Call Externalities, Network Effects and Market Power: The Orange/T-Mobile Merger

David Harbord and Steffen Hoernig

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The merger between Orange and T-Mobile will create a single network with at least 37% of all UK mobile subscribers. The European Commission has recently approved the merger subject to certain undertakings agreed by the companies. But will these undertakings be enough to allay the competition and welfare-related concerns raised by the merger? What effects should we expect the merger to have on economic efficiency, consumer surplus and mobile firms' profits?[1]

1   Introduction

Last year the European Commission (EC 2009) issued a *Recommendation* proposing dramatic reductions in the fees mobile firms charge other networks for calling their subscribers. Earlier this year the Commission approved the merger of Orange and T-Mobile in the UK mobile market (EC 2010). The two decisions interact in important ways.

Mobile termination rates (MTRs) are the charges that mobile firms levy on fixed networks and other mobile operators for completing, or "terminating", calls on their networks. MTRs are not directly observed by consumers but significantly affect what they pay for 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 mobile termination rates (MTRs) in every country in the European Union.[2]

The Commission recommends that MTRs be reduced by an order of magnitude to reflect the actual marginal or incremental costs of providing call termination to other networks. Regulators around Europe have since fallen into line and in the UK, Ofcom (in Ofcom 2010) is now proposing to reduce MTRs from an average price of more than 4 pence per minute (ppm) to its own incremental cost estimate of 0.5 ppm by 2015.

The EC's *Recommendation* was heavily influenced by a recent body of economic literature which highlights the two-sided nature of mobile interconnection markets, and the

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[1] A companion article reports results from our welfare analysis of adopting much lower mobile termination rates in the UK, as recently recommended by the European Commission.

[2] See Harbord and Hoernig (2010) and Harbord and Pagnozzi (2010) for detailed discussions.

significant role that "network effects", "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 the sender and receiver of a call benefit from it - otherwise no one would ever answer the phone. Call externalities arise because under a "calling party pays" (CPP) regime, such as that adopted in 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.

The level of MTRs not only directly affects the prices paid by consumers for calls, but also indirectly the intensity of competition between mobile networks. High MTRs increase mobile networks' incentives to set large price differentials for making own network ("on-net") versus off network ("off-net") calls. These price differentials create "network effects" which intensify competition between mobile networks to attract new subscribers, and create a competitive advantage for larger networks which can offer cheap on-net calls to a larger subscriber base.[3] The strength of these incentives also depends on the importance of receiver benefits, since high off-net call prices only affect subscribers on other networks when they care about receiving calls. Hence any analysis of competition and pricing on mobile networks needs to take both call externalities and network effects into account, and *a fortiori* this is true of merger analysis.

Our recent paper (Harbord and Hoernig 2010) presented results from a calibrated welfare model of the UK mobile telephony market which includes many mobile networks; calls to and from the fixed network, on-net/off-net price discrimination, and call externalities. The analysis focused on the short-run effects of adopting lower mobile termination rates (MTRs) on total welfare, consumer surplus and profits. The model is equally capable of analyzing the economic implications of the recently-approved merger between Orange and T-Mobile, however, and that is the topic of this article.

2   Merger Model Results

The Orange/T-Mobile merger will combine two mobile firms with current market shares of 21.3% and 15.7% respectively, into a single network with more than 32 million subscribers and 37% of the market. We simulated the effects of this merger under two different assumptions concerning the level of MTRs, and for six values for the ratio of receiver to sender benefits, or the call externality parameter (β in our model). First, mobile networks' MTRs were set at Ofcom's estimates of "fully allocated cost" for the final year of the current price control 2010/11.[4] Second, MTRs were set at zero (known as "bill-

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[3]Harbord and Pagnozzi (2010) provide empirical evidence on the importance of on-net/off-net price discrimination in European mobile markets and the strength of the associated network effects.

[4]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. This results in MTRs of 4.3 ppm for Vodafone, O2, T-Mobile and Orange, and 4.6 ppm for H3G.

and-keep" in the trade) prior to the merger. Although no European regulatory authority is currently proposing to reduce MTRs to zero, the levels now being discussed are so small as to make any differences negligible.

2.1   Effects of the Merger under 2010/11 MTRs

With MTRs set at their regulated levels for 2010/11, we found the overall effects of the merger to depend strongly on the strength of call externalities, or receiver benefits. In the absence of any call externalities, the merger will *improve* allocative efficiency and welfare by moving more subscribers on to a single large network, thus avoiding the inefficiencies associated with high off-net call prices, themselves partly a product of MTRs which exceed marginal cost. In other words, the merger may help to ameliorate the negative effects of above-cost MTRs as currently allowed by the UK regulatory authorities. This observation provides a stark illustration of the inefficiencies created by the historic approach to regulating MTRs. In the absence of call externalities, efficiency and welfare (although not consumer surplus) would be increased even further by a merger of all five of the mobile network operators in the UK market into a single monopoly network, so that all mobile-to-mobile calls became more efficiently-priced on-net calls.

