ELSEVIER Information Economics and Policy 10 (1998) 471–488

INFORMATION ECONOMICS AND POLICY

Market structure in mobile telecoms: qualified indirect access and the receiver pays principle

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Received 5 August 1998; accepted 17 August 1998

Abstract

Scarcity of spectrum limits the number of competing network operators in mobile telecoms. In the United Kingdom a regulatory review is currently enquiring into the effects of limited competition in the mobile market. The European Commission is also reviewing competition in roaming across mobile networks in Europe. In the UK the industry regulator Oftel claims that the prices for calling mobile phones are too high. We show that such relatively high prices stem from asymmetric incentives. The convention in the UK is for the originating party to pay for a telephone call. If instead the receiver were to pay for some or all of a call, we show that prices of calls to mobiles would be lower. We also argue that qualified indirect access could stimulate more effective competition in mobile telecoms.

Keywords: Mobile telecoms; Qualified indirect access; Receiver pays principle; Fixed-mobile integration

1. Introduction

The growth in significance of mobile or cellular telephony in recent years has been very dramatic. Before 1985 in the UK mobile telephony was only used by special groups like the security forces. In 1998 over 8 million or over 15% of the population of the UK subscribed to a mobile network and according to Oftel (1998b) phone ownership is growing at 20% a year. The striking growth in the popularity of mobile phones is mirrored around the world, despite relatively high prices for certain mobile services.

As cellular telephony makes use of a scarce resource, spectrum, this necessarily

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0167-6245/98/$19.00
PII S0167-6245(98)00015-8

constrains the number of operating networks. For example, in the UK and in other European countries there are between two and four national digital GSM networks. Inevitably with such small numbers of operators competition may not be effective. Nevertheless, the number of operators in most countries has increased in recent years and this has resulted in more competition, see OECD (1996).

In the UK the regulatory authorities in the mid-1980s anticipated that the constraint on the number of network operators might compromise competition in cellular telephony markets. Hence it was decided as a matter of policy that competition would be stimulated through service providers. For this to work the network operators were originally not permitted to sell services directly to customers. This was achieved by separating the industry into network operators and downstream service providers, see Geroski et al. (1989).

However, this policy failed to deliver effective competition as the service providers acted largely as airtime resellers on behalf of the network operators. Furthermore, over time the authorities relaxed and then removed the constraints on the network operators preventing them from selling direct to customers. The inadequacy of competition in UK mobile telephony prompted the industry regulator Oftel to investigate the industry in 1996, and in 1998 it concluded that the price of calling mobile phones was too high, see Oftel (1998a).

Oftel has proposed remedies to deal with the lack of competition in the industry. These rely on intrusive price regulation focused both on the level and structure and prices. In this paper we argue that these measures are heavy-handed and unnecessary. Alternative remedies exist which can stimulate greater competition in the industry and alter the incentives facing operators to bring about lower prices for calling mobile phones.

The paper is organised as follows. In Section 2 we describe in brief the structure of the industry and the policy issues that have been raised recently. Section 3 outlines the key economic characteristics of the industry. In Section 4 we appeal to the relevant economic theory that is a useful guide to policy design. Section 5 introduces the concept of the ‘receiver pays principle’ (RPP). RPP is argued to be a way of changing the incentives faced by mobile operators so that they encourage the setting of lower prices for calls to mobiles. In Section 6 the concept of ‘qualified indirect access’ (QIA) is explored. QIA is argued to be a method for stimulating more effective competition into an industry that inherently has a finite limit on the number of network operators. Section 7 concludes the paper by summarising our policy prescriptions.

2. The mobile telecoms market in the UK: structure and issues

2.1. Structure

Since the introduction of cellular phones in the UK in 1985, mobile communications have been transformed from a virtually exclusive business product to one that

has extended to the mass market. The UK mobile market is forecast to grow from 7.66 million users (2.117 m analogue users and 5.543 m digital users) in September 1997 to an estimated 17.64 million in the year 2003.[1] The introduction of UMTS (third generation, mobile broadband) services some time after 2002 will add further impetus to market development. Nevertheless overall mobile penetration within the UK market at around 14% is relatively low compared to the more mature markets in Scandinavia where it stands at over 30%.[2] Recent penetration rates (customers per 100 capita) in mobile telephony for a selection of countries are shown in Fig. 1.

