particular firms. If the level of transfer we calculate is correct, that is sufficient for the purpose of this study.
- b) Mobile networks in Europe rely on the same technology, network elements and network structure. Therefore it is basically volumes, market shares and geography which cause differences in cost.

²⁸ Empirical evidence of this pattern can be found in ITU Regulatory Survey (1999, 2000).

²⁹ Such calculations have been made by OFTEL (2002) and the UK Competition Commission (2003).

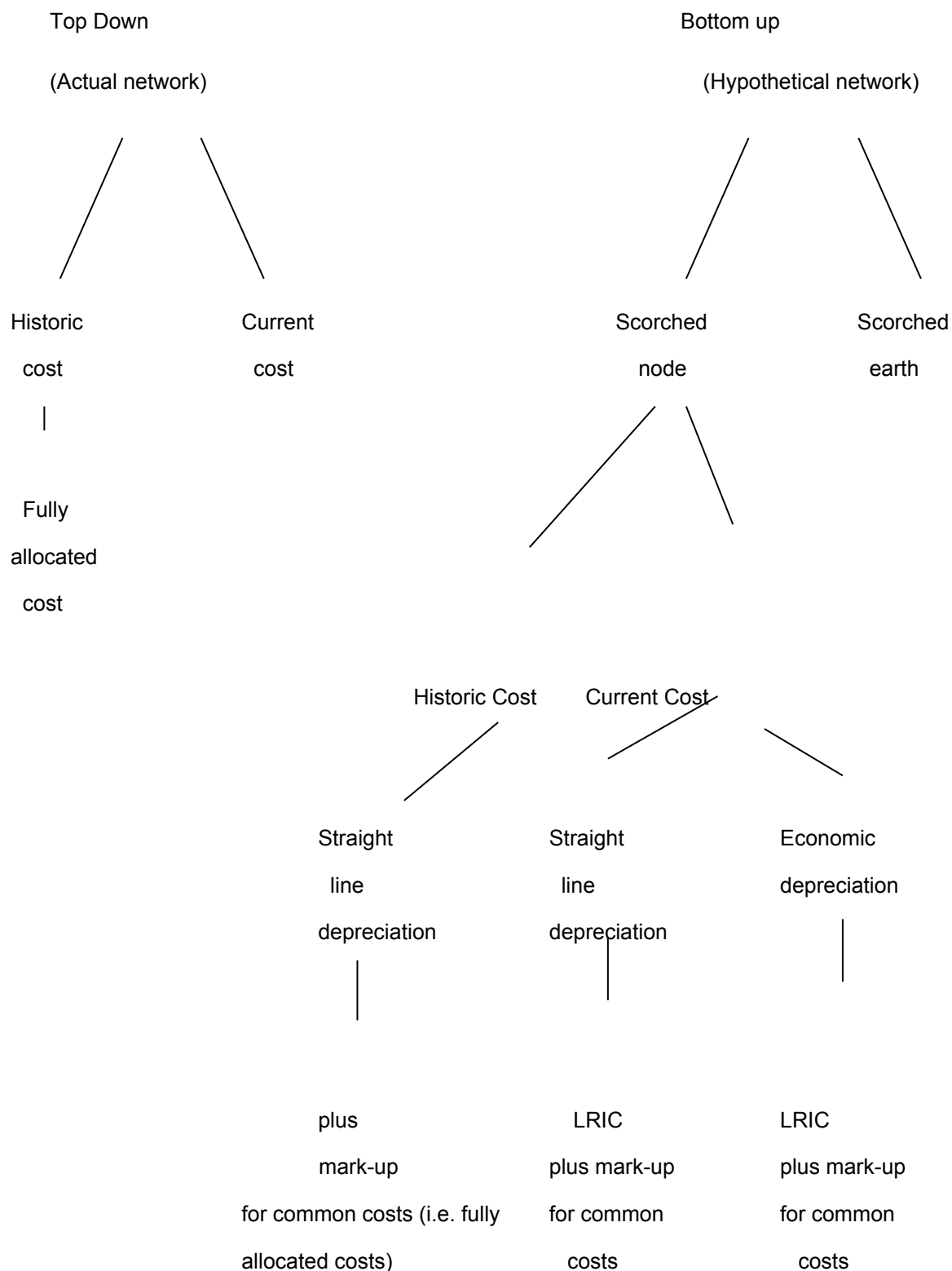
- c) An earlier study done by Analysys (2000) for ECTA and covering 10 countries calculates mobile termination costs under the same methodology. Although the results show a significant spread over all countries, the results for Germany, France and the UK are very close to each other.

5.1 Costs of termination in mobile networks

In seeking an estimate of the cost of mobile termination, to compute fixed to mobile transfers, we have chosen to rely on UK estimates and to use work done by OFTEL and by the Competition Commission reports, in its report of January 2003.³⁰

First, however, we consider the range of possible cost models available. These can be illustrated as follows:

³⁰ Competition Commission, *Vodafone, O₂, Orange and T-Mobile* (2003).



Using the bottom-up modelling approach, there is also the question of whether the model should include voice only or voice and data, including SMS. As we are focusing on fixed to

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mobile transfers the model we chose is based on voice alone (SMS are almost invariably mobile to mobile). To determine the cost model to be used in evaluating the transfer, we need to clarify the following options illustrated on the figure.

Top-down or bottom-up?

Because of their labour intensive method of construction, top-down estimates are generally only available for individual years. They tend to be based on historic cost and are difficult to project. For our (medium to long-run) purposes, the bottom-up approach is more practicable.

Scorched node or earth?

Scorched earth (fully optimising network design as of now) makes unrealistic assumptions about what an operator can do to keep costs down. The scorched node approach (using the existing base station configuration) is more realistic and fairer to mobile operators, as it does not assume perfect foresight in network design.

Historic cost (HCA) or current cost accounting (CCA)?

This makes less difference for mobile than for fixed networks but, in a world of some inflation and changing relative prices, CCA better expresses how costs move over time.

Straight line or 'economic' depreciation?

This makes a significant difference to the time path. Straight-line depreciation makes calls very costly at the outset, when the same depreciation allowance is spread over very few incoming calls, but cheaper as volumes grow. Economic depreciation matches the cost of equipment to the actual and forecast data and thus smoothes the figures. Over a period of years, this matters less, but economic depreciation seems preferable.

Scale of operator?

Costs vary with scale and can be calculated on the basis of operators' actual activity levels, or hypothetical levels if shares were equal. The Competition Commission has done the latter in the UK (where the shares of Orange, T-Mobile, O₂ and Vodafone are not far from equal), in order to avoid penalising more successful operators with lower rates. This would not necessarily be appropriate in all circumstances, for example when market shares were very different. However, we are interested in total transfers, and hence unit costs averaged over all networks. Provided that unit costs vary with scale in a particular way, which is likely to be satisfied at least to an approximation, the size distribution of operators does not affect the average.³¹ The same point about averaging applies to cost differences between combined 900/1800 and 1800 MHz operators. Costs averaged according to the distribution of output over the technologies serve our purpose adequately.

³¹ The technical condition is that the unit cost curve is linear over the relevant range.

Scale of mark-up on LRIC

Mobile operators have several major costs common to a number of services, especially those of customer acquisition. The Competition Commission accepted OFTEL's argument that mobile termination charges should not recover non-network costs, including costs common to a number of retail services. Such costs should be recovered in the retail margins. At the same time termination charges should include an element to take account of externalities (e.g. to help finance handset subsidies).³² This seems a sensible approach.

Form of the mark-up

The operators wanted their proposed high mark-up to be distributed on Ramsey principles – i.e. heavily on (price-inelastic) mobile termination.³³ OFTEL and the Competition Commission favoured equiproportionate mark-ups. In view of the rejection of non-network common costs for recovery in termination charges, the level of the average mark-up is so small that it is insignificant. Also, our aim in this project is not to estimate efficient prices (which should be done properly by simultaneously maximising welfare over both fixed and mobile services), but to compute financial transfers.

The Competition Commission adjustment

Finally, we consider the Competition Commission report (2003) which brought adjustments to OFTEL's cost model in three ways. In recognition of the impending entry of a fifth operator, the 'standard' market share would fall to 20%. In OFTEL's view, this would reduce each operator's total costs. In the Competition Commission's view, the fall would be much lower. This change of assumption increased cost per minute by € 2.4 cents, from € 8.4 to € 10.8 cents, but is not relevant to our calculations prior to 2003.³⁴ The Competition Commission also believes that OFTEL had underestimated the operators' equipment needs by an amount equal to € 1.4 cents per minute. Finally, the Competition Commission thought OFTEL had overestimated operating costs by € 0.4 cents per minute. These adjustments are only made for data for 2001, but the same percentage change of +11% can be applied to other years if required

Conclusion

In the light of these arguments, we believe that LRIC with equiproportionate mark-ups form the best basis for estimating the fixed to mobile transfer. Table 6 gives the cost estimates for combined 900/1800 operators, for 1800 operators and a simple average of the two, before and after the 11% Competition Commission adjustment. The prices are in 2000/2001 prices, where £ = €1.50.

³² Competition Commission, *Vodafone, O₂, Orange and T-Mobile*, 2.275-2.280 (2003).

³³ Competition Commission, *Vodafone, O₂, Orange and T-Mobile*, 2.320-2.386 (2003).

³⁴ Competition Commission, *Vodafone, O₂, Orange and T-Mobile*, 2.510-2.523 (2003).

Table 6: Costs (including normal profit and a mark-up for common costs), € cents per minute

	Combined 900/1800 Operator		1800 Operator		Simple average	
	a)	b)	a)	b)	a)	b)
1993/4	17.6	19.5	21.6	24.0	19.6	21.7
1994/5	17.0	18.9	21.3	23.6	19.1	21.2
1995/6	15.0	16.6	19.0	21.1	17.6	18.8
1996/7	12.0	13.3	16.5	18.3	14.2	16.8
1997/8	10.5	11.7	12.0	13.2	11.2	12.4
1998/9	9.0	10.0	11.2	12.4	16.1	11.2
1999/0	8.1	9.0	10.1	11.2	9.1	10.1
2000/1	7.4	7.7	9.1	10.1	8.2	8.9
2001/2	7.2	8.0	9.0	10.0	8.1	9.0
2002/3	6.3	7.0	7.8	8.7	7.0	7.8

- a) Unadjusted
b) Adjusted(+11%)

Source: Competition Commission report and data from OFTEL's submission. Some earlier data are read from a graph and may have slight inaccuracies.

