Welfare Analysis of Regulating Mobile Termination Rates in the UK (with an Application to the Orange/T-Mobile Merger)

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EARIE 2010, Istanbul
September 3rd 2010
A Mobile termination rate (MTR) is the price that a mobile network operator (MNO) charges to ”terminate” calls from other networks.

MTRs come in two flavours, fixed-to-mobile (FTM) and mobile-to-mobile (MTM).

Almost everywhere sectoral regulators have imposed a cap on MTRs, often (but not always) equal for FTM and MTM calls - why?
Will MNOs set low or high MTRs?

- Economic theory shows that
  - MNOs want to set a high FTM termination rate ("competitive bottleneck")
  - MNOs want to set high or low MTM termination rates depending on the prevailing types of retail tariffs:
    (Assume differentiation between on- and off-net calls)
    - Linear / pre-paid tariffs: high MTRs reduce competitive intensity
    - Two-part / post-paid tariffs: low MTRs reduce competitive intensity
  - Practice shows that most MNOs set high MTRs
Effects of high MTRs

- **FTM calls:**
  - Transfer of surplus from fixed to mobile consumers (results in "Waterbed effect") and/or MNOs
  - Inefficiency in fixed market through high FTM prices

- **MTM calls:**
  - Inefficiency in mobile market through high MTM off-net prices
  - Transfer of surplus from MNOs to subscribers (two-part/post-paid tariffs)
  - Transfer of surplus from subscribers to MNOs (linear/pre-paid tariffs)
MNOs have SMP in the markets of termination of calls to own subscribers, and there is inefficiency.

Thus MTR caps are imposed, with strong downward trend over last decade.

EU recommendation of May 2009: MTRs should converge to LRIC, where "increment" is mobile termination as additional service.

Means MTR target in the 1 – 2 Eurocent range.
UK: Ofcom Consultation of 2009

- Status quo: Somethink like fully allocated costs (FAC) pricing
- Ofcom consulted on different targets for lowering MTRs
  - LRIC or LMRC
  - Reciprocity with fixed networks (MTR = FTR)
  - Bill-and-keep (zero MTRs)
  - Capacity-based charges (not in our paper)
- Our paper: Calibrated model of UK mobile and fixed markets in order to disentangle effects and compare options
The Model

- Based on multiple network competition model of Hoernig (2009)
- 5 (or 6) mobile networks competing directly against each other
- Asymmetrically-sized networks
- Two-part tariffs with on/off-net discrimination
- Call externalities
- Model computes equilibrium prices and profits
- One fixed network (BT), only FTM + MTF calls modeled
- Fixed retention on FTM calls
- Sorry, no formulas this time (they are in the paper)
Calibration

- Ofcom (2009) information on subscribers, demand
- Calibrate linear demand function
- Real market shares (held constant for short-run effects)
- Own estimate of marginal costs
- Calibration of network differentiation parameter and stability check
- Consider different levels of call externality $\beta$
Results: Preliminaries

- All results are
  - in millions of pound sterling per year
  - in comparison to status quo

- We will consider the fixed and mobile markets separately and in aggregate
### Aggregate Change in Welfare

<table>
<thead>
<tr>
<th>β</th>
<th>LRMC</th>
<th>Recip</th>
<th>B &amp; K</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>367</td>
<td>366</td>
<td>360</td>
</tr>
<tr>
<td>0.25</td>
<td>648</td>
<td>675</td>
<td>674</td>
</tr>
<tr>
<td>0.5</td>
<td>1023</td>
<td>1086</td>
<td>1091</td>
</tr>
<tr>
<td>0.75</td>
<td>1537</td>
<td>1651</td>
<td>1665</td>
</tr>
<tr>
<td>1</td>
<td>2272</td>
<td>2459</td>
<td>2485</td>
</tr>
</tbody>
</table>

- Low call externalities: MTR at cost socially optimal
- High call externalities: MTR below cost socially optimal
- Social welfare predicted to increase by between £0.3bn and more than £2bn, depending on the strength of the call externality
Consumer Surplus in Mobile and Fixed Markets