The current market structure in UK mobile telecommunications reflects past perceptions about likely developments in the mobile sector. There are four network operators holding six licenses: Vodafone Ltd and Telecom Securicor Radio Ltd ('Cellnet') each hold a GSM900 license and a TACS analogue license; and Mercury Personal Communications Ltd (MPCL) ('One2One') and Orange Personal Communications Services Ltd ('Orange') each have a GSM1800 license. Vodafone and Cellnet both launched their analogue services in 1985 and introduced their digital GSM900 services in 1993 and 1994 respectively. Vodafone and Cellnet are currently required to have a coverage of at least 90% of the UK

France	7.5
Germany	8
Netherlands	8.5
Austria	10.5
Ireland	11.5
Canada	12
Switzerland	12
UK	14
Italy	16
New Zealand	16.2
USA	17
Japan	18
Australia	24
Hong Kong	26
Denmark	27
Sweden	32
Norway	33
Finland	37

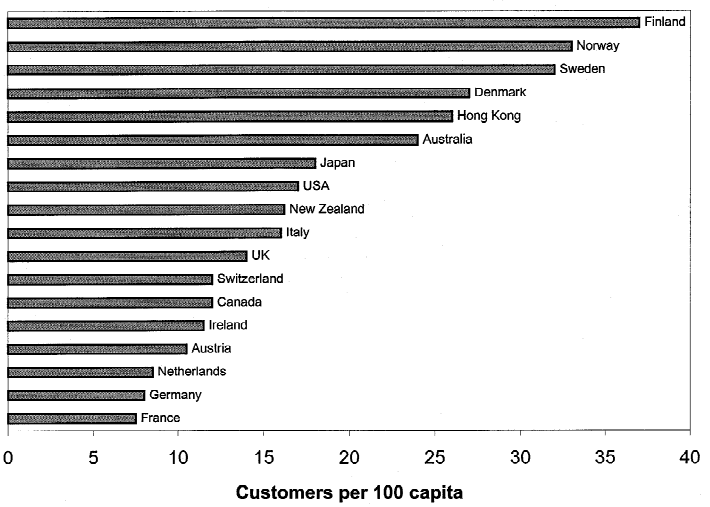

Fig. 1. Mobile penetration (%, September 1997). The data for Hong Kong, Australia, Japan, and New Zealand are referring to July 1997 and the data for the USA and Canada refer to January 1997. Sources: Fintech Mobile Communications, Mobile Communications International and Company Reports.

[1] See Fig. 1.4 in the Appendix to *Economic Evaluation of Number Portability in the UK Mobile Telephony Market*, a study undertaken by Ovum Ltd for Oftel, June 1997.

[2] At the end of December 1997 the penetration rate in the UK had reached 15% on the back of strong sales figures in the final quarter of 1997, see The Times newspaper, January 6th, 1998.

population.[3] In Table 1 the market share of each network operator in the UK is presented. It can be seen that the dominant operators in the UK market are Cellnet and Vodafone.

In addition to the network operators, there are many service providers (e.g. Cellcom, Peoples Phone, Talkland, Carphone Warehouse, etc.); businesses that 'resell' mobile airtime and provide enhanced services on the mobile networks. Many of these service providers are wholly owned or tied to a specific network operator. Increasingly the network operators are consolidating their services under a common downstream brand, blurring the distinction between a service provider and a network operator.[4]

Although the market has many service providers, price competition in user tariffs 'has been less strong than might appear' and 'the networks' recommended retail tariffs are closely followed by almost all service providers'[5].

Cellnet and Vodafone, prior to 1994, were prohibited from selling services direct

Table 1
Market shares of UK mobile network operators

Network	Total subscribers	Share of total market %	Digital subscribers	Share of digital market %
September 1997				
Cellnet	2,840,000	36.8	1,715,000	30.9
Vodafone	3,018,000	42.7	2,020,000	36.4
One2One	808,000	8.4	808,000	14.6
Orange	1,000,000	12.0	1,000,000	18.1
December 1997				
Cellnet	2,930,000	35.9		
Vodafone	3,120,000	38.2		
One2One	950,000	11.6		
Orange	1,160,000	14.2		

[3] 'All mobile phone [network] operator licenses awarded in the UK over the last twelve years have included roll-out and coverage obligations. The two most recent licenses awarded to One2One and Orange in the early 1990s followed those of Vodafone and Cellnet, awarded in the mid-1980s, in requiring 90% coverage of the population. In the case of the One2One and Orange licenses, this coverage obligation was accompanied by a roll-out obligation of 31 December 1999, i.e. some six years after the expected commencement of commercial services. Three of the four mobile phone operators have achieved the 90% coverage target well ahead of the deadlines set in their respective licenses, and One2One is expected to achieve its target later this year – two years ahead of its deadline. Vodafone and Cellnet have now achieved 97% coverage of the population, which represents a very mature network by any standard, whilst Orange and One2One are also aiming for similar coverages in the not too distant future.' See Oftel, Director General's statement *Number Portability in the Mobile Telephony Market: Explanatory Note*, 3 October 1997. The first generation analogue TACS service is now being phased out by both Cellnet and Vodafone.

[4] For example, Vodafone purchased Peoples Phone in 1997 and has rebranded the retail chain under its own name.

[5] Oftel, *Fair Trading in the Mobile Telephony Market*, paras 5.3 and 5.6, April 1997.

to the public. Instead services were sold to the public through service providers, tied and independent.