5.2 Data

Our estimation of financial transfers between fixed and mobile operators covers the period from 1998 to 2002. For each year, and in each country analysed, fixed to mobile termination profits (or transfers) amount to $NF_{mf} = (P_m - C_m) I_m$. This section presents the data used in our calculations. The above table 6 gives C_m . In other words, we consider that network costs do not significantly differ over this period between the three countries. This seems a reasonable assumption given the relative penetration rate, the size of the market and the

country coverage across the three countries³⁵. Usually, I_m and P_m are not directly available in regulatory and companies reports³⁶. Our estimations are based on two series of public overall data: revenues and traffic of interconnection (international and national, mobile and fixed networks), and revenues and traffic in mobile networks. Results were cross-checked with different proxies (balance of incoming/outcoming flows in mobile networks based on individual consumption, revenues distribution and costs of sales in operators' annual reports).

The principal area for application of cost-oriented rated pricing is in interconnection to the fixed incumbent's network (see 3.1.1. above). Most NRAs have developed cost models using either management accounting (top-down) or engineering (bottom-up) data to calculate the long-run marginal cost of a range of interconnection services, including call termination in particular.

UK experience has demonstrated the feasibility of carrying out equivalent cost-modelling exercises on mobile networks, leading to the setting of cost-oriented charges (see section 4 above). Similar models exist or are being developed for mobile operators in many jurisdictions, including several countries in Europe – Austria, Greece and Sweden – Australia, the Caribbean and South Korea. There is no insuperable practical modelling difficulty in setting mobile termination rates on a cost-oriented basis.

The most prominent illustration to date is provided by the UK, and the Competition Commission report of 2003 discusses in exhaustive detail the issues arising in implementing cost-oriented prices and embedding it within a multi-year price cap.³⁷

Comparative findings

The next tables present the annual fixed-to-mobile termination transfers in the three countries according to the four cost models considered (as well as the associated interconnection volumes).

Table 7: Comparative analysis of fixed to mobile transfers 1998-2002

Annual fixed to mobile termination transfer in UK*	1998/99	1999/2000	2000/01	2001/02	2002/03	Total**
with OFTEL cost model & termination on combined 900/1800 operator	0,86	0,99	1,10	1,13	0,90	5,28
with OFTEL cost model & termination on simple average of technologies	0,80	0,90	1,00	1,00	0,82	4,81
with CC cost model & termination on combined 900/1800 operator	0,81	0,91	1,00	1,02	0,82	4,84
with CC cost model & termination on simple average of technologies	0,74	0,81	0,90	0,88	0,74	4,25

³⁵ See section 3 above. Furthermore, it is worth noting that a 5% increase in unit cost would reduce the total transfer by 1,7% in France, and 2,4% in Germany.

³⁶ Noticeable exceptions are the 2000 Interconnection Market Survey in France and Germany.

³⁷ Competition Commission, Vodafone, O₂, Orange and T-Mobile, 2003.

Fixed-to-mobile interconnection volume (bn minutes)	5,64	9,03	12,10	13,58	14,64	
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(bn €. 2000 prices) * Years run 1 April to 31 March, except 2002, from 1 April to 31 December ; ** with 2002 three quarters' results extrapolated linearly for a full year.

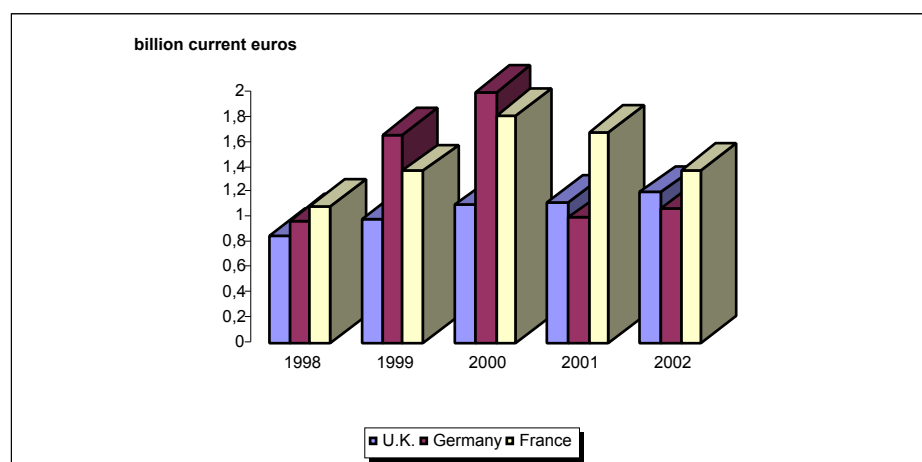
Annual fixed to mobile termination transfer in Germany	1998	1999	2000	2001	2002	Total
with OFTEL cost model & termination on combined 900/1800 operator	0,97	1,66	2,00	1,00	1,08	6,70
with OFTEL cost model & termination on simple average of technologies	1,02	1,80	1,92	0,89	0,99	6,62
with CC cost model & termination on combined 900/1800 operator	0,92	1,59	1,92	0,90	0,99	6,32
with CC cost model & termination on simple average of technologies	0,98	1,75	1,82	0,78	0,88	6,22
Fixed-to-mobile interconnection volume (bn minutes)	4,42	7,41	10,76	12,2	13,3	

(bn €, 2000 prices)

Annual fixed to mobile termination transfer in France	1998	1999	2000	2001	2002	Total
with OFTEL cost model & termination on combined 900/1800 operator	1,09	1,37	1,81	1,68	1,38	7,33
with OFTEL cost model & termination on simple average of technologies	1,09	1,37	1,75	1,59	1,31	7,11
with CC cost model & termination on combined 900/1800 operator	1,05	1,32	1,75	1,60	1,31	7,03
with CC cost model & termination on simple average of technologies	1,05	1,32	1,68	1,51	1,22	6,79
Fixed-to-mobile interconnection volume (bn minutes)	3,8	5,6	7,65	9,40	10,36	

(bn €, 2000 prices)

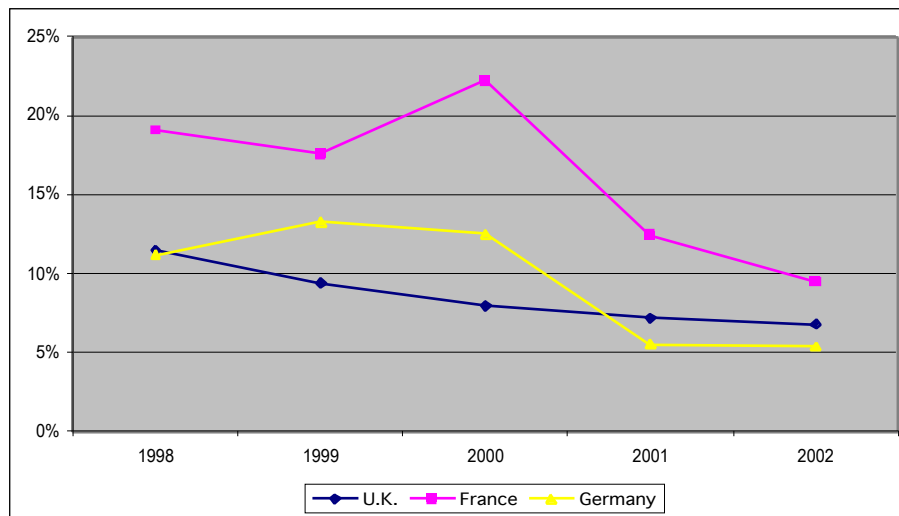
Figure 7: Annual fixed to mobile termination transfers in the UK, Germany and France*



Calculated with OFTEL cost model & termination on combined 900/1800 operator.

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Figure 8: Transfers as a fraction of total mobile revenues (retail plus interconnection)



The total of those transfers ranges between €17.3 and €19.3 billion in five years (in 2000 prices). The cumulated transfers in the three countries peak in 2000, doubling the level of 1998. Surprisingly, the decline in termination rates started in 2000 does not significantly reduce the amount of transfers. In Germany, after a 50% decline in 2001 due to an equivalent cut in rates, the transfers increase again by 10% in 2002. During that year, the growth in volumes compensates the small cut in termination rates. In the UK, the amount of transfers is cut by only 6.45% in 2002. In France, the 20% decline in termination rates in 2002 only creates a 15% reduction in transfers. This means that 25% of the glide path reduction in termination rates is offset by the increase in volumes corresponding to fixed to mobile substitution. This substitution effect on transfers should probably increase since a growing share of the fixed voice traffic terminates on mobile networks.

6 Impact of transfers

6.1 Macroeconomic impacts

The previous section estimated the financial transfers from fixed to mobile in France, Germany and the UK to be €19 billion between 1998 and 2002. These three countries accounted for about 50% of mobile subscribers in the EU in 2002 (141 out of 286 million). If the same pattern of transfers were repeated elsewhere, the total sum involved would exceed €38 billion.

We will now study the effects of the transfers. It is necessary to address this question in the abstract in the absence of a counter-factual (i.e. what would have happened in the absence of the transfers). We will, moreover, need to consider the impact both before and after the downturn which has affected the telecoms industry since 2000.

6.2 Impact on customers

The impact on consumers is clearly split between customers of fixed and mobile networks. Fixed customers have simply paid more for their fixed to mobile calls, which in 2002 in the UK accounted for 16% of retail expenditure on fixed telecoms networks. This high proportion reflects the impact of high termination rates.

The impact on consumers of mobile services will depend, as we have emphasised above, on the competitive context. A country's outgoing mobile market may either be wholly competitive – in which case no excess profits accrue to the operators within it – or it may exhibit market power exercised either by an individual operator on a unilateral basis or in a co-ordinated way by a group of operators. That market power might attain the level of dominance, if it enables the firm or firms to behave independently of customers and competitors.

In the first case – a wholly competitive market – mobile customers would have gained all the benefits of higher termination rates in the form of lower outgoing call prices, larger handset subsidies etc. We regard this situation as very much the exception in EU mobile markets. The more prevalent situation has been one in which either a single operator (a market leader) or a group of operators has exercised market power. As a result, surpluses from call termination may have been shared in varying proportions between mobile operators and consumers.

This structure of prices would have had the effects noted elsewhere on competition between fixed operators and mobile operators within each group. Fixed consumers are likely to have lost out not only from higher prices but also from the deterioration of the competitive environment in fixed services, which was aggravated by the transfer of resources from the fixed to the mobile sector. The detriment suffered by consumers from loss of choice should not be underestimated.

Finally, the transfers have a distributional effect on particular groups of consumers, triggered by their use of (higher-priced) fixed or (lower priced) mobile services. Attempts have been made to identify winners and losers. Data on subscriptions to and use of fixed and mobile networks show, however, that it is extremely difficult to disentangle the distributional effects. Owners of both fixed and mobile phones lose from high fixed to mobile call charges, but gain if the resulting surpluses are rechannelled into lower mobile outgoing charges. The only unambiguous winners or losers are respectively mobile only and fixed only subscribers. After close examination of these issues, the UK Competition Commission rejected the mobile operators' argument 'that high termination charges do not produce adverse distributional effects, not only a distortion that particularly disadvantages a certain group of fixed-line-only and payphone customers but also operates as a detriment to all customers who use fixed-line telephones more than mobile phones when making calls to mobiles, or who make more off-net calls to mobile than they receive'³⁸.