With any significant level of call externalities, however, this result is reversed by the strategic incentive of the newly merged firm to increase its off-net call prices. It is a standard result of the recent literature that, in the presence of call externalities, large networks charge higher off-net prices than smaller networks.[5] Hence there is a critical level of the call externality parameter above which the merger becomes harmful to allocative efficiency and welfare. In our simulations, this always occurs when the ratio of receiver to sender benefits is between one fifth and two fifths (see Table 1). For large call externalities, our simulations predict overall welfare losses from the merger exceeding £1.4 billion per year, dwarfing the cost savings of £390 - £420 million per year predicted by the companies themselves.[6] For moderate to high call externalities the merger would appear to be detrimental to economic efficiency, even if we allow for all of the cost savings posited by the companies.

Table 1   Merger under 2010/11 MTRs

	$\beta = 0$	$\beta = 0.2$	$\beta = 0.4$	$\beta = 0.6$	$\beta = 0.8$	$\beta = 1$
Change in Welfare (£ m)	24	6	-56	-210	-573	-1,465
Change in Consumer Surplus (£ m)	-1,821	-1,883	-1,982	-2,142	-2,418	-2,932
Change in Profits (£ m)	1,845	1,889	1,926	1,932	1,844	1,467

[5] To be more precise, each network's off-net prices are increasing in its own market share.

[6] Our estimate of the merger's expected annual cost savings is based on information provided in Orange and T-Mobile (2009).

Since the merger reduces the number of competitors in the mobile market, however, it reduces the intensity of competition between mobile networks to attract new subscribers. This in turn induces mobile firms to raise the level of their fixed charges, increasing profits at the expense of consumer surplus. This reduction in consumer surplus exceeds £1.8 billion per annum in the absence of call externalities ($\beta = 0$), and exceeds £2.9 billion per year when β equals one. Losses in consumer surplus are, unsurprisingly, closely mirrored by corresponding increases in mobile firms' profits, as illustrated by Table 1.

2.2 Effects of the Merger under Bill-and-Keep

If instead we perform our simulations with much lower MTRs, such as those proposed in the recent European Commission *Recommendation*, the (negative or positive) effects of the merger on aggregate welfare are much reduced. The merger's effects on consumer surplus, however, vary depending on the impact of the reduction in MTRs on market shares. We considered two possibilities. First, that MTRs are reduced prior to the merger, with no (short-run) effect on network market shares. In this case, with very low receiver/sender benefit ratios ($\beta < 0.4$) the merger improves allocative efficiency by just over £2 million per year, but this welfare gain falls to zero when β reaches one half (see Table 2). The maximum welfare loss of just over £29 million per year occurs when β is equal to one. If we allow for the companies' claimed cost savings of £390 - £420 million per year, this means that the merger will be efficiency improving for all reasonable values of the call externality parameter.

But the merger still results in large decreases in consumer surplus for all values of β, from £1.98 billion per annum when $\beta = 0$ to £2.74 billion per year when $\beta = 1$. Hence even if a regime of very low MTRs were adopted, such as bill-and-keep, the merger creates significant welfare losses for consumers, and significantly increases the profits of the mobile networks.

Table 2   Short-run Effects of Merger under Bill-and-Keep

	$\beta = 0$	$\beta = 0.2$	$\beta = 0.4$	$\beta = 0.6$	$\beta = 0.8$	$\beta = 1$
Change in Welfare (£ m)	2	2	1	-1	-8	-29
Change in Consumer Surplus (£ m)	-1,983	-2,065	-2,171	-2,309	-2,491	-2,743
Change in Profits (£ m)	1,985	2,067	2,172	2,308	2,483	2,715

The adoption of bill-and-keep should result in a medium to long-run tendency for networks' market shares to equalize, however, due to the relationship between MTRs, on-net/off-net price discrimination and positive or negative network effects. A reduction of MTRs to zero much reduces the competitive advantage of larger networks, and this should

promote growth by smaller networks.[7] To capture this, we make the extreme alternative assumption that network's market shares are equalized both before and after the merger (see Table 3). In this case, the merger's effect on aggregate welfare ranges from just over £1 million per year (when $\beta = 0$), to minus £2 million per year (when $\beta = 1$). The effect on consumer surplus is also somewhat ameliorated, and varies between minus £1.2 billion per year (when $\beta = 0$), to minus £ 1.7 million per year (when $\beta = 1$), again mirrored by corresponding increases in mobile networks' profits.