2.2. Issues

The main policy issue in the mobile telecoms market in the UK is the regulatory investigation into the price of calls to mobile phones. In June 1996 Oftel began investigating the apparent high cost of making calls to mobile phones and in March 1997 issued a consultative document, Oftel (1997). In December 1997 the DGT (Director General of Telecommunications) claimed that Cellnet and Vodafone set discriminatory termination charges. In March 1998 Oftel made a statement on the price of calls to mobile phones, and referred three matters to the MMC (Monopolies and Mergers Commission). These dealt with the interconnection or termination charges set by Cellnet and Vodafone and the retention charges levied by BT, the main fixed line operator in the UK.

In May Oftel submitted its evidence to the MMC, see Oftel (1998b). The Oftel submission is predicated on heavy-handed regulation as it is proposing to regulate both the structure and level of prices in the mobile market on the basis of measures of forward looking long-run incremental costs. Oftel has rightly identified that termination charges exceed cost, but its proposed remedies are not necessarily the most effective for dealing with the problem. Oftel is proposing that for the foreseeable future BT's charges for handling calls to mobile phones (BT's rentention rate) should be subject to a RPI-X price-cap. Furthermore, it is also proposed that the structure of prices be regulated: the price charged by BT for calling a mobile phone should be the same irrespective of the mobile network called. Oftel is also proposing that the interconnection charges levied by Cellnet and Vodafone should be reduced and subject to RPI-X price-caps.

3. The key economic characteristics of the mobile market

The relatively high prices charged for making calls to mobile phones stem from five features found in the UK market place. These are:

1. Spectrum scarcity
2. Customer contracts
3. Numbering
4. The caller pays principle
5. Call patterns.

1. *Spectrum scarcity* limits the number of network operators and, as already noted, in the UK there are currently six networks operated by four companies

(Cellnet, MPCL, Orange, Vodafone). The existence of service providers means that in practice more than four firms serve customers, but these are largely airtime resellers and insignificant in terms of effective competition. As mentioned above there has been much recent vertical integration in the industry whereby network operators have bought into formerly independent downstream service providers.

2. *Customer contracts* tie most new subscribers to one network for a period of around 15 months. With churn in the industry averaging around 25%, this suggests that possibly many customers are locked into one network at any moment in time for a period of time averaging around 7 months. In practice therefore a significant number of customers are not able to change networks without incurring substantial switching costs.

3. *Numbering* of mobile phones in the UK means that currently whenever a subscriber changes network he has to change his telephone number. For some customers this can present a large switching cost. However, number portability is to be introduced into the UK from January 1999 which should largely alleviate this problem.

4. *The caller pays principle* is the established way in which mobile and fixed telephony services are sold in the UK. It should be emphasised that this is a convention and not a necessity. There is an alternative: RPP. Indeed, RPP could possibly overcome one of the problems referred to the MMC by the DGT, see Section 5 below.

5. *Call patterns* in the UK are such that the majority of calls made on mobile networks terminate on fixed networks, whereas only a small fraction of calls made on fixed networks terminate on mobile networks. Furthermore, only a small proportion of calls originating on mobile networks terminate on mobile networks. Thus call patterns are asymmetric.

4. Insights from economic theory

Economic theory provides some useful guidance to the problems. The subject under investigation falls into an area known as two-way interconnection. Two-way interconnection is best understood in a simple stylised setting. Consider two firms A and B selling services to customers. Think of A and B as two ferry operators offering services between ports X and Y, where port X is owned by firm A and port Y is owned by firm B. In this setting, firm A (B) can affect the price firm B (A) charges its customers through the harbour fee it levies on firm B (A) for *access* to its port facilities in X (Y).

A straightforward application of economic principles would show that in the absence of collusion between the two firms, access charges will be set in excess of cost and therefore final prices will also exceed cost. Indeed, if a separate access charge is set by each firm double-marginalisation arises. In practice access charges are likely to be reciprocal, that is the access charge at each port will be the same.

In this case the ferry operators could achieve monopoly final prices through setting a high access charge, despite any appearance of vigorous competition in final markets.

Armstrong (1998) and Laffont et al. (1998a,1998b) outline two-way interconnection issues and Laffont and Tirole (1998) have studied the problem in greatest depth. Two-way interconnection is a characteristic of the mobile telecommunications industry in the UK. So does the economic literature confirm the DGT's insights?