³⁸ Competition Commission *Vodafone, O₂ Orange and T-Mobile*, paragraph 2.400 (2003).

6.3 Impact on mobile operators

MNOs would clearly suffer revenue losses if mobile termination rates were lower. In the less competitive version of the outgoing mobile market, shareholders would suffer, assuming that retail prices would not be raised correspondingly. In the fully competitive version, outgoing mobile prices and handset subsidies would be affected to an amount corresponding to the decline in termination revenues. The increase in prices would also affect traffic minutes volumes and the number of subscribers.

6.3.1 Effects on revenues

The most in-depth studies concern the UK market. There is a consensus among analysts that interconnection accounts on average for 25% of UK MNOs' revenues. This structure depends however on the profile of the subscribers. Lower quality subscribers will, for instance, use mobile phones disproportionately for receiving calls, and thus termination revenues will typically be higher for lower tier operators³⁹. A study by Commerzbank⁴⁰ analyses the impact of a cut in termination rates on UK MNOs. The revenue loss largely depends on the ratio of incoming minutes and on the pressure for passing the cut onto the consumer.

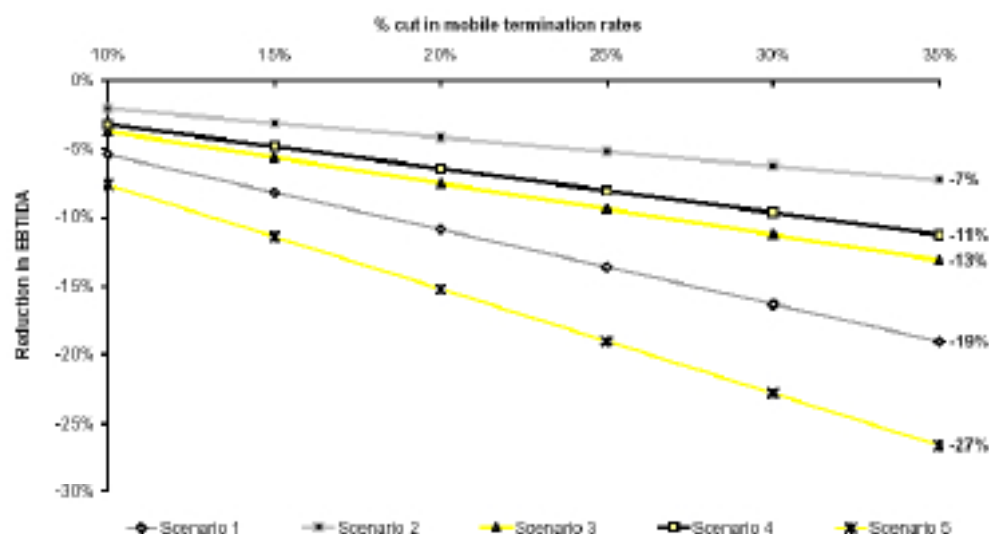
In the case where the cut is not massively passed on to the consumer, then the loss of EBITDA ranges between 5 and 15% for a 20% cut in termination rates. It reaches 15 to 30% if the cut is passed on to the consumer.

This calculation, which has not yet been carried in other countries does not take into account the growth of mobile voice traffic. But, as we have seen, the growth in fixed to mobile traffic associated with substitution may largely compensate for the decline in termination rates. Besides, the calculation shows that the impact on MNOs of the cuts in termination rates depends upon the market segment of each operator and the profile of its customer base. As a consequence, it should amplify asymmetry between players and stimulate competition in the mobile market, notably through on-net calls discrimination. For instance, MNOs with a larger share of outgoing calls could propose cheaper prices for on-net calls whilst keeping the same prices for off-net calls: they would then pass the gains on off-net calls (due to the cut in termination rates) on to their on-net consumers attracting incoming calls. In that case, the reduction of transfers between the MNOs would be used to subsidise on-net calls and to increase incoming traffic.

³⁹ OFTEL Q2 2002 shows that mobile termination accounted for 25.3% of T-Mobile's service revenue, but 21.5% for Vodafone. See Lehman Brothers 'Telecom Services, UK Telcos – Outlook favours Mobile Pure Plays' (7 February 2003).

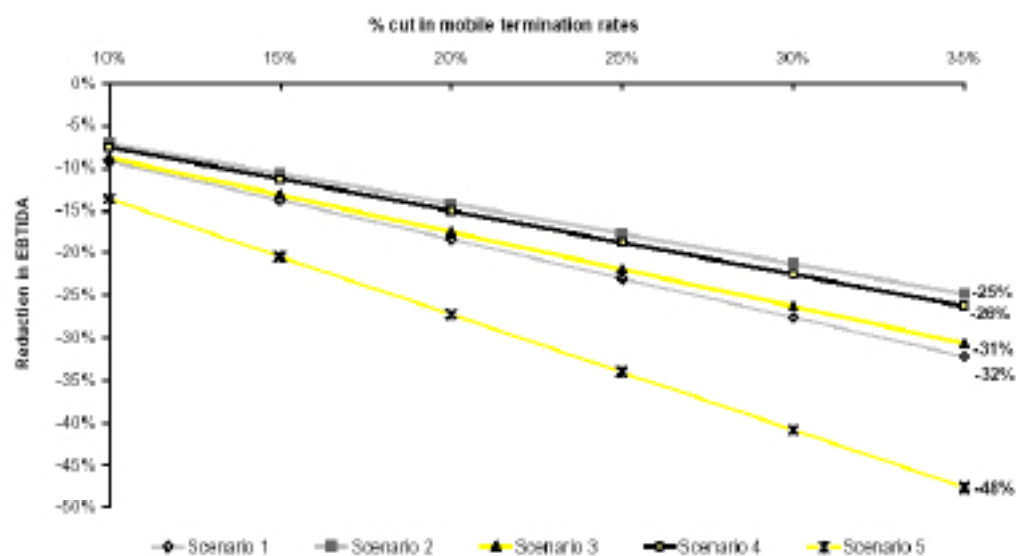
⁴⁰ Mobile termination rates. Regulatory thoughts and themes for 2003. Commerzbank Securities (16 January 2003).

Figure 9: Mobile termination rate cut – Impact on UK MNO EBITDA (assume cut is not passed on to end-users in the form of lower mobile-to-mobile off-net tariffs)



Note: Scenario 1 and 2 assume incoming interconnection revenues (mobile+fixed) represent respectively 20% and 30% of total revenues while outgoing interconnection is 15%. Scenario 3 approximates the set of operating conditions of O₂ UK and Orange UK; Scenario 4 that of Vodafone UK; and Scenario 5 that of T-Mobile UK. Source: Commerzbank Securities.

Figure 10: Mobile termination rate cut – Impact on UK MNO EBITDA (assume cut is passed on to end-users in the form of lower mobile-to-mobile off-net tariffs)



Note: Scenario 1 and 2 assume incoming interconnection revenues (mobile+fixed) represent respectively 20% and 30% of total revenues while outgoing interconnection is 15%. Scenario 3 approximates the set of operating conditions of O₂ UK and Orange UK; Scenario 4 that of Vodafone UK; and Scenario 5 that of T-Mobile UK. Source: Commerzbank Securities.

6.3.2 Effects on 3G roll-out

We consider that 3G is a new market independent from 2G telephony.

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However, it is commonly argued that the impact of mobile termination rates on 2G MNOs' EBITDA could slow down the 3G roll-out and alter the competitive position of 2G MNOs. It is also debated that 3G additional mobile spectrum should induce new tariff schemes, increasing fixed to mobile competition on voice. We examine below how these various aspects of the MNOs competition are related.

The capacity issue

Mobile communications transmit encoded signals through a dedicated radio spectrum. Successive mobile generations are based on innovative encoding and modulation technologies improving the efficiency of use of spectrum resources. Network infrastructure is the pre-required investment to exploit spectrum resources. This investment, and in particular, the network geometry, depends on the encoding and modulation technology. The available spectrum limits the transmission capacity of each operator and, in a competitive market, should influence its long-term pricing strategy.

Spectrum

2G technologies (GSM 900 and DCS 1800) are allocated bandwidth averaging 170 MHz per country. This bandwidth is shared among the national operators. In Europe, the smaller number of MNOs per country allows more spectrum per operator than in the US.

Operators with a smaller customer base can provide larger spectrum to each subscriber. However, they have no reason to discount prices as long as network externalities allow the growth of their subscriber base.

3G operates on higher frequencies using additional bandwidth. Spectrum is then expanded to 220-330 MHz per country. This means that the purchase of a 3G licence allows a 2G MNO to nearly double its available spectrum per customer.

Coding and modulation (spectral efficiency)

A mobile network is composed of cells of which the size is inversely proportional to the modulation frequency. Each cell is served by a Base Transceiver Station (BTS) which handles the communication procedures (modulation, de-modulation, encoding, radio-transmission) with the local handsets. For 2G, cell sizes vary from 35 km maximum for GSM 900, to 3-5 km for DCS 1800. So DCS 1800 is of higher density than GSM 900 but offers more capacity.

W-CDMA technology used for 3G has a wider capacity potential than DCS 1800. However it operates at a higher frequency than GSM and requires more cells. In existing DCS 1800 cells (3-5 km), W-CDMA increases capacity by 20%. But in smaller cells (2.6 km) the increase is 70% for one transceiver. A second transceiver doubles the capacity for only €50 000 capex.

Consequence

Compared with DCS 1800 infrastructure, W-CDMA, which operates 20% more efficiently, will achieve a capacity improvement (depending on the population density), of 1.7 times (France) to 2.8 times (Italy). In areas of high population density, the increase in capacity ranges from 2.6 times to 5.0 times with one transceiver per BTS, compared with DCS 1800.

In other words, once rolled-out, 3G infrastructure has much more voice capacity, and more extension flexibility than 2G. How will this advantage be valued by MNOs?

Mobile termination rates and 3G roll-out

If not compensated by an increase in volumes or in prices, a reduction in mobile termination rates would have a negative impact on MNOs' operating margins and cash-flow available for 3G roll-out.

O₂ UK for instance announced just after the CC decision of January 2003 that it will delay the planned launch of 3G services until the second half of 2004. This was followed three months later by a £5.9 billion write down in its 3G licence. But this move has not yet been followed by all operators. Vodafone insists on keeping its 3G licence book value. Orange has announced a two-year delay in its French roll-out while keeping its British schedule on time.