### Aggregate Change in Consumer Surplus

<table>
<thead>
<tr>
<th></th>
<th>$\beta = 0$</th>
<th>$\beta = 0.25$</th>
<th>$\beta = 0.5$</th>
<th>$\beta = 0.75$</th>
<th>$\beta = 1$</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRMC</td>
<td>29</td>
<td>217</td>
<td>464</td>
<td>800</td>
<td>1276</td>
</tr>
<tr>
<td>Recip</td>
<td>-31</td>
<td>174</td>
<td>443</td>
<td>810</td>
<td>1328</td>
</tr>
<tr>
<td>B &amp; K</td>
<td>-51</td>
<td>157</td>
<td>429</td>
<td>800</td>
<td>1326</td>
</tr>
</tbody>
</table>

- Low call externalities: MTR below cost reduces CS
- High call externalities: MTR **below** cost increases CS
- Consumer surplus increases less than total welfare
- Implies that networks also gain on aggregate
Fixed Market

- Changes do not depend on call externalities

**Change in Fixed Market Values**

<table>
<thead>
<tr>
<th></th>
<th>Welfare</th>
<th>Consumer Surplus</th>
<th>Profits</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRMC</td>
<td>541</td>
<td>473</td>
<td>68</td>
</tr>
<tr>
<td>Recip</td>
<td>676</td>
<td>592</td>
<td>84</td>
</tr>
<tr>
<td>B &amp; K</td>
<td>712</td>
<td>623</td>
<td>88</td>
</tr>
</tbody>
</table>

- Welfare in fixed market increases due to lower FTM prices
- Consumer surplus increases due to lower FTM transfers
- Profits increase due to higher FTM quantities
- Both consumers and the fixed network benefit
Welfare in Mobile Market

Change in Mobile Welfare

<table>
<thead>
<tr>
<th></th>
<th>$\beta = 0$</th>
<th>$\beta = 0.25$</th>
<th>$\beta = 0.5$</th>
<th>$\beta = 0.75$</th>
<th>$\beta = 1$</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRMC</td>
<td>-174</td>
<td>107</td>
<td>481</td>
<td>996</td>
<td>1731</td>
</tr>
<tr>
<td>Recip</td>
<td>-310</td>
<td>-1</td>
<td>410</td>
<td>975</td>
<td>1783</td>
</tr>
<tr>
<td>B &amp; K</td>
<td>-352</td>
<td>-38</td>
<td>380</td>
<td>953</td>
<td>1773</td>
</tr>
</tbody>
</table>

- Welfare decreases: reduced transfers from fixed market
- Welfare increases: lower off-net prices
- The second effect dominates with medium to high call externalities
## Consumer Surplus in Mobile Market

### Change in Mobile Consumer Surplus

<table>
<thead>
<tr>
<th></th>
<th>( \beta = 0 )</th>
<th>( \beta = 0.25 )</th>
<th>( \beta = 0.5 )</th>
<th>( \beta = 0.75 )</th>
<th>( \beta = 1 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRMC</td>
<td>-444</td>
<td>-256</td>
<td>-9</td>
<td>327</td>
<td>802</td>
</tr>
<tr>
<td>Recip</td>
<td>-623</td>
<td>-418</td>
<td>-149</td>
<td>218</td>
<td>736</td>
</tr>
<tr>
<td>B &amp; K</td>
<td>-674</td>
<td>-467</td>
<td>-194</td>
<td>177</td>
<td>702</td>
</tr>
</tbody>
</table>

- Mobile CS decreases strongly:
  - Reduced transfers from fixed market (Waterbed effect)
  - Higher fixed fees due to smaller tariff-mediated network effects

- Mobile CS **increases with high call externalities** due to lower off-net prices

- Even mobile consumers may gain from reduced MTRs
The Merger between T-Mobile and Orange