The literature suggests that under *certain conditions* final prices will exceed costs and may even approach monopoly levels because of monopoly power in access markets. What are these certain conditions? The conditions which seem critical that lead to monopoly pricing are:

1. Sufficiently differentiated services
2. Linear prices
3. Market symmetry

How well do the above describe the mobile market in the UK? Probably not well at all. Although services are differentiated to some extent, chiefly between GSM 900 and GSM1800 services, most customers regard Cellnet and Vodafone as being very similar. It may be argued that coverage (and hence quality) differs across the networks, but the coverage differences between Cellnet and Vodafone are insignificant. Linear prices are *not* offered to consumers; instead more general two-part tariffs characterise pricing in UK mobile telephony markets. According to Laffont and Tirole (1998) more general tariffs of this kind tend to undermine monopoly pricing in two-way interconnection markets.

As mentioned above, in terms of call patterns the UK market is certainly not symmetric. Nevertheless, we present a simple model below which shows in an asymmetric setting how two firms offering possibly identical mobile telephony services can nevertheless result in monopoly pricing.

4.1. An asymmetric model of two-way interconnection: caller pays principle

Here we characterise the UK mobile telephony industry as it currently exists under the caller pays principle (CPP) in a stylised setting. For simplicity suppose there are three firms A, B and C, where A and B supply mobile telephony services and firm C supplies fixed telephony services. Let the demand for outgoing calls at firms A and B be given by $q_i = q_i(p_A, p_B)$ for i = A, B where p_A and p_B denote prices of calls. Let the demand function for each firm be identical, and suppose that each is well behaved.

For simplicity, assume that all calls made by subscribers at A and B terminate off-net on to the fixed network C. (In practice the majority of calls on UK mobile

networks terminate on fixed networks, and the majority of these terminate on BT's network.) Let the demand for calls made by fixed subscribers to mobile users on network i be given by $q_{Ci} = q_{Ci}(p_{Ci}, q_i)$, where p_{Ci} is the price charged by network C for making calls to mobile network i. We assume that calls to mobile network i are an increasing function of the demand for network i services. In other words, there is a network externality effect.

Assume that costs at all firms are linear and fixed costs are absent. (In practice fixed costs are present, but we make this assumption for simplifying reasons.) Assume that each mobile network faces a cost $\alpha_i > 0$ for originating and terminating a call, the fixed network has a cost $\alpha_C > 0$ for terminating or originating a call, and $\alpha_i > \alpha_C$ for each i = A,B. Thus the incremental cost of mobile termination exceeds that associated with the fixed network, as in practice. Let the termination charges levied by an operator on another operator for delivering a call to a recipient be denoted t_j for j = A,B or C.

Each mobile network i = A,B seeks to maximise profits given by the following:

$$\max_{\underbrace{p_i, t_i}} \Pi_i = (p_i - t_C - \alpha_i) q_i(p_A, p_B) + (t_i - \alpha_i) q_{Ci}(p_{Ci}, q_i(p_A, p_B)).$$

The first part of the expression shows the profits derived from off-net calls, and the second part of the expression shows the profits derived from calls made from the fixed network to the mobile network. It is straightforward to see that each mobile network sets $t_i > \alpha_i$. Each mobile network chooses a termination charge t_i and a retail price p_i. Note that the retail price pi affects the quantity of incoming traffic: as it attracts more (fewer) customers it receives more (fewer) calls.

The fixed network seeks to maximise profits given by the following:

$$\max_{t_C, \underbrace{p_{C_A}, p_{C_B}}} \Pi_C = (q_A + q_B)(t_C - \alpha_C) + \sum_i (p_{Ci} - t_i - \alpha_C) q_{Ci}(p_{Ci}, q_i).$$

We assume that each mobile network knows that the fixed network chooses the price p_{Ci} given the termination charges t_i and the retail prices p_i. The first order conditions for the fixed operator are:

$$\frac{\partial \Pi_C}{\partial p_{Ci}} = q_{Ci} + (p_{Ci} - t_i - \alpha_C) \frac{\partial q_{Ci}}{\partial p_{Ci}} = 0.$$

The first term in the above expression is positive and as the derivative of the demand function for calls to mobile network i is assumed to be negative, it follows that $(p_{Ci} - t_i - \alpha_C) > 0$. Thus $p_{Ci} > \alpha_i + \alpha_C$, in words: the fixed network sets the price of calls to mobile networks above the costs associated with such calls. We can write $p_{Ci}(t_i, p_A, p_B) > t_i + \alpha_C$. Not surprisingly the higher ti the higher the price set by the fixed network to call the mobile network. (This can be seen formally by totally differentiating the above first order condition.) Furthermore, the fixed network sets its termination charge t_C above incremental cost α_C.

Each mobile network through its choice of termination charge *t*i maximises the value of incoming revenues so that:

$$\frac{\partial \Pi_i}{\partial t_i} = q_{Ci}(p_{Ci}(t_i, p_A, p_B), q_i) + (t_i - \alpha_i)\frac{\partial q_{Ci}}{\partial p_{Ci}}\frac{dp_{Ci}}{dt_i} = 0.$$

The above first order condition implies that double-marginalisation arises, because the mobile network i chooses a termination price in excess of its incremental cost $(t_i - \alpha_i) > 0$. (In practice negotiations between the fixed and mobile operator i are likely to lead to double-marginalisation not occurring, but nevertheless in the framework here monopoly excess would still arise.)