However, 3G should be considered as a separate business case. If the launch of 3G services is delayed, this may have many causes besides the cut in mobile termination rates. German operators have announced the same decision as O₂ with no regulatory constraint. Nevertheless, the surge of 3G new entrants offering large voice buckets raises questions about future mobile termination rates and MNOs' relative competitive position.

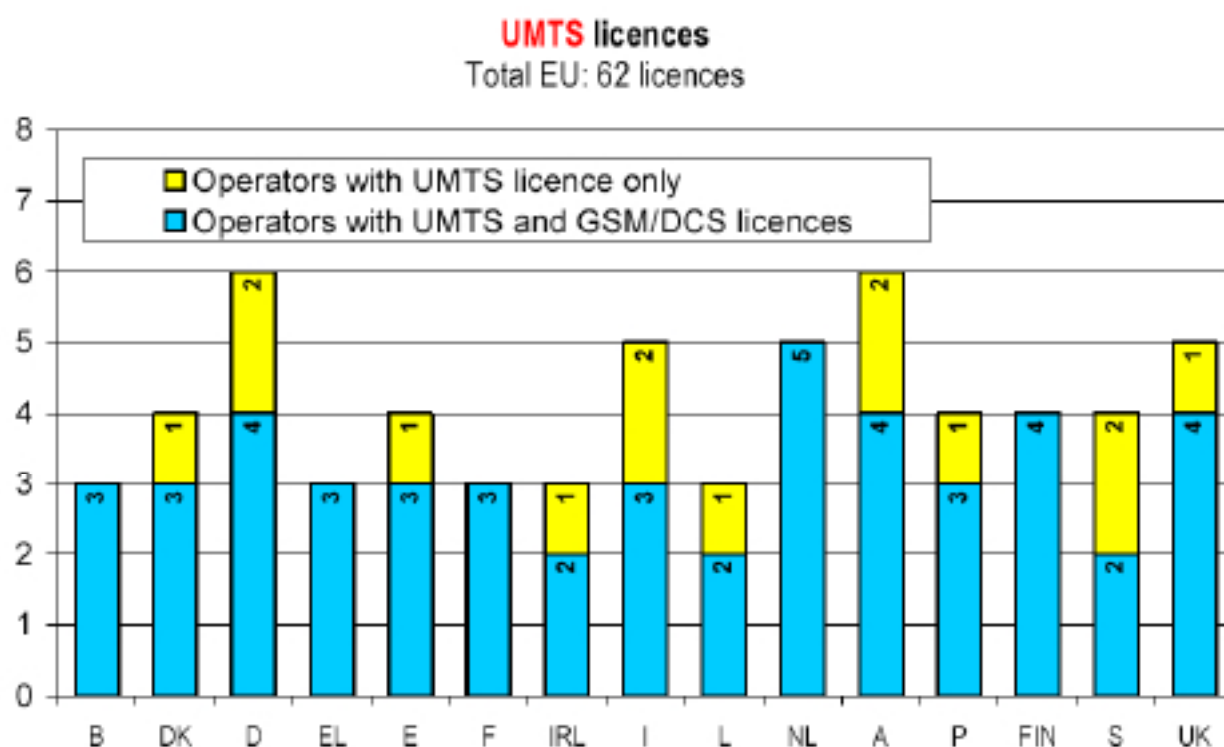
6.3.3 Relative competitive position

3G penetration depends on how a new 3G infrastructure competes with the existing 2G networks. This includes two dimensions: one is competition in voice, the other is the bundling of voice and data services.

As for data services, it is important to remember that considered in terms of its capacity utilisation, SMS are currently priced 450 times higher than an average two-minute call and account for less than 1% of 2G networks' traffic⁴¹. The number of SMS has grown by 56.8% in 2002 in France. From the standpoint of a 2G MNO, multimedia messaging services (MMS) on 2G should differentiate enough to preserve this high revenue source. Thus if there is no new entrant, there is no hurry for installed MNOs to roll-out 3G.

⁴¹ ABN-Amro '3G Tsunami: The revolution begins', page 9 (October 2002).

Figure 11: 3G licence distribution in Europe



Source: Telecommunications Regulatory Package – VIII Implementation Report – Annex I – Corrigendum March 2003.

In 10 of the 15 EU countries, at least one of the 3G service providers will be a new entrant.. Will MNOs be severely weakened in front of pure-play 3G operators? The consensus is that, as with the second wave of DCS 1800 licences, competition between MNOs will increase while new entrants may struggle to reach break-even market shares. Although it is still too early to build up a penetration model, the on-going experience of Hutchison provides a useful indication..

The Hutchison case

Hutchison is a 3G pure-play in the UK, Italy and also in Austria. In March 2003 it disclosed its bundling and tariff offers under the '3' brand for the first two countries. These bundles can be compared with the local conditions proposed by the 2G MNOs.

- UK: 1000 voice mins, 100 mins video calls, 250 SMS, 50 video downloads for £59.99 monthly on a 12 month contract (double for £99.99). For voice only, this offer doesn't beat T-Mobile's 'all-you-can-eat' offer at £75.
- Italy: 600 voice mins, 600 video-call mins, 150 SMS, 50 video messages, 100 e-mails, 100 accesses to portal for €85 per month. €140 offers the same bundle but includes the NEC e606 handset. As the Italian voice market is heavily biased towards prepay, the '3' proposition differentiates by advance payment which is quite unusual in the consumer context.

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In each country, the '3' offer has been close to the best buy for voice volumes and differentiated on new data services such as video calling. Those services can be accessed only through new handsets. So far, these are not subsidised (except for the 20,000 first UK subscribers who can get them at half-price). The price of a NEC video-call handset in the UK (£400) is close to double that of a subsidised MMS one. In Italy where handsets are not subsidised, 3G handsets cost between 115% and 150% of equivalent 2.5G handsets.

As far as coverage is concerned, it is expected to be around 50% population in the UK and 45% in Italy, increasing to 80% and 65% respectively by the end of 2003.

These first offers show that the really innovative 3G application is video-calls (and video messaging) to be accessed through a specific handset. Penetration then relies on network externalities: the service can be valued only if there are enough subscribers to communicate together by video. The offer doesn't make clear how these externalities would be subsidised. It seems that while voice revenues keep the same role as in 2G, '3' only relies on handset renewals to support enhanced 3G services. This may be not sufficient to promote network externalities, especially if the 2G MNOs decide to delay their own roll-out.

In early June, there were only 25 000 '3' subscribers in Britain and 90 000 in Italy, far short of the EU year-end target of 2 million. 3 UK then announced new tariff bundles with 750 and 500 voice minutes for £35 and £25 to any network at any time. For the first three months, the package includes a £20 and £10 allowance for video calling, video messaging and Internet content respectively. With both packages customers can send and read e-mails and view selected Internet content for free until the end of August 2003.

These offers correspond to a price of € 7 cents (resp € 7.5 cents) per voice minute, which is about € 3 cents below the lowest mobile termination rate in Europe and € 12 cents below the lowest termination rate in the UK. This indicates that in the UK, mobile voice may become the service through which the 3G network externalities are to be subsidised.

In other words, new entrant 3G service providers have to subsidise network externalities. We have seen in section 5 that, in the case of 2G, such subsidies amounted to several billion euros in each country. If 3G entrants choose to subsidise externalities through handsets, they may keep high margins on voice and SMS, but they will have to wait for handset renewals and compete with 2G to attract customers. This may prove efficient in countries where handsets are not subsidised and mobile voice consumers commonly use pay-as-you-go tariffs⁴². If they do it through voice prices, they will lose immediate revenues, but this may oblige their 2G competitors to follow them, impacting both their 2G asset value and their margins for 3G roll-out. This may lower the 3G entry barrier. In that case, the 2G competitors could find interest in writing down their 2G business (as a price war consequence) and writing up their 3G. This may be why Orange and Vodafone do not yet write down their 3G licences and keep their 2004 3G objective in the UK. This is in line with the large

⁴² Soon after the UK new tariff release, Hutchison has announced that in Italy, "3" would subsidize handsets rather than enter a price war on voice minutes.

transmission capacity offered by W-CDMA technologies. If this appears to be the successful penetration scenario for 3G, the resulting issue could be that 3G new entrants then purchase some marginal 2G operators (and customers). This in turn would make the writing down of the corresponding 3G licences a coherent course of action.

In such a competitive context, it is vital for fixed network operators that mobile termination rates remain below the retail mobile voice prices.

An alternative scenario is that 2G MNOs keep retail prices and termination rates so high to oblige the '3' to pay them as much as possible to attract new customers. This would increase the cost of the subsidies of 3G externalities to be financed through voice buckets by the pure-plays, to the benefits of the 2G MNOs. In that case, high mobile termination rates would then raise the 3G entry barrier and slow down the roll-out.

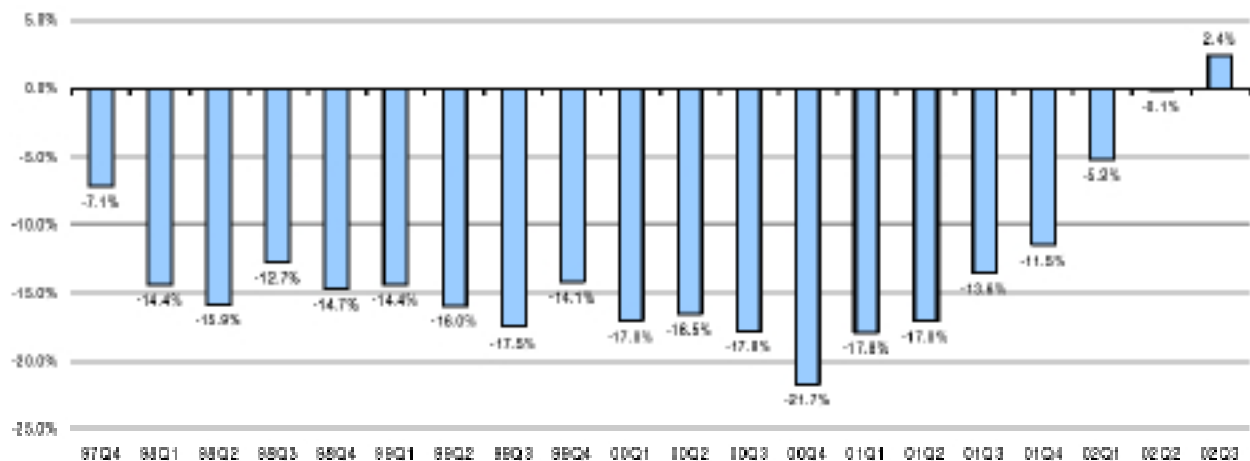
6.3.4 Opportunities to expand

Besides new competition with 3G, MNOs are confronted with two other issues: the slowdown of the 2G penetration and the decrease in mobile termination rates. According to the European Commission, the annual average growth of 2G penetration in Europe, which was over 68% in 1999 and 2000, has fallen to 36% in 2001 and to 6% in 2002⁴³. On the other hand, most countries have started an implementation of the ONP Directive 97/33/EC on mobile termination rates.

