Welfare Effects of Regulating Mobile Termination Rates in the UK

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The European Commission has recently recommended dramatic reductions in the fees mobile networks charge others for calling their customers. Regulators around Europe have fallen into line, and many are now reducing these fees by an order of magnitude. What effects should we expect these reductions to have on economic efficiency, consumer surplus and mobile firm's profits? We report results from a short-run welfare analysis of the UK mobile market which lends strong support to the Commission's recommendation.[1]

1 Introduction

All telecommunications networks in Europe are required to interconnect so that subscribers on one network can communicate with subscribers on other networks, by making off-network ("off-net") calls. A hotly debated issue amongst regulators and academic economists has been the level of the charges levied by mobile firms on fixed networks and other mobile operators for completing, or "terminating", calls on their networks. Mobile termination rates (MTRs) are not directly observed by consumers, but significantly affect what they pay for off-net calls, and indirectly in subscription charges. Concerns about mobile call termination being a "bottleneck" service, and a history of high charges, have led to the regulation of MTRs in every country in the European Union and in numerous other countries around the world.[2]

Until recently, the approach to regulating MTRs adopted by most European regulatory authorities has been to allow for total cost recovery based on fully-allocated network cost models. This approach has increasingly been called into question, however, by a new body of economic literature which highlights the two-sided nature of mobile interconnection markets, and the significant role that "receiver benefits" and "call externalities" play in the analysis of competition, pricing and entry in these markets. Receiver benefits simply refer to the fact that both senders and receivers of calls benefit from them - otherwise no one would ever answer the phone. Call externalities arise because under a "calling party

[1] A companion article reports results from our analysis of the Orange/T-Mobile merger.

[2] See Armstrong and Wright (2009a) for a discussion centered on the UK experience.

pays" (CPP) regime, such as that adopted in all European countries, only the sending party is charged for calls. Hence, *ceteris paribus*, senders will tend to make too few (or too short) calls, as they will fail to take account of the full value of their calls to receivers. Call externalities imply that efficient calling charges - and hence efficient MTRs - are below cost, in order to induce senders to "internalize" the benefits obtained by receivers.[3]

Influenced in part by this new literature, in May 2009 the European Commission (EC 2009) proposed that drastic reductions in MTRs be implemented in all European countries so as to reflect the actual marginal or incremental costs of call termination on mobile networks. Shortly thereafter, the UK regulator published a consultation document (Ofcom 2009) which (re)considers the pros and cons of a number of alternative approaches to regulating MTRs. These included: (i) adopting long-run incremental or marginal cost pricing (LRIC or LRMC), broadly the approach recommended by the EC; (ii) imposing reciprocity with fixed networks, i.e. setting mobile termination charges to match the regulated rates of fixed-line network operators; and (iii) adopting "bill-and-keep", which would effectively abolish mobile termination charges by setting them equal to zero.

While the first option is in line with the EC's *Recommendation*, reciprocity with fixed networks would also significantly reduce MTRs, since fixed-line operators' regulated termination rates are typically an order of magnitude below those charged by mobile networks. Bill-and-keep represents the most radical change in policy, but it has already been adopted in a number of countries (such as the USA, Canada, Hong Kong and Singapore: see Harbord and Pagnozzi 2010; Analysys Mason 2008), and was recently recommended by the European Regulators' Group (ERG 2009).

The debates over these various approaches have to date been based on largely informal and qualitative arguments. What has been lacking is a realistic quantitative assessment of the welfare consequences of adopting one or another of the alternatives now being aired. The main purpose of our recent paper (Harbord and Hoernig 2010) was to provide such an assessment for the UK mobile market, but using a modelling approach with wide applicability in Europe and around the world.

Building on the standard model employed by nearly all economists to analyze competition, pricing and welfare in network markets such as mobile telephony, we estimated the impact on total welfare, consumer surplus and producer surplus of a decrease in MTRs in the UK telecommunications market from their current regulated levels to one or another of the alternatives described above. Our quantitative analysis is based on Hoernig (2010), which provides an analytically tractable model of competition between multiple, asymmetrically-sized mobile networks and allows us to determine both consumer surplus and networks' profits in the imperfectly competitive equilibrium.