Each mobile operator i also chooses its retail price p_i to maximise profits, and this results in a first order condition as follows:

$$\frac{\partial \Pi_i}{\partial p_i} = q_i(p_A, p_B) + (p_i - t_C - \alpha_i)\frac{\partial q_i}{\partial p_i} + (t_i - \alpha_i)\frac{\partial q_{Ci}}{\partial q_i}\frac{\partial q_i}{\partial p_i} = 0.$$

From the above we can see that the retail price p_i is a function of the rivals' price and the price set by the fixed network. The fixed network uses the above first order condition in its own maximisation programme when setting its termination charge. Again a double-marginalisation problem arises.

It is perfectly possible for $p_i - t_C - \alpha_i$ to be negative, i.e. the mobile network may set its retail price below the cost associated with these calls. It does not follow, of course, that the price the mobile operator sets is necessarily below the economic cost associated with these calls. Consider the extreme case where the mobile operators offer identical services. (Differentiability of the demand functions no longer holds in this case.) In this setting Bertrand competition leads to call charges from the mobile networks to the fixed network lying below cost, i.e. $p_i < t_C + \alpha_i$. The monopoly pricing due to the fixed network bottleneck distorts the structure of prices, with mobile to fixed prices lying below accounting costs and fixed to mobile call charges lying above accounting costs. In a more general setting (i.e. with imperfect competition due to differentiated services in the mobile market) this distortion will persist, but mobile to fixed charges will be higher. In the limit, when services are completely different (not a case in practice), monopoly pricing occurs in mobile to fixed markets.

The important insight from the above is the fact that the prices set for calls to the mobile sector depend on the prices set in the mobile to fixed market. The higher the charges levied for mobile to fixed networks, the greater will be the price of calls to mobile networks. Thus remedying problems in the fixed to mobile market can be influenced to some extent by competition in the mobile to fixed market.

In an asymmetric market structure like that found in UK mobile telecoms, two-way interconnection results in monopoly prices due to the application of monopoly power in access markets.

5. Changing incentives: the receiver pays principle

If the MMC rules that matters referred by the DGT are against the public interest, recommendations can be made whereby Oftel could remedy effectively the problems in the mobile market.[6] This could be achieved through a license amendment that incorporates RPP. The system would work as follows. A person making a call from a fixed phone to a mobile phone would pay a price equal to the relevant peak/off-peak fixed price of a local fixed call. The person receiving the call would makeup the difference between the posted price of a fixed to mobile call and the lower charge paid by the call originator. The posted price of a fixed to mobile call would be set by the mobile operator. Introducing this principle is straightforward and has the appealing property of keeping customer tariffs simple: callers need not be concerned about whether they are calling a fixed or mobile number.[7] More significantly, a caller will know for sure what he is paying for a call irrespective of the terminating mobile network.

RPP, more fundamentally, means that the incentives faced by the mobile operators change significantly. In the present regime where the caller pays, mobile operators can set high termination charges without this leading to a *direct* impact on the well-being of their own mobile subscribers. Indeed, mobile subscribers currently worry almost exclusively about the cost of outgoing calls. (There is an exception in the case of international roaming where the RPP already applies.) Under a receiver pays regime, if a mobile operator sets higher termination charges it will necessarily decrease demand among its own subscribers for its own services – because of a direct relationship between termination charges and subscriber well-being (utility). In the following section, we show formally that the receiver pays principle can result in low termination charges. Note the prescribed remedy does not rely on heavy-handed regulation and it enables more effective competition to take place.

5.1. An asymmetric model of two-way interconnection: receiver pays principle

We modify the model outlined in Section 4.1 above and consider the case where the receiver pays for calls. Some simplifying assumptions are made to the analysis. Assume that the fixed operator sets a price for calls to the mobile operators, equal to the price charged for calls to other fixed networks. For simplicity, assume that this price is regulated and equals α_C (alternatively competition in the fixed market results in incremental cost pricing), and that the termination charge set by the fixed

[6] The MMC is due to publish its report in December 1998.

[7] Indeed, dual-mode handsets which allow intelligent switching between the fixed and mobile systems like the Ericsson TH688 means that callers will shortly not know whether they are calling a fixed or mobile phone even if the number dialled is a mobile number. Such a technological innovation and further innovations in the pipeline strengthen considerably the case for RPP.

network also equals α_C. Let the 'posted' price p_{Ci} for calls from the fixed network to mobile network i be set according to the rule: $p_{Ci} = t_i + \alpha_C$. The customers of the mobile network are assumed to pay $p_{Ci} - \alpha_C$ for receiving a call, i.e. t_i. Ideally it should be the case that $t_i = \alpha_i$. The demand function for services from each mobile network is modified; demand decreases in the termination charge t_i.