This means that MNOs' growth which benefited from strongly growing network externalities, might now be re-focused on Average Return Per User (ARPU).

One option is to cut costs, reduce handset subsidies and to raise prices. Another option is to look for volumes and market shares in voice. In that scenario, new pricing schemes may occur, especially in countries where the launch of 3G services opens the way to mobile voice 'bucket pricing' campaigns.

⁴³ European Commission, Telecom Regulatory Package – VII Implementation Report, Annex I. Corrigendum, page 47 (March 2003).

Figure 12: Annual change in quarterly ARPU for the European mobile market (%)⁴⁴

Source: Company data, CSFB research.

Bucket pricing, i.e. the offering of ‘more-minutes-than-you-can-eat’ at a cheap fixed price, has been largely used by MNOs in the US. According to consultants, *‘the US mobile operators increased the number of “bundled” voice minutes while keeping the price per month fixed. End-users were offered buckets filled with airtime, possibly too much to consume within a month anyway, teaching the end-user that more and longer calls resulted in a relative lower price per minute, competing directly with fixed-line tariffs. This concept of bucket pricing has led to increasing minutes of use per subscriber in the US while ARPU remained stable, whereas in Europe the minutes of use remained stable and ARPU decreased. Recent research by Citigroup indicates that in Europe the minutes of use are typically half the US level’*⁴⁵

In other words, the philosophy of bucket pricing is not to offer the consumer a lower average price for minutes, but to provide incentives to consume more through the lowest possible marginal prices.

The US tariff structure based, on the one hand, on the segmentation of the fixed market between local (free calls) and long distance, and on the other, on a billing focused on the on-net part of the mobile calls (the receiver pays for the termination) has helped the success of such schemes for regional and long-distance calls⁴⁶.

In Europe, high mobile termination rates have prevented so far such kind of offers. The more minutes a MNO sells, the more termination fees it should pay to competitors. Discrimination in on-net versus off-net call pricing may counter this risk: O₂ Netherlands has launched in September 2002 a ‘bucket’ offer applying only to on-net calls. This constraint makes, of

⁴⁴ A year of transition. European Mobiles: 2003 Outlook. Credit Suisse First Boston.

⁴⁵ From a study by Fource Consulting.

⁴⁶ Yankee Group's 1stQ 2003 Wireless/Mobile North American Carrier Tracker, shows that the average US mobile phone user logged 490 minutes of use in the fourth quarter of 2002. This stands in contrast to 480 minutes of use in the same period for fixed line telecoms - a figure derived from the US Census and based on an assumption of there being 2.6 persons per household.

course, the bucket offer less transparent. However, some customers could probably take advantage of it: the BMRB report finds out that in Britain, 45% of the youngest consumers (15-24) are likely to know if the number they are calling belongs to the same network⁴⁷. Moreover, when the termination rates reflect the termination costs, the spread in costs between on-net and off-net calls narrows, which makes the bucket offer easier to use.

As we have seen above, 3G new entrants may use bucket schemes to attract customers. As long as termination rates are over the costs, they will pay transfers to 2G MNOs for terminating off-net mobile calls. In principle, 2G MNOs cannot follow them without lowering termination rates at a level which will prevent them from discrimination complains. If they do so in order to limit the price gap with 3G, they will have to pass the cut in termination rates on to the consumer as soon as it occurs. This may result in an increasing substitution between fixed and mobile voice⁴⁸.

In countries where there is no 3G new entrant, and moreover, where the incumbent is a big 2G MNO, the mobile market should be less competitive. However, the SMS market will not be steady enough to pull the ARPU growth. Therefore, the MNOs may then choose to increase prices preferably to entering a price war for volumes.

6.4 Impact on FNOs

For a fixed-network operator, lower mobile termination rates reduce revenues (under the CPP regime) but could improve the operating margin, the net cash flow generated, and the EBITDA.

6.4.1 Integrated incumbents

Integrated incumbents would both benefit and suffer to a degree reflecting their participation in each market. The final outcome is the balance between profit and loss in the mobile division and cost reduction in the fixed division. Ignoring for the moment elasticity effects, the result will depend on: i) the difference between the incumbent's market share in fixed and mobile markets⁴⁹, ii) the share of mobile activities in the incumbent consolidated results (revenues, income, EBITDA), iii) and the share of mobile customers and revenues that would be affected by a decision on call termination. In a fully consolidated scheme, the larger the difference between the incumbent's fixed market share compared with its mobile subsidiary, and the higher the fixed to mobile traffic volume, the larger the overall benefits from a cut in call termination for the telecoms group. As the following table illustrates, the gains could be

⁴⁷ BMRB report on pricing structures, page 190 (July 2002).

⁴⁸ As a result of fixed to mobile substitution, factoring in a willingness to pay a 50% premium to the underlying fixed line price in aggregate, ABN Amro estimates conservatively outgoing voice ARPU growth of 18% on mobile networks. ('3G tsunami: the revolution begins', October 2002).

⁴⁹ Provided that the usual mobile market share estimation based on customer figures also give a fair estimation of incoming traffic share.

slightly larger for Deutsche Telekom than France Telecom due to a greater difference in fixed/mobile market position (respectively 78% - 48% in France and 74% - 41% in Germany⁵⁰), a lower dependence of financial results on mobile activities, and a significant fraction of its mobile revenues not affected by possible decisions on termination.

Table 8: Incumbents' dependency on mobile revenues

	France Telecom	Deutsche Telekom	British Telecom
Fixed domestic market share (retail revenues)			
local calls			
local distance calls	89.8%	98%	65.7%
Internet calls	74.3%	68%	53.3%
	67.6%	61%	45.5%
Mobile subsidiary	Orange (84%)	T-Mobile (100%)	none*
Domestic market share (customers)	48%	41%	0
Mobile share of 2001 revenues	35%	27%	0
Mobile EBITDA contribution	27%	10%	0
European share of mobile revenues	90%	75%**	0%

*After the spun-off of its mobile division as mm02 in December 2001. **Estimated from the number of subscribers. Source: Company data, *Telecommunications Regulatory Package - VIII Implementation Report – Annex I – Corrigendum* March 2003, p. 17

6.4.2 Incumbents

Lower mobile termination rates would have reduced their costs but this would in most cases be recognised within the retail price controls, either by cutting fixed to mobile price specifically, or requiring a lower overall level of fixed retail prices in a price cap. Fixed-originated minute volumes would have risen through own price and cross-price effects, via changes in mobile prices. Additionally, in highly competitive mobile markets, lower mobile termination rates would have caused outgoing mobile charges to rise, discouraging the number of subscribers, calls made or both.

6.4.3 Alternative Fixed operators

These would have benefited from higher volumes of traffic in the same way that the incumbent would have done. They might have benefited in particular from an enhanced competitive position *vis-à-vis* mobile operators in the provision of virtual networks embracing some combination of fixed, fixed to mobile and mobile calls. If, in addition, not all the costs

⁵⁰ Estimates of incumbent operators' market share for calls to mobile networks from European Commission (2002) *Telecommunications Regulatory Package - VIII Implementation Report - Annex I - Corrigendum*, page 19 (March 2003).

saved on lower termination rates would have been passed on to fixed consumers, both the incumbent and competitive fixed operators would benefit.

Effects on profits

In the UK and in France, overall minutes to mobile amount to 8% of total fixed line calls (excluding Internet) in 2001/02. Given the business market orientation of alternative operators, this ratio is usually higher around 15% on average. The elasticity of operating switch margin to mobile termination rate is therefore -0,15 (i.e. a 10% cut in termination rate mechanically improves the firm's margin by 1,5%). However, a fraction of the costs saved by the cut in termination rate will be passed on to consumers. Then the overall gain and increased financial performance will depend on the volume effect (price elasticity on termination) and the price reduction. For the sake of illustration, let us consider a 15% reduction⁵¹ of which half of the costs saved passed on to consumers, and a price elasticity on termination of 0,15 (average figure from financial analysts reports in 2003). Simple arithmetic shows that in this situation the EBITDA would increase by 1,2 to 3,75 points of revenue for the current range of wholesale prices in Europe.

Relative competitive position

If passed on to consumers, a decrease in termination rates will reduce the relative price of fixed to mobile calls compared with on-net and off-net mobile calls. This price and cross-price elasticity effect would slow down the substitution between fixed and mobile services.

Opportunities to expand

As the overall fixed telephony market is stagnant or declining, fixed operators have few opportunities to grow in this line of business. However, a correction of price distortions would probably foster both the incentives and the resources to accelerate roll-out of fixed broadband services (DSL, cable, satellite). Apart from generating additional revenues and profits, this move is required to compete with the expected mobile offers in data services after 2005. Substantial up-front investments are associated with a local/regional DSL offer to residential customers and SMEs, or to serve remote offices of large corporations (such as bank branches, retailers, etc.) scattered throughout the territories. The increased profitability allowed by lower termination rates would improve their financial position as well as access to capital markets to push on this investment strategy.

6.5 Conclusions

In summary, the winners in the case of a lower fixed to mobile termination rate would have been fixed operators and their customers; losers would have been a combination of mobile

⁵¹ In the range of cuts observed in Sweden and Spain in 2002 or considered in France, Italy and Belgium in 2003.

operators, their customers and (possibly) the Government. The economy as a whole would also have been a winner due to an increase in efficiency. In terms of economic efficiency, where mobile termination rates were unregulated, the price of fixed to mobile calls would be too high and consumption would be at an inefficient level. If these profits were recycled to depress outgoing mobile call prices and handset prices, then competition between fixed and mobile services would also be distorted, leading to a wasteful use of resources. This might ultimately have the effect of taking fixed and mobile services into the same market, when if competitively priced they would be in different markets – a different version of the well-known cellophane fallacy⁵².

It is of equal significance that the transfers have had an effect on the dynamics of the fixed and mobile markets. Their effect on alternative networks has hampered competition in fixed services, by weakening the incumbents' profitability, and has also limited fixed competitors' abilities to offer an effective challenge in the roll-out of broadband.

Moreover, the transfers have stimulated a strong substitution dynamic which is now causing fixed to mobile traffic to grow. This trend partly compensates for the glide path reduction in termination rates and in 2002 kept the fixed to mobile transfers at almost similar levels.