Table 3   Merger under Bill-and-Keep with Market Share Symmetry

	$\beta = 0$	$\beta = 0.2$	$\beta = 0.4$	$\beta = 0.6$	$\beta = 0.8$	$\beta = 1$
Change in Welfare (£ m)	1	1	1	0	-1	-2
Change in Consumer Surplus (£ m)	-1,220	-1,270	-1,335	-1,420	-1,533	-1,689
Change in Profits (£ m)	1,221	1,271	1,336	1,421	1,533	1,686

3   Discussion

Our simulations show that with MTRs set at their regulated levels for 2010/11, the overall efficiency effects of the Orange/T-Mobile merger depend on the strength of call externalities. The merger *improves* allocative efficiency and welfare in the absence of receiver benefits by moving more subscribers on to a single large network. With much lower MTRs (such as bill-and-keep in our simulations), these aggregate efficiency effects are much reduced, since off-net call prices are much closer to their efficient level once MTRs are set at zero. Nevertheless, the merger significantly reduces competition and consumer surplus in each of the scenarios we have considered, even once we allow for a longer-run tendency for networks' market shares to equalize. And in every scenario mobile firms profit hugely from the relaxation in competition caused by the merger, at the expense of their subscribers.

The European Commission approved the merger in March this year, subject to certain undertakings agreed by the companies relating to network-sharing arrangements and divestiture of spectrum (see EC, 2010). It is difficult to see how these undertakings address the competition policy and welfare-related concerns illustrated by our simulation model, however.

References

[1] Armstrong, M. and Wright, J. (2009a). 'Mobile call termination', *Economic Journal*, vol. 119, pp. F270–F307.

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[7]Indeed, when call externalities are absent or small, adopting bill-and-keep can result in "negative network effects", and subscribers will, all else equal, prefer to join a smaller network (see Armstrong Wright, 2009, p. F286).

[2] Competition Commission (2009). *Mobile phone wholesale voice termination charges: Determination*, HMSO, London.

[3] European Commission (EC) (2009). *Commission Recommendation on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU*, 7 May, Brussels.

[4] European Commission (EC) (2010). *Mergers: Commission Approves Proposed Merger Between UK Subsidiaries of France Telecom and Deutsche Telekom, Subject to Conditions,* Brussels.

[5] Harbord, D. and Hoernig, S. (2010). 'Welfare Analysis of Regulating Mobile Termination Rates in the UK (with an Application to the Orange/T-Mobile Merger)', CEPR Discussion Paper No. 7730, March.

[6] Harbord, D. and Pagnozzi, M. (2010). 'Network-based price discrimination and 'bill-and-keep' vs. 'cost-based' regulation of mobile termination rates', *Review of Network Economics,* vol. 9(1), Article 1.

[7] Ofcom (2010). *Wholesale Mobile Voice Call Termination: Market Review, Volume 2 – Main Consultation,* 1 April, London.

[8] Orange and T-Mobile (2009). *Combination of Orange UK & T-Mobile UK: Creating a New Mobile Champion*, 8 September.

Biographical Information

David Harbord

Affiliation: Market Analysis Ltd, Oxford (http://www.market-analysis.co.uk/)

David Harbord is the Director of Market Analysis Ltd, an Oxford-based economics consultancy group. He has a BA in Political Economy from the University of Toronto; an MA in Economics from York University; and a PhD in Economics from the London School of Economics. Prior to taking up a career in consulting he pursued an academic career, and held teaching and research positions at Bristol University, the University of Oxford, Stanford University, the University of British Columbia and the London School of Economics.

David's primary research areas are in industrial economics, regulation, and competition policy. He has published numerous articles in journals such as the *Review of Network Economics*, the *Journal of Competition Law and Economics*, the *RAND Journal of Economics*, the *Economic Journal*, the *International Review of Law and Economics*, *European Economy*, the *European Competition Law Review* and the *Electricity Journal*

Steffen Hoernig

Affiliation: Universidade Nova Lisboa and CEPR (http://docentes.fe.unl.pt/~shoernig/)

Steffen Hoernig is Associate Professor of Economics at Universidade Nova Lisboa, Lisbon, Portugal, and a CEPR Research Affiliate. He obtained a degree in Management at the Universität Bielefeld in Germany; a Master in Applied Mathematical Sciences at the University of Georgia, Athens, USA; and a PhD degree in Economics at the European University Institute in Florence, Italy. His research and publication area is industrial organization, with particular emphasis on telecommunications economics, and he has published articles in the *Journal of Industrial Organization*, the *European Economic Review*, *Information and Economics & Policy*, *Economic Theory* and the *Journal of Regulatory Economics*.