The profit maximisation problem for each mobile network becomes:

$$\max_{\underbrace{p_i}, \underbrace{t_i}, p_{Ci}} \Pi_i = (p_i - \alpha_C - \alpha_i) q_i(p_A, p_B, p_{Ci}) + (t_i - \alpha_i) q_{Ci}(a_C, q_i(p_A, p_B, p_{Ci})).$$

Note that the above differs from the previous case because the demand for mobile to fixed services now depends on the posted price p_{Ci}. The problem can be simplified as the mobile network's choice of termination charge implies the selection of the posted price. The first order conditions for the mobile networks are:

$$\frac{\partial \Pi_i}{\partial p_i} - q_i + (p_i - \alpha_C - \alpha_i) \frac{\partial q_i}{\partial p_i} + (t_i - \alpha_i) \frac{\partial q_{Ci}}{\partial q_i} \frac{\partial q_i}{\partial p_i} = 0,$$

$$\frac{\partial \Pi_i}{\partial t_i} = (p_i - \alpha_C - \alpha_i) \frac{\partial q_i}{\partial t_i} + q_{Ci} + (t_i - \alpha_i) \frac{\partial q_{Ci}}{\partial q_i} \frac{\partial q_i}{\partial t_i} = 0.$$

From the above we can observe that that the sum of $(p_i - \alpha_C - \alpha_i)$ and $(t_i - \alpha_i)$ is positive. The more responsive calls to mobiles are in response to the demand for mobile services, the closer are termination charges to incremental costs. Imperfect competition, however, means that prices will not equate with costs and termination charges will exceed incremental costs the more responsive is the demand for fixed to mobile calls as the demand for mobile calls changes (i.e. the cross-elasticity of demand is high).

Consider the case of homogeneous mobile services. In this situation a firm can gain the entire market either by reducing its retail price or by lowering its termination charge. (A full model accounting for the indirect utility functions would leave the firm indifferent about which price to change.) Clearly in this case there is a multiplicity of equilibria. In some of the equilibria the retail price may lie above incremental cost and the termination charge may lie below incremental cost.

Under RPP and with regulation or competition governing the retail price of the fixed network, the elimination of double-marginalisation lowers prices. In some cases termination charges set by the mobile network will be lower than in the CP case. This is more likely if demand for the mobile network's services is more responsive to termination charges.

In addition to promoting more effective competition, RPP does away with the need for uniform charges set by a fixed operator for calls to all mobile operators. Thus Oftel's proposal for uniform prices, which places a serious regulatory

impediment in the market on the structure of prices, is unnecessary. Furthermore, this proposal clearly weakens the prospects for operators to compete differentially across VPNs (virtual private networks). Under RPP the caller will, of course, face a uniform price, but the receiver of a call need not pay the same contribution on each mobile network. Indeed, mobile networks will compete more effectively to lower the amount their subscribers contribute towards the cost of incoming calls.

RPP already operates in a limited way in the UK. Orange offers its subscribers the option of purchasing a fixed line number with a city prefix code. A customer may purchase a number that would be recognised as a London number, for example it may have a prefix 0171. A call made to this number is charged at a rate equivalent to the fixed line charge levied when calling a London fixed line number. The difference between this amount and the higher charge levied for calling a mobile number is made up by the recipient of the call. The service is intended to appeal to businesses who are seeking to attract incoming calls, much like free phone 800 numbers do in fixed telephony networks. RPP also works both for international roaming on GSM mobile networks, for call-divert within national territories, and in the United States and Canada.

The use of RPP in North America has been argued by some to limit the growth in cellular penetration and use. In particular, it is often argued that subscribers withhold disclosure of their numbers to deter unwanted incoming calls. However, with digital systems caller line identification (CLI) and tariffs which permit the first minute of an incoming call to be free, such as practised by Sprint PCS, help to prevent this.

6. Effective competition: qualified indirect access

The problems in the mobile market in the UK that the DGT has referred to the MMC cannot be looked at in isolation. As shown above, the prices set for calls to mobile phones affect and are affected by the prices set for calls made from mobile phones to fixed networks. As the prices of calls from mobile phones are affected by the market structure and by the conduct of firms in the market, it follows that the price of calls to mobile phones are similarly affected.

With only four network operators in the UK, competition involves a small number of players. It is well known that where there are more firms in a market, competition is likely to be more effective. We disagree with Oftel that 'the market for mobile services is not open to additional competition'.[8] Not only may RPP lead to greater competition, additional competition can also arise through *indirect access*.[9]

[8] Para 1.8 in Oftel (1998b).

[9] See the Appendix for a brief overview of indirect access and the European Commission's Interconnection Directive.