A new situation has arisen with the emergence in some countries of 3G pure-plays interested in creating network externalities for their new services. If these new entrants decide to attract customers through subsidised voice packages, termination rates will determine the level of subsidies to be financed by the pure-plays. In this scenario, mobile termination rates not only appear as a driver in fixed to mobile competition, but also as a key parameter of 3G penetration. If 3G has to be subsidized through mobile voice, then mobile termination rates could become a source of transfers from 3G pure-plays to the incumbent 2G MNOs.

In this section, we have attempted an exercise in counterfactual history to show the effects of the transfers. We do not claim to have considered all their ramifications. It is clear, however, that transfers on this scale will have significantly affected – and are still affecting – the shape of the telecoms sector in Europe. Our next task is therefore to consider future policy towards transfers between fixed and mobile.

7 Regulatory and policy conclusions

In this section of the study we will summarise our findings and the underlying theoretical results and develop our regulatory and policy conclusions.

⁵² The term 'Cellophane fallacy' is coined after the US vs. Dupont case. It describes a situation where "the current price [is] above competitive levels – a dominant undertaking could already have raised prices above competitive levels to its profit-maximising level. In that situation, it will be constrained from raising prices further by substitution from its closest substitutes... If prices already exceeded the competitive level, however, it would clearly be wrong to include those products in the relevant market and argue that they prevented the undertaking from exercising market power." (UK Office of Fair Trading's Guidance on Market definition, 1999 (section 5.13))

7.1 Guidelines for public interest pricing

The ideal standard from a public interest point of view for wholesale pricing in general and for termination rates in particular is the competitive market standard. Because there is no competition for providing the termination service to a particular mobile network the 'market price' to be observed in practice is not the result of the competitive interaction of various MNOs in a competitively structured wholesale market comparable to the retail market for mobile services. The termination service in one network is not a substitute for the termination service in another network. This evaluation of the competitive conditions does not exclude the possibility that MNOs face certain indirect constraints in setting the level of termination rates. These constraints may result if mobile subscribers take into account the level of fixed to mobile retail rates when making the choice between different mobile networks. These retail rates are mainly determined by mobile termination rates. Via this chain of effects there may be some competitive constraint on termination rates flowing from competition for mobile retail services and limiting MNOs to set monopolistic rates. But when we compare actual termination rates with rates based on the relevant competitive or public interest cost standard we will see that these potential competitive forces, at least up until now, are only able to generate very limited competitive pressure and control on termination rates.

We have argued in section 5.1 that the appropriate public interest standard for termination rates is forward-looking LRIC (including a reasonable return on capital employed). According to this public interest standard termination rates in the three countries analysed are far above relevant costs. Rates that do not meet the public interest standard generate a variety of economic distortions:

- They distort competition between fixed and mobile networks;
- They distort prices among various mobile services;
- They create economic welfare losses;
- They redistribute expenditure among various customer groups;
- They distort relative competitive and growth opportunities of different business entities.

These distortions become more relevant as the price-cost margins on termination rates increase, or in other words as the absolute amount of transfers increases.

7.2 Reasons for keeping a certain degree of transfers

There are two (potential) economic reasons for keeping a certain degree of transfers. One of these arguments relates to the competitive market standard. Even under competitive conditions for termination services there may be a certain level of transfers or, in other words, the resulting termination rates may be above the corresponding LRIC because this

service may – even under competitive conditions – be less price elastic than other services provided by MNOs.

Another potential economic reason for keeping a certain degree of transfers may result from network externalities. It may be in the public interest and in the interest of fixed-network users to have the chance to communicate to a larger mobile user community compared to a smaller one. If subsidies are necessary to attract marginal users to the mobile networks then transfers may be an appropriate instrument to arrange for the fixed network user community contributions to internalise this externality. We have dealt with this argument extensively in section 3.2 and do not see public interest benefits at a relevant level justifying significant transfers on this basis, given the high penetration rates which we have reached in Europe in the meantime. It could even be argued that nowadays there may be more reason to subsidise fixed network users to keep them on the network than the other way around. Mobile penetration rates are still growing while fixed-line penetration, which has already a significant lower level than mobile penetration, is beginning to decline.

There are many other arguments floating around which we cannot accept from an economic perspective as relevant in justifying significant amounts of transfers:

- Regulating termination rates may have negative impacts on the competitiveness of the market structure in the mobile market;
- Regulating termination rates may limit the ability of MNOs to finance innovations in 3G and other new activities;
- Regulating termination rates may hinder MNOs to get a proper return to finance 3G licence fees;
- Reducing or abolishing transfers would prevent MNOs from offering further subsidies on handsets.

In some countries, for example in France and Germany, MNOs do not have symmetric positions in the market, but have different market shares. In Germany, for instance, the two leading operators, T-Mobile and Vodafone, have a combined market share of 80% while the remaining two MNOs share the other 20% market share. Although the German mobile market is regarded as quite competitive, the ability of MNOs to rebalance their respective retail price structure due a sudden and heavy decrease in mobile termination rates may not be equally distributed among the MNOs. If, for instance, the smaller MNOs have greater difficulty in increasing retail prices, then their already relatively weak competitive position in the market may be further weakened. Our conclusion is that potential competitive impacts on the mobile market should not give reason for keeping transfers forever but give reason for regulators to take care of potential market impacts when defining their remedies with regard to termination rates. The case defined above may justify a glide path to bring down termination rates closer towards costs rather than take one big leap from the current price level. The more excess profits the MNOs earn in the market, the less justified is any glide

path approach. Regulators should consider this aspect when defining their regulatory strategy.

It is often argued that the profits from termination rates are a special source for MNOs to finance further network developments and innovations, in particular 3G-network deployment. This argument contradicts the MNOs' argument of vigorous and effective competition. In such a case MNOs would adjust their rate structure if they had to reduce termination rates to reach their old level of profits⁵³. In this scenario there is no impact of termination rates on the ability of MNOs to finance any activity. In addition, UMTS has been licensed as a separate market. This means that any UMTS business case should live and stand on its merits and not from subsidies.

The analysis, arguments and conclusions relating to financing of any 3G licence fee are the same as those we developed for innovation financing. Moreover, if network externalities have to be subsidised for 3G, there is no reason why (users of) fixed networks rather than mobile users should finance them.

If MNOs have to reduce termination rates they have to increase retail rates or reduce handset subsidies to keep their former level of profit. In a world of perfect or vigorous competition in the retail market MNOs have no choice but to raise prices. Otherwise they would face a loss. Mobile customers would suffer from such price adjustments. The situation is somewhat different if there isn't perfect competition. If MNOs have maximised their profits at the former level of termination rates, they cannot increase mobile retail rates to compensate for lost profits due to reduced termination rates. Otherwise they would lose profits in the retail market. In that situation MNOs' shareholders would suffer due to a reduction in overall profits. Handset subsidies have an impact on the willingness of certain customer groups to subscribe to a mobile network. Reducing handset subsidies would therefore reduce current penetration rates to a certain degree. This would be a problem from the public interest point of view if current penetration levels are coherent with exhausting network externalities. As we discussed in section 3.2 there are, however, some indications that current penetration levels are higher than socially optimal. Furthermore, the general subsidisation of handsets causes a lot of economic waste which cannot be justified by network externalities. There may be more efficient means of keeping marginal subscribers on the networks than by subsidising handsets.

7.3 Reducing current levels of transfers serves the public interest

We have argued that reducing current levels of transfers serves the public interest. Although there is a clear trend that shows termination rates going down faster than retail rates, fixed network users are still paying significant amounts of transfers to mobile users. Moreover fixed to mobile volume increases partly compensate the unit fall of the transfer. Reducing

⁵³ In reality the situation is a little more complex when average costs are increasing due to demand reductions.

transfers would increase the benefit of fixed network users in particular and would reduce economic welfare losses.

7.4 Regulators should act if market forces do not correct distortions

If economic distortions are high and market forces do not exist or are too slow to correct distortions there is a case for regulatory intervention. Regulation can improve the situation and the public interest if it has proper instruments at its disposal and if the application of these instruments does not cause countervailing effects to the public interest which outweigh the benefits of regulatory intervention.

How can we identify the need for regulatory intervention? We see two criteria which should form the basis of whether or not to act. The first criterion relates to the price-cost margins of termination services in a market which is characterised by SMP of relevant operators. Margins should still be significant before a regulator should impose regulatory measures. Applying this criterion therefore requires estimating the costs for providing termination in each relevant mobile network. Secondly, the regulator should look at the speed according to which price distortions are reduced either by market forces or by economic behaviour of MNOs driven by the threat of potential regulation. One indicator to measure the proper speed of change is the degree according to which termination rates decrease faster than retail rates⁵⁴.

In the case at hand the action parameters of regulators for applying remedies are obvious: they have to bring mobile termination rates closer to costs. There are two very basic decisions which have to be taken:

- Should the adaptation of prices to costs be organised in one big step or should it be better organised over time in a glide path as part of a price cap regime?
- Should all MNOs in the market be subject to price regulation of their termination rates?

In the world of static economic models any distortion within economic variables should be corrected immediately. Keeping distortions over time or choosing a glide path to decrease distortions over time would cause further welfare losses. The real world, however, is more complex when the process of reducing distortions generates a chain of complex adjustment processes which cause a lot of economic impacts and effects. Given the high profit margins in termination rates and the policy of many regulators to accept this situation so far, a regulatory policy, for example, to halve termination rates could cause significant turmoil in the mobile industry and to mobile customers. The corresponding rebalancing rate cannot be managed within one big step. In the next paragraph we develop the argument that sudden and significant changes may cause negative impacts on the competitive conditions in the

⁵⁴ For a further discussion of a glide path approach see section 7.6.2.

mobile market. These arguments favour an adaptation process to bring down termination rates. The appropriate point to implement this is a price cap approach over several years.

There is not only economic distortion due to the level of termination rates compared to the respective network costs. Competition between FNOs and MNOs is directly affected. For a certain amount of calls users are indifferent (if we ignore the price for a moment) whether or not they make a specific call via a fixed or a mobile connection. The cost of providing such a call from a fixed line consists of a fixed line (origination) component either produced by the operator at cost or provided at a regulated (normally cost-based) interconnection charge and added to a mobile termination rate significantly above costs. The mobile call origination is produced at cost plus a fixed-line termination charge, normally regulated at cost. This means that the MNO can produce the same call at significant lower costs than the FNO. Therefore, competition between the two types of networks is distorted.