We calibrated this model using data pertaining to the UK mobile market, and solved for the equilibrium multi-part tariffs under alternative assumptions concerning the level of MTRs and the importance of receiver benefits, or call externalities. Our simulation results,

[3] See Harbord and Pagnozzi (2010) for a more detailed discussion.

reported below, show that although consumer surplus and economic welfare *may* decrease in the mobile market *considered in isolation* as we reduce the level of MTRs, as predicted by much of the recent literature, aggregate welfare *and* consumer surplus increase in the telecommunications market as a whole for all reasonable values of the ratio of receiver to sender benefits (the call externality parameter in our model). Depending on the strength of call externalities, our model predicts market-wide welfare improvements of £360 million to £2.5 billion per annum, with bill-and-keep often resulting in the greatest increase in overall welfare. Inclusion of the fixed-line operator and call externalities in the analysis has thus proved indispensable in assessing the economic effects of the recently proposed reductions in MTRs.

2 Simulation Results

In our base scenario MTRs were set at their regulated levels for 2010/11, the final year of Ofcom's current price control.[4] The base scenario was then compared with the three alternatives described above: (i) "LRIC" or "LRMC" pricing; (ii) reciprocity with fixed networks; and (iii) bill-and-keep. Five values for the ratio of receiver to sender benefits, or the call externality parameter (β), were considered, and a LRIC (or LRMC) value of 1.0 pence per minute (ppm) was used.[5]

As shown in Table 1, total welfare, i.e. the sum of social welfare in the mobile and the fixed markets, increases significantly under all three alternative scenarios for MTRs . The extent of the increase depends upon the size of the call externality parameter, and exceeds £2.2 billion per year in all scenarios when β is equal to one, i.e. with equal caller and receiver benefits.

Table 1 Change in Total Welfare Over FAC Pricing

	$\beta = 0$	$\beta = 0.25$	$\beta = 0.5$	$\beta = 0.75$	$\beta = 1$
LRMC Pricing (£ m)	367	648	1023	1537	2272
Reciprocal with Fixed (£ m)	366	675	1086	1651	2459
Bill-and-Keep (£ m)	360	674	1091	1665	2485

In the absence of call externalities, the increase in aggregate welfare is caused by aligning MTRs more closely to marginal costs, since above-cost MTRs distort call prices upwards and call quantities downwards. Hence, when $\beta = 0$, it is unsurprising that LRMC pricing results in the largest welfare increase. When call externalities matter,

[4] 4.6 ppm for H3G and 4.3 ppm for the four other mobile operators, Vodafone, Orange, T-Mobile and O2. These are the final 2010/11 values as determined by the Competition Commission (2009) of 4.3 ppm and 4.0 ppm respectively, indexed by inflation to increase from 2006/07 prices to 2008/09 prices.

[5] The French regulator, ARCEP (2008), estimates LRIC on mobile networks to lie between 1 and 2 eurocents per minute (i.e. 0.9 ppm and 1.8 ppm). Ofcom (2010) currently estimates LRIC, or LRMC, at 0.5 ppm.

welfare-maximizing MTRs are always below cost, however, for two reasons. First, in the absence of strategic effects, below-cost MTRs induce networks to "internalize" call externalities by setting off-net prices below cost. Second, since call externalities create strategic incentives for mobile firms to increase their off-net prices, reducing MTRs below marginal cost mitigates this effect.[6] Hence bill-and-keep increasingly dominates LRMC pricing in welfare terms as we increase β from zero to one.

As discussed in more detail in our paper, reducing MTRs reduces network effects and relaxes price competition in the mobile market. It also reduces monetary transfers from the fixed to the mobile market. Both can result in lower levels of mobile consumer surplus for small values of β. Consumer surplus in the fixed market always increases, however, due to the reduction in the fixed-to-mobile call price. In the absence of call externalities (i.e. $\beta = 0$), the former effect dominates the latter for bill-and-keep and reciprocal termination rates in our simulations, hence aggregate consumer surplus decreases. For $\beta \geq 0.25$ this result is reversed, and for large call externalities (i.e. $\beta = 1$), aggregate consumer surplus increases by more than £1.2 billion in every scenario (see Table 2).