Indirect access enables an operator wishing to offer telephony services to gain access to the subscribers of a network through interconnection. For example, BT subscribers may access the services offered by many other operators by dialling a special prefix code. As of June 1998, indirect access of this kind is not available in the UK mobile market. (However, Oftel is investigating the matter following a complaint made by an international voice reseller against Vodafone. Under Article 9 of the EU Interconnection Directive, see the Appendix, Oftel is obliged to resolve such disputes on a case-by-case basis.)

The regulatory authorities in the UK and elsewhere, when looking at indirect access to mobile network infrastructures, are faced with three policy alternatives:

1. The Status Quo: No indirect access (NIA)
2. Qualified indirect access (QIA)
3. Unconstrained indirect access (UIA)

We believe that option 2, QIA, is the preferred option. We consider each in turn.

6.1. Option 1: NIA

NIA means operating in the climate seen today in UK mobile telecommunications where indirect access to mobile subscribers is unavailable to OLOs (other licensed operators). (That is, only direct access through the incumbent licensed network operators is permissible.) Arguably NIA was imposed to ensure there existed desirable investment incentives: the mobile network operators could invest in infrastructure without fearing ex post opportunism, both regulatory and commercial. In other words, by guaranteeing the market to the investor in the infrastructure, other service providers are not able to seek favourable terms after the investments have been made. Today the network infrastructures have met their license requirements (e.g. 90% roll-out), and fears of opportunism would seem less relevant than a few years back.

NIA is unattractive as it means that the incumbent network operators retain dominance. Furthermore, it compromises innovation in new services by limiting competition. NIA would be particularly damaging for the future service roll-out on UMTS, where service provision will involve dynamic small firms entering the content and information markets (much like Internet service providers do in the computer network industry).

6.2. Option 2: QIA

QIA is a middle ground. It allows indirect access to a licensed GSM network

infrastructure through interconnection by any Annex II operator[10] who satisfies certain criteria. The following criteria would seem necessary to ensure that effective competition is stimulated.

1. *Variety*. A qualified indirect access operator (QIAO) should provide a 'wide range of telecommunication services'[11] and *importantly* offer two-way communication. That is, the voice and simple data services offered by the incumbent network operators should also be offered in the portfolio of services by a QIAO (e.g. voice, voicemail, SMS, etc.). Thus, a QIAO should offer *both* outgoing calls and incoming calls. (From the model outlined above it is clear that competition for outgoing calls is competitive. In practice this is certainly the case. Any remaining excess margins (e.g. on outgoing international calls) are likely to be eroded in the short-term.) Incoming calls to mobiles are far from competitive. Thus from a welfare perspective, a QIAO should contribute to competition on the incoming side of the market as well as on the outgoing side.

2. *Innovation*. A QIAO should show a commitment to investment in better quality services by providing 'innovative market offerings'.[12] These would be construed as new interactive information based services making use, for example, of IP based technology. This would require interconnection at the MAP (mobile applications protocols) and the provision of a complete customer handling service. It would not be sufficient to offer only prefix code access and repackaged voice telephony services. QIAOs would need to offer their subscribers their own numbers, be able to offer a wide range of services (complete voice services as today, with voice mail, etc.) and new interactive services. Significantly this would pave the way for UMTS and hence stimulate demand for UMTS service provision. A desirable effect here would be the lower risk exposure faced by UMTS infrastructure investors.

3. *Multi-Access*. A QIAO should be allowed to access indirectly the subscribers on operators with significant market power (SMP).[13] Where there are two or more such operators this would lead to multi-access. MA (multi-access) QIAOs (MAQIAOs) would be able to offer better service quality in certain geographical areas. In particular, QIA should be granted in preference to operators seeking MA, particularly where such QIAOs seek to offer service provision to rural areas. This should enable a better quality of service in such areas where currently the incumbent network operators may be reluctant to invest in sufficient network coverage. By obtaining MA a QIAO could improve resilience which is essential for certain users (emergency workers, e.g. rural doctors and vets) and in certain circumstances (e.g. lone women drivers in rural areas). Of course, a MAQIAO

[10] An Annex II operator is an operator defined under the European Commission's Interconnection Directive as having both rights and obligations with regard to interconnection with other Annex II operators.

[11] See Article 9 EU Interconnection Directive highlighted in the Appendix.

[12] See Article 9 EU Interconnection Directive highlighted in the Appendix.

[13] An operator may be defined as having significant market power under the Interconnection Directive.

could offer its services to any of the existing GSM network companies through a roaming agreement. By allowing MA to QIAOs, the incumbent operators could better rationalise their investments (in the parlance of economics there would not be an inefficient prisoner's dilemma situation). This would lead to less duplication in areas where demand is relatively low and probably greater investments in densely populated urban areas. Finally, MAQIAOs would likely offer benefits to the incumbent network operators as this would stimulate demand in those areas where otherwise the quality of the network signal of any one network operator would not be sufficiently resilient enough to attract certain classes of customer. MAQIAOs would clearly be of benefit to rural businesses and to those customers living in rural areas.