7.5 Remedies

We will now take a forward-looking view, and discuss the impact of various remedies relating to mobile termination or the parties identified above. This discussion is set within the framework of the new regulatory arrangements for electronic communications services due to come into effect on 25 July 2003. These specify remedies which can be employed in response to a finding of significant market power (or dominance) in any market considered suitable for *ex ante* regulation. In the context of our discussion the three key remedies are as follows:

In relation to wholesale markets:

- Prohibition of discrimination: this prohibits discrimination of all kinds, including delays in providing service to competitors, poor quality of service applied to some customers but not to others, and so on; most relevantly in our context it can prevent a vertically integrated operator from charging itself a lower implicit termination charge than it charges its competitor – for example, it prevents a mobile operator supplying fixed to mobile calls from charging its customers less than its own mobile termination rate charged to competing third parties, plus other costs incurred in supplying the service.
- Cost-oriented pricing: this requires the supplier of a wholesale service to set a charge equal to cost – normally LRIC – plus any relevant mark-up.

In relation to retail markets:

- Price control, through a price cap for example: this can be applied to calls on the fixed incumbent's network of a particular type made by a residential or business customer (or both), or it can apply to a basket of services, which may include fixed to mobile calls.

At the same time it is open to NRAs to propose markets other than those listed in the Commission's Recommendation for the application of *ex ante* regulation, or to propose additional remedies. In the context of our discussion, an NRA might propose to conduct an *ex ante* market analysis of the mobile outgoing market, and to apply remedies in the event that single, collective or leveraged dominance were found there. Such remedies might include price controls, restrictions on handset subsidies or other measures. Alternatively an NRA might propose an alternative remedy (not listed in the Directives) to deal with mobile termination. We will consider these alternatives below, as appropriate, but focus primarily on the three remedies noted above.

In selecting remedies NRAs have an obligation to observe proportionality, which means that remedies must be a) necessary; b) based on the nature of the problem identified; and c)) the least burdensome available. They must also be consistent with the objectives of the new regulatory arrangements, which can be summarised as the encouragement of investment and innovation, and the protection of consumers.

7.5.1 Prohibition of discrimination

This can cover any form of unequal treatment of a firm's own customers and those of its competitors. It could be applied in a situation where a mobile operator (dominant in the supply of mobile terminations services on its own network) provided an inferior service to off-net callers from other mobile networks than to on-net callers from its own networks, with the effect of encouraging retail customers to join its own network.

A more subtle form of discrimination arises where an operator chooses a combination of wholesale and retail prices which favour its own operations. For example, it might charge € 20 cents for the termination of another operator's call on its network, while offering a competing retail service which requires the same termination service for € 7 cents. As another example, a mobile operator may charge a different termination rate to fixed than to mobile operators, or discriminate within each class. Such a combination of prices makes it impossible for a competitor to compete. Such conduct is known as a margin squeeze, as the margin between the retail and the wholesale price (negative in the example above) is insufficient to allow an efficient competitor to enter the retail market in question.

A prohibition of this form of discrimination prevents the operator in question from setting retail prices and termination charges which exclude equally efficient competitors from serving the retail market, but it does not control the price of the wholesale product. In the example above, the firm could avoid discrimination either by lowering its termination charge to a level below € 7 cents, to allow competitors an adequate retail margin, or by raising its own retail price above € 20 cents, again allowing its competitors an adequate margin. There is a well-attested example of mobile operators in the UK raising their prices to avoid a charge of discrimination. It may therefore need to be accompanied by other remedies.

The remedy in question has, however, been widely used in the communications sector, notably in relation to the supply of wholesale and retail broadband services. Issues arise in relation to the scope of the services over which non-discrimination should apply, the identification of relevant costs which must be covered and the measurement of such costs, but it has proved to be a viable remedy in many jurisdictions. In some member states (France) where mobile operators have been declared to have SMP on retail mobile markets, an obligation not to discriminate exists and has been enforced in a dispute between MNOs. It may be necessary to couple a non-discrimination obligation with a transparency requirement, to ensure that competitors have access to retail price information.

7.5.2 Cost-oriented pricing

This remedy is appropriate for governing access to a durable bottleneck facility, especially where the technology is well established and the service is mature. These last two considerations help matters because cost-related pricing inevitably requires the collection of unit cost data, which are more reliable when the technology is well understood and output levels are relatively stable.

The principal area for application of cost-oriented rated pricing is in interconnection to the fixed incumbent's network (see 3.1.1. above). Most NRAs have developed cost models using either management accounting (top-down) or engineering (bottom-up) data to calculate the long-run marginal cost of a range of interconnection services, including particularly call termination.

UK experience has demonstrated the feasibility of carrying out equivalent cost-modelling exercises on mobile networks, leading to the setting of cost-oriented charges. (See section 4 above). Similar models exist or are being developed for mobile operators in many jurisdictions, including several countries in Europe including Austria, Greece and Sweden, and also Australia, the Caribbean and South Korea. There is no insuperable practical modelling difficulty in setting mobile termination rates on a cost-oriented basis.

7.5.3 Retail price controls

The decision to apply a price control on a retail service required the NRA to satisfy itself that no alternative remedy such as a wholesale price control is adequate to achieve the same result.

The Commission's Recommendation on relevant markets for ex *ante* regulation distinguishes between fixed access and calls for residential and for non-residential customers, and it is likely that NRAs will reach a different assessment on the level of competition in residential and business markets.

When, however, an NRA is satisfied that a retail price control is appropriate it must decide on the method and scope of the control – whether to use a price cap or another method, and

whether to control individual prices or the average price of a basket of services. In relation to fixed to mobile calls, such calls can either be subject to a separate price control or form part of a larger controlled basket. In the former case, a cut in mobile termination rates will be reflected at the next price control review in a lower retail price. In the latter case, a cut in mobile termination rate may have no effect on the retail price of calls to mobile but lead, for example, to a cut in the price of national calls on the fixed network. Both practical and theoretical considerations suggest that fixed to mobile calls are better subject to price control as part of a broader retail basket. It is easier to establish the costs of a larger group of service than a single service, and it will probably enhance consumer welfare if the operator has some flexibility in setting relative prices within an overall price control. It is only necessary to control the prices of the dominant firm. Doing so alters the environment in which competitors operate, and indirectly constrains them.

7.5.4 Other remedies

The discussion above has focused on the use of non-discrimination and cost-based pricing. These are capable of going directly to the source of market failure: cost-oriented pricing to deal with excessive pricing of termination, and the prohibition of discrimination to deal, where necessary, with practices which restrict the number of competing services available to end users.

Other variants have been proposed:

- Links between mobile termination rates and outgoing mobile prices: the aim is to 'borrow' competition in the latter services to drive down termination rates; but the approach may equally soften competition in the outgoing market.
- Establishing a 'rule of thumb' linking fixed and mobile termination rates; but this would be a 'rough and ready' version of the cost-oriented regulation of rates proposed above, and would need constant revision.

Remedies of this kind tend to be variants of the main ones discussed above. In our view, it is better to rely on the originals, in most cases.

7.6 The impact of the remedies

7.6.1 The players

We now illustrate how alternative combinations of remedies applied to calls to mobile and mobile termination will impact upon the various parties. We focus upon the main parties as follows:

- **Incumbent fixed operators:** these are Europe's historic monopolists with dominant market shares especially among residential customers.

- **Competitive fixed networks:** of varying types; the model adopted here is of a fixed network focusing on business customers.

- **Mobile operators:** member states differ significantly in number of mobile operators, equality of market shares and (accordingly) degree of competition. Outgoing mobile markets could in principle be fully competitive, so that any surpluses from termination would be immediately recycled in lowering out-going prices. This is likely to be the exception rather than the rule, and markets will be less than fully competitive even though smaller and less successful operators may not be excessively profitable or even profitable, on a forward-looking basis. Mobile markets also differ in terms of whether 3G will introduce new players; where there is at least one new player, the competitive position will be affected, in ways which depend upon particular conditions of competition. In the account which follows, we assume a market for outgoing mobile services in which one or more operator exercises market power, even though that market power may not attain the level of dominance. This reflects the situation in most member states.

- **Fixed/mobile integrated operators:** most incumbents (with the exception of BT and Eircom) have wholly or partly owned mobile affiliates; the impact of any increase on such groups is the sum of the effects on fixed and mobile profitability. Historically, where fixed operators have been regulated more tightly than mobile, there has been an incentive to move profits to mobile networks.

- **End users of fixed and mobile services:** these will naturally be divided into business and residential users, for certain purposes. It is likely that very large business users will be little affected by regulatory changes, as they will have already secured the benefits of competition by special arrangements (for example, virtual mobile private networks for mobile services).

7.6.2 The probable impact of remedies

Table 9 and the accompanying notes show the likely effect on the parties identified on a 7 point scale, from +3 (significant gainer), through 0 (no change) to -3 (significant loser). The *status quo* is characterised by:

- either no price control of termination, or control via a glide path which keeps charges significantly above costs for a lengthy period;
- the absence or partial implementation of non-discrimination provisions relating to termination charges for fixed to mobile, off-net and on-net mobile calls;
- no retail price control over fixed to mobile calls.

We regard this as being fairly representative of member states, though there are some exceptions. In the three countries to which our empirical estimates of fixed to mobile transfers relate, the current situation is as follows:

	Non-discrimination	Control of fixed to mobile tariffs	LRIC pricing of termination
France	Enforced for on-net mobile calls	None	Glide path, but no explicit cost floor
Germany	Competition law	None	Not regulated
UK	Not enforced for on-net mobile calls	Controlled as part of retail price cap	In place, with glide path

Table 9: Probable impact of alternative combination of remedies, compared with status quo

Remedies	Non- disc	Non-disc, Retail price control	LRIC	LRIC, Retail price control	LRIC, Non-disc	LRIC, Retail price control, Non-disc
Impact on Operators						
1. Incumbent fixed operator ^a	+1	0	+2	+1	+3	+2
2. Competitive fixed operator ^b	+2	+1	+2	+1	+3	+2
3. Mobile operators	-1	-1	-2	-2	-2	-2 to -3
4. Integrated fixed-mobile operator ^c	-1 to +1	-1 to +1	-1 to +1	-1 to +1	-1 to +1	-1 to +1
Impact on Consumers						
5. Fixed services ^{fd}						
- business	+1 to +2	+2	+1	+3	+2	+3
- residential	+1	+1	0 to +1	+2	-1	+2
6. Mobile services ^e	-1	-1	0 to +1	-2	-2 to -3	-2 to -3

Notes to Table 9

^a Incumbent fixed operator benefits via higher retention (absent retail price controls on fixed to mobile) and via volume changes as prices fall.

^b We assume that competitive networks are heavy suppliers of fixed to mobile calls and benefit from non-discrimination and LRIC remedies, especially in the absence of control over retail prices. In this case, some of the reduction in termination rates will accrue to them, rather than immediately to customers. Consumers and competitors will both benefit from an increase in the volume of calls.