- The UK had until 2009 five MNOs, O2 (28%), Vodafone (23%), Orange (21%), T-Mobile (16%), H3 (6%), and the MVNO Virgin (6%)
- The Orange/T-Mobile merger created an MNO with 37% market share
- Orange/T-Mobile predicted cost savings of about £400m
- The European Commission cleared the merger in March 2010
- Our question: How does the merger affect consumers under different MTR scenarios?
- Following tables show changes in £m
Let’s for a start keep MTRs where they are

Merger with 2010/11 MTRs

<table>
<thead>
<tr>
<th>$\beta$</th>
<th>W</th>
<th>CS</th>
<th>$\pi$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>24</td>
<td>-1,821</td>
<td>1,845</td>
</tr>
<tr>
<td>0.2</td>
<td>6</td>
<td>-1,883</td>
<td>1,889</td>
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<tr>
<td>0.4</td>
<td>-56</td>
<td>-1,982</td>
<td>1,926</td>
</tr>
<tr>
<td>0.6</td>
<td>-210</td>
<td>-2,142</td>
<td>1,932</td>
</tr>
<tr>
<td>0.8</td>
<td>-573</td>
<td>-2,418</td>
<td>1,844</td>
</tr>
<tr>
<td>1</td>
<td>-1,465</td>
<td>-2,932</td>
<td>1,467</td>
</tr>
</tbody>
</table>

Welfare increases with low call externalities!

Absurd result?

No, merger brings many previous off-net calls on-net

Increase due to existing distortion through high MTRs

In any case, consumers suffer and profits increase
Merger under B & K, constant market shares

- Now assume Bill & Keep as the most extreme change
- Keep market shares constant for now

<table>
<thead>
<tr>
<th>$\beta$</th>
<th>0</th>
<th>0.2</th>
<th>0.4</th>
<th>0.6</th>
<th>0.8</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>$W$</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>-1</td>
<td>-8</td>
<td>-29</td>
</tr>
<tr>
<td>CS</td>
<td>-1,983</td>
<td>-2,065</td>
<td>-2,171</td>
<td>-2,309</td>
<td>-2,491</td>
<td>-2,743</td>
</tr>
<tr>
<td>$\pi$</td>
<td>1,985</td>
<td>2,067</td>
<td>2,172</td>
<td>2,308</td>
<td>2,483</td>
<td>2,715</td>
</tr>
</tbody>
</table>

- Small welfare effect (similar call prices)
- Similar large reduction in consumer surplus
- Profits increase by same amount
Bill & Keep might lead to more similar market shares in the long run

So let’s check symmetric market shares right away

Merger under B & K with Symmetry

<table>
<thead>
<tr>
<th>β</th>
<th>W</th>
<th>CS</th>
<th>π</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>-1,220</td>
<td>1,221</td>
</tr>
<tr>
<td>0.2</td>
<td>1</td>
<td>-1,270</td>
<td>1,271</td>
</tr>
<tr>
<td>0.4</td>
<td>1</td>
<td>-1,335</td>
<td>1,336</td>
</tr>
<tr>
<td>0.6</td>
<td>0</td>
<td>-1,420</td>
<td>1,421</td>
</tr>
<tr>
<td>0.8</td>
<td>-1</td>
<td>-1,533</td>
<td>1,533</td>
</tr>
<tr>
<td>1</td>
<td>-2</td>
<td>-1,689</td>
<td>1,686</td>
</tr>
</tbody>
</table>

Again, only a small welfare effect

Consumer surplus reduction is smaller but still large

Profits continue to increase by same amount
Conclusions

■ Ofcom’s proposed MTR reductions have multiple effects
  ■ Fixed market participants gain in welfare and surplus
  ■ Mobile welfare increases, but mobile consumers may lose due to lower transfers and reduced competitive intensity
  ■ Mobile consumers may still gain overall due to lower off-net prices if call externalities are important

■ Results do not much differ between Ofcom’s proposals

■ B & K offers additional benefit of simplicity

■ Orange/T-Mobile merger
  ■ Lower MTRs reduce adverse welfare effects of the merger
  ■ But consumers lose out anyway (and MNOs gain)
Thank you!

(Teşekkür ederim!)