Table 2 Change in Aggregate Consumer Surplus Over FAC Pricing

	$\beta = 0$	$\beta = 0.25$	$\beta = 0.5$	$\beta = 0.75$	$\beta = 1$
LRMC Pricing (£ m)	29	217	464	800	1276
Reciprocal with Fixed (£ m)	-31	174	443	810	1328
Bill-and-Keep (£ m)	-51	157	429	800	1326

We also estimated the effects of reducing MTRs on consumer surplus, welfare and profits for the mobile market considered in isolation. According to our simulations, welfare decreases in the mobile market when the call externality parameter β is very low, but increases in all scenarios for $\beta > 0.25$ (see Table 3). Mobile networks' profits on the other hand, increase for all levels of β.

Table 3 Change in Mobile Welfare Over FAC Pricing

	$\beta = 0$	$\beta = 0.25$	$\beta = 0.5$	$\beta = 0.75$	$\beta = 1$
LRMC Pricing (£ m)	-174	107	481	996	1731
Reciprocal with Fixed (£ m)	-310	-1	410	975	1783
Bill-and-Keep (£ m)	-352	-38	380	953	1773

The reduction in mobile welfare for low values of β is caused by the reduction in consumer surplus, itself a product of the relaxation in mobile-to-mobile network competition and reduced fixed-to-mobile transfers. With higher levels of call externalities, this effect is reversed, as shown in Table 4.

[6] See Armstrong and Wright (2009b), Berger (2005), Hoernig (2007) and Harbord and Pagnozzi (2010).

Table 4 Change in Mobile Consumer Surplus Over FAC Pricing

	$\beta = 0$	$\beta = 0.25$	$\beta = 0.5$	$\beta = 0.75$	$\beta = 1$
LRMC Pricing (£ m)	-444	-256	-9	327	802
Reciprocal with Fixed (£ m)	-623	-418	-149	218	736
Bill-and-Keep (£ m)	-674	-467	-194	177	702

Finally, we considered the effects of reducing MTRs on the fixed market.[7] Welfare in the fixed market increases significantly, for two reasons: First, transfers to mobile networks are reduced, and second, FTM call prices are brought closer to their efficient level. Almost all of the increase in welfare on the fixed network is due to the increase in consumer surplus created by lower FTM call prices.

Table 5 Change in Fixed Market Values Over FAC Pricing

	Welfare	Consumer Surplus	Profits
LRMC Pricing (£ m)	541	473	68
Reciprocal with Fixed (£ m)	676	592	84
Bill-and-Keep (£ m)	712	623	88

3 Conclusion

The regulation of mobile termination rates based on fully-allocated costs results in regulated MTRs an order of magnitude above reasonable estimates of long-run incremental, or marginal, costs on mobile networks. In the presence of call externalities, efficient pricing on mobile networks requires MTRs below marginal cost, and this has led to increasing calls for reform (see Harbord and Pagnozzi 2010). The EC's *Recommendation* represents a radical shift in regulatory policy, which may ultimately lead to the abolition of MTRs altogether. While the recent theoretical literature provides some qualitative support for this change in policy, our analysis provides a rigorous and quantifiable approach to assessing the effects of significant reductions in MTRs in the UK mobile market, and elsewhere.

Our simulations show that reducing MTRs broadly in line with the European Commission's recommendation increases social welfare, consumer surplus and networks' profits in the UK mobile market. And contrary to claims made in the recent literature, our simulations confirm that reducing MTRs can also benefit mobile subscribers considered in isolation, especially when call externalities are significant. Our short-run welfare analysis thus lends support to a move away from fully-allocated cost pricing and towards much

[7] The model includes profits and consumer surplus from FTM calls, and also consumer surplus from receiving MTF calls. Fixed termination rates are set at cost, so there are no termination profits. The estimated values for changes in welfare, consumer surplus and profits in the fixed market do not depend on the size of the call externality, since the mobile-to-fixed price is independent of the level of MTRs.

lower MTRs. Interestingly, Ofcom (in Ofcom 2010) is now proposing to reduce MTRs in the UK to its own LRIC estimate of 0.5 ppm by 2015, although the European Commission recommends that this be achieved by the end of 2012.

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