^c Outcome depends on balance to gains and losses. If a typical integrated operator has 70% of the fixed market and 35% of mobile revenues, and if regulation of fixed markets is less than tight, an integrated operator could benefit. If their fixed activities are highly regulated they may lose if their mobile business is regulated too.

^d Fixed customers gain from regulation of mobile termination charges and of retail prices to mobile. Non-discrimination provisions might disadvantage them, in certain circumstances. Business customers are assumed to be heavier users of fixed to mobile calls than residential customers.

^e Generally speaking, mobile customers in the more competitive mobile market places will lose more as there will be no excess profits to insulate them from the change.

Table 9 seeks to identify the long-term effects of the remedies. The table suggests that the incumbent and competitive fixed operators benefit, progressively, from the imposition of the

LRIC and non-discrimination remedies. Retail price control may reduce this benefit, to some degree, but this factor is diminished by the highly competitive fixed market in which they operate. The table embodies the assumption that competitive networks benefit particularly from the non-discrimination remedy, because of their high component of business customers, which are intensive in fixed to mobile traffic.

Mobile operators suffer correspondingly. If mobile termination rates fall, are they able to recover profitability by raising prices in outgoing markets? If those markets were currently fully competitive, they would be forced to (after a transition); otherwise their businesses would fail to recover the cost of capital. However our starting point is that they exercise a degree of market power – not necessarily dominance – in most European markets. That has been deployed to raise prices as far as possible. A reduction in termination rates would not automatically lead to a successful co-ordinated effort to raise outgoing prices by way of compensation, except by reference to a particular pattern of behaviour as the part of the operators when subject to challenge, rather than standard profit maximisation.

In the case of an integrated fixed-mobile network, the effects go in opposite directions. Consumers of fixed services experience predictable consequences, with business fixed customers benefiting particularly. Given our assumption about mobile operators' market conditions and behaviour, we expect mobile operators and their shareholders to bear most of pain of reduced mobile termination rates.

It is reasonable to expect a transition period as the effects work through. They also depend on the scope of the remedy. A discrimination remedy has to be applied or not applied to a given set of transactions: there is no middle ground. Regulators could, however, confine its operation to a particular set of services, for example, they may find that mobile operators enjoy dominance on call termination on their own networks, and that this justifies a prohibition on discrimination in relation to fixed to mobile calls, whereas in the case of mobile to mobile calls for certain classes of business customers – closed user groups – where customer chooses both the originating and terminating operator, such a remedy is not necessary.

In relation to cost oriented pricing, regulators can delay the full application of cost-oriented termination changes by establishing a glide path within a price cap which allows charges to fall progressively towards the falling level of costs. This approach was recommended in the UK in both its 1997 and 2002 reports,⁵⁵ and similar phased reduction have been agreed between NRAs and mobile operators elsewhere.

Glide paths may prevent disruption of markets, sudden changes in retail prices or dramatic worsening of an operator's profitability. However they can also delay the attainment of the goals of regulation, such as better balanced and more efficient tariffs and a better deal for consumers. We believe that consumers' interests should be paramount, and that the main

⁵⁵ MMC, Cellnet and Vodafone, 1998, Competition Commission, Vodafone, O₂, Orange and T-Mobile (2003).

purpose of glide paths should be to avoid substantial disruptions in the prices they face, which may arise from the precipitate withdrawal of a flow of profit in a company subject to effective competition. Where excess profits are being made, there is no obvious justification for a glide path, from the consumers' standpoint, and they should be curtailed to a minimum. This is a very important point in the light of the propensity of NRAs to seek compromises with mobile operators by creating glide paths of great length which damage consumers' interests.

7.7 General conclusions

Mobile termination services are wholesale or interconnection services like similar services in the fixed networks. They are wholesale in the sense that it is not the end users which demand those services. Under the calling party pays arrangement and end-to-end pricing only other operators demand those services to be able to offer their customers fixed to mobile or off-net mobile calls.

Wholesale services, in particular termination services, are essential to other operators. They cannot practically and economically duplicate those services. Each operator is providing the wholesale service under monopolistic conditions to its customers. There is practically no supply-side substitution to those termination services. There is, however, limited demand-side substitution which limits MNOs from extracting all potential monopoly rents from this service. The demand-side constraints are, however, too weak to force MNOs to bring termination rates to a level which corresponds to a competitive standard and to the overall regulatory standard for wholesale services, namely forward-looking incremental costing. Instead, mobile termination rates in Europe are characterised by significant price-cost-margins leading to huge economic transfers from the fixed networks to the mobile networks.

Such transfers may originally have been intended to help an infant industry grow against the overwhelming market power of the dominant FNOs. There was some efficiency microeconomic justification in giving them a capability to internalise network externalities via subsidised handsets. With the emerging competition in the fixed networks and the tremendous growth of the mobile industry mainly in the second half of the 1990s, such policies have lost their economic justification totally and they have gone into reverse. Overpriced termination rates and the large associated transfers from fixed to mobile networks are nowadays a source of significant economic distortions. The pricing system is distorted, welfare losses occur and, in particular, competition between fixed and mobile services is being distorted. The last aspect of the current transfer system is the most crucial one in the current process of sector and competition development. Mobile and fixed networks are competing more with each other. Fixed networks face a reduction in access lines and in call volumes due to the increasing competition by mobile networks. This results in an increase of the relative share of fixed to mobile communications in the fixed voice traffic. It is, however, essential that both types of networks are facing proper and efficient regulatory rules governing that competition. The current asymmetries in the terms and conditions for interconnection services do not fit with that standard. Competitive distortions are not an

abstract concept. We can observe already that the current system invites MNOs to set retail rates which are below their corresponding wholesale services.

All the evidence which does exist and which we derived in this study suggests that reducing the level of termination charges in Europe from current unregulated levels would serve the public interest. Market forces will not do it fast enough or even at all. A clear mandate for regulatory intervention is defined. The only relevant issue we see is whether regulators take actions to reduce termination rates significantly in one big step when they have accepted those distortions for quite some time either by doing nothing or by choosing inappropriate regulations. In that situation mobile customers and MNOs would face serious disruptions.

The other question is what are the appropriate regulatory actions or remedies to take. The new European regulatory framework offers as major remedies for this situation the prohibition of discrimination and cost-oriented pricing as remedies related to the wholesale markets. In relation to retail markets, price control mechanisms are being offered. Besides these straightforward remedies one might also consider some more unconventional remedies like controls on handset subsidies, links between mobile termination rates and outgoing mobile prices and links between fixed and mobile termination rates.

We see the need to prohibit discrimination to prevent operators from excluding competitors from the retail market which is not adequately served. Cost-oriented pricing as a remedy for a durable bottleneck facility may be implemented by a price cap approach which leads after a relevant price cap period to the acceptable level of cost-based termination rates. Whether retail price controls for fixed to mobile calls should be applied depends on the competitive conditions on these retail markets. If dominant FNOs are able to catch major parts of the profits resulting from termination rate reductions, regulators should consider this option.

References

Analysys (2000), 'Economic Studies on the regulation of the mobile industry', Final report for ECTA, 25 February 2000.

Armstrong, M. (2002), 'The Theory of Access Pricing and Interconnection', in M. Cave, S. Majumdar, I. Vogelsang (Eds.) *Handbook of Telecommunications Economics*, North-Holland.

BMRB report, pricing structures, July 2002. Appendix 6.2 to the Competition Commission (2003) '*Reports on references under section 13 of the Telecommunications Act 1984 on the charges made by Vodafone, O₂, Orange and T-Mobile for terminating calls from fixed and mobile networks*'..

Commission of the European Communities (1997), '98/195/EC Recommendation on interconnection in a liberalized telecommunications market – Part 1 (Interconnection Pricing)', Brussels, 15.10.97, amendments 98/511/EC and 2000/263/EC.

Commission of the European Communities (1998), '98/322/EC Recommendation on interconnection in a liberalized telecommunications market – Part 2: Accounting separation and cost accounting', Brussels, 8.4.98.

Commission of the European Communities (1999), 'Investigation of the EU Commission about lowering the fees of calls between fixed and mobile networks', Brussels, May 4, IP/99/298.

Commission of the European Communities (2003), '*Recommendation on Relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Article 15 of the Directive 2002/21/EC of the European Parliament and of the Council of 7 March 2002 on a common regulatory framework for electronic communications networks and services*', February 11.

Commission of the European Communities (2001), 'Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions - Seventh Report on the Implementation of the Telecommunications regulatory Package', Brussels, COM(2001)706, 28.11.2001.

Commission of the European Communities (2003), 'Recommendation of 11/02/2003 on Relevant Product and Service Markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC'.

Commission of the European Communities (2003), 'Telecom Regulatory Package – VII Implementation Report', Annex I. Corrigendum, March.

Competition Commission (2003), '*Reports on references under section 13 of the Telecommunications Act 1984 on the charges made by Vodafone, O₂, Orange and T-Mobile for terminating calls from fixed and mobile networks*'.

Official Journal (2002), 'Directive 2002/21/EC of the European Parliament and of the Council of 7 March 2002 on a common regulatory framework for electronic communications networks and services', OJ L 108, 24.4.

Freund N., Ruhle E.-O. (2002), 'Regulatory concepts for fixed-to-fixed and fixed to mobile interconnection rates in the European Union', ITS Europe Conference, Madrid, 8-10 September.

Gans J. S. and King S. P. (2001), 'Using "Bill and Keep" arrangements to soften Network Competition', *Economic Letters*, Vol. 71, No.3, June, pp.413-420.

IRG (2002), *Input from the Independent Regulators Group on the EC's Working document on Relevant Product and Service Markets with particular focus on Section 4.3.1 'Wholesale call termination on mobile networks' and the regulatory consequences thereof*, 27 September.

IRG (2002), *Working paper on market definition for mobile termination*, Significant Market Power Working Group, February.

Kurth M. (2003), 'Mobilfunk – Festnetz: Partnerschaft über angespannte Konkurrenz?' *Multimedia und Recht*, Beilage 1 / 2003, pp. 3-11

Monopolies and Mergers Commission (1998), *Cellnet and Vodafone*.

OFTEL (2001): International benchmarking study of mobile Services, Issued by the Director General of Telecommunications, 7 November.

OFTEL (2001), Review of the Charge Control on Calls to Mobiles, 26 September.

Rohlfs J. (2002), 'Efficient pricing with cross-elasticities, network externalities and a profit constraint: with application to termination charges of mobile network operators', ITS Europe Conference, Madrid, 8-10 September.

Samarajiva, R., Srivastava, L., Kelly, T. (2001), 'The Regulatory Environment for Fixed-Mobile Interconnection', *Communications & Strategies*, no 42, pp. 23-48.