Arguably MAQIAOs may compromise the network operators' investment strategies. This seems a vacuous argument. The networks are assured a fair return from the sale of services to QIAOs. Furthermore, in some instances, particularly through MA and the offering of innovative services, demand would be stimulated. As QIAOs would always need access to the base station infrastructures of the network operators, any stimulus to the market should in fact lead to greater investments. The only investments that may be 'compromised' are those pertaining to marketing and in the area of customer support (billing, etc.).

6.3. Option 3: UIA

UIA would allow any OLO with Annex II status to interconnect with the mobile networks (or at least with those defined as having SMP). This would obviously lead to more service providers serving the market, but most of these would simply be repackaging existing services. While there is some scope for this today, the additional benefits from further entry of this kind would be limited to certain users (e.g. outgoing international calling).

However, UIA would damage the prospects for those operators seeking to establish a wide range of telecommunication services. This is because margins on voice would be cut dramatically and this would erode the revenue streams needed for small start-up operations seeking to deliver innovative market offerings. UMTS service provision would likely suffer as UIA entry would likely lead to fewer dynamic new information or content based service providers emerging. This is because up-front costs (endogenous sunk costs) would not be covered by other revenues. In addition, many small indirect access providers would increase interconnection costs significantly with little obvious compensating benefits flowing to customers, bearing in mind that new entry would likely concentrate on outgoing calls.[14]

[14] The tendency for UIA entrants to focus on outgoing call services stems from the relatively small investments needed. Under MAQIA much more investment is needed in basic infrastructures (e.g. switches, home location registers, billing platforms, value added service platforms, IN development platforms, IP gateways, etc.).

On the basis of the above it would seem that MAQIA is a way to promote more effective competition in UK mobile telephony. If necessary, UIA could be introduced after a temporary period of exclusion in favour of QIAOs.

7. Conclusion

We have looked at competition in the mobile telephony industry and the case of ineffective competition in the UK industry. We described the structure of the UK industry and outlined the measures that have been proposed by the regulatory authorities for dealing with monopoly problems. These measures are based on price-caps that seek to establish cost-based prices. We believe that the intention of the regulatory authorities is honourable, but the means to the end is unsatisfactory. In the paper we have argued that the receiver pays principle and qualified indirect access can deal more effectively with the competition problems identified. These policy prescriptions could be deployed in mobile industries around the world.

Acknowledgements

We would like to thank Sandy Levin and participants at the ITS World Biennial Conference in Stockholm, June 1998 for helpful remarks. Of course, errors are our responsibility.

The EU Interconnection Directive and indirect access

Article 4(1) means that a PTO license holder designated an Annex II operator shall have a right and, when requested by organizations in that category, an obligation to negotiate interconnection with each other for the purpose of providing the services in question. On a case-by-case basis, the national regulatory authority [i.e. Oftel] may agree to limit this obligation on a temporary basis and on the grounds that there are technically and commercially viable alternatives to the interconnection requested, and when the interconnection is inappropriate in relation to the resources available to meet the request.

Article 4(2) states that organizations which have significant market power shall meet all reasonable requests for access to the network including access at points other than the network termination points offered to the majority of end-users. The DTI has stated that with regard to mobile operators, the SMP obligations that can be imposed [include] Article 4(2). (See DTI Notes on Implementation of the Interconnection Directive, October 1997.)

The DTI has stated that ‘In considering any disputes over requests for indirect access put to him from other operators, the Director would consider each case on its merits, applying the criteria set out in Article 9 of the Directive.’ Oftel has published a statement on indirect access: Oftel’s policy on Indirect Access, Equal

Access and Direct Connection to the Access Network, July 1996. However, this document focused largely on fixed networks.

In March 1998 Oftel began investigating a case where IMNS, an international simple voice resale business, has requested interconnection with Vodafone to gain indirect access to Vodafone customers.

The EU Interconnection Directive: Article 9

This Article deals with the general responsibilities of the national regulatory authorities (NRAs). According to Article 9(1) and NRA (e.g. Oftel) has to take account of: the need to ensure satisfactory end-to-end communications for users, the need to stimulate a competitive market.

Article 9 also deals with the role of NRAs and dispute resolution. Article 9(5) states that an NRA in the event of a dispute, at the request of either party, take steps to resolve the dispute within six months of this request.

When resolving a dispute an NRA 'shall take into account, inter alia:

- the user interest,
- regulatory obligations or constraints imposed on any of the parties,
- the desirability of stimulating innovative market offerings, and of providing users with a wide range of telecommunications services at a national and Community level,
- the availability of technically and commercially viable alternatives to the interconnection requested,
- the nature of the request in relation to the resources available to meet the request, the relative market positions of the parties, the promotion of competition'.

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