Auctions and Mobile Market Competition: Evidence from European 4G Auctions

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The paper in a nutshell

• This paper examines the effects of 4G spectrum auctions on mobile market competition (concentration, prices and coverage/investment)

• By exploiting cross-country differences in the timing of 4G spectrum auctions, the authors find that low band auctions (<1 GHz) increase concentration and firm prices in previously concentrated markets. They find substantial heterogeneous effects depending on the type of operator.

• The authors use a simple theoretical model to help ground their understanding of the mechanisms at play
General comments

• Interesting paper using novel hand-collected data on 4G European auction events

• Studies relevant questions to better inform auction design

• Some comments on identification and heterogeneous effects (although there are significant changes in the presentation with respect to the paper version of March 2021)
Identification – Exogeneity of treatment adoption

Main assumption: Variation in the timing of auction events is not driven by ex-ante competition. Rather, it is caused by technical and bureaucratic reasons

+ Country balancing tests

However,

- There might be different trends in regulatory stance across countries influencing auction timing and impacting the variables of interest. Country/operator fixed effects cannot fully account for that.
- Suggestion: add an index of regulatory pressure as control, for instance:
  - The ITU’s ICT Regulatory Tracker
  - The OECD Product Market Regulation Index specific to telecommunications (measure the regulatory barriers to firm entry and competition)
Identification – No confounding alternative programs or policies (1/2)

1. From Table 2 in the paper: Most countries had multiple 4G auctions (events). Several countries had two (even three) distinct <1 GHz and/or >1 GHz spectrum auctions

   – First and second events considered distinctively in the previous version of the paper suggested differentiated effects across events. Why is this no longer considered?

   – Are there possible confounding effects now, in particular to identify heterogeneous effects by type of bandwidth?
Identification – No confounding alternative programs or policies (2/2)

2. Data from Q1 2009 to Q1 2019 and focus on 4G auctions: The end of the analysis period coincides with 5G spectrum auctions in some countries of your sample.

  – Are there any possible confounding effects?
  – Would this affect the identification of heterogeneous effects by type of bandwidth?

**Table:** European 5G auctions before 2019Q2

<table>
<thead>
<tr>
<th>Country</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy</td>
<td>October 2018</td>
</tr>
<tr>
<td>Sweden</td>
<td>December 2018</td>
</tr>
<tr>
<td>Denmark</td>
<td>February 2019</td>
</tr>
<tr>
<td>Switzerland</td>
<td>February 2019</td>
</tr>
<tr>
<td>Austria</td>
<td>March 2019</td>
</tr>
</tbody>
</table>

*Source:* https://5gobservatory.eu
Heterogeneous effects

- Set-asides and spectrum caps: In the paper you mention that you cannot explore heterogeneous effects based on these factors because of lack of variation.
  - There are now 23 countries in your sample (ppt vs. 17 countries in the paper). Could you now check for these potential heterogeneous effects?
  - The theoretical model predicts that stronger incumbents have incentives to pre-empt other competitors by over-buying spectrum, knowing that additional capacity will give them market power in the post-spectrum market. As most auctions in the sample were capped, do you think you are estimating a lower bound of potential effects?

- Timing and order of high and low bandwidth auctions
  - Could you now check for these potential heterogeneous effects now?
  - Do you think this order can be endogenous?
Minor comments (1/2)

1. When looking at heterogeneous effects by operator type it could be interesting to also look at the effect of auctions on market shares.

2. In the paper, you say you are surprised that coverage does not seem to change after auctions or only weakly, inasmuch as many countries implement coverage requirements as part of their license.
   - Possible reason: deployment takes time and it might be difficult to capture a potential effect on average when using the contemporary level of coverage.

3. Investment (CAPEX) not analyzed in the paper. How to interpret the new results and put them in the context of results regarding 3G and 4G coverage?
Minor comments (2/2)

4. Likely need to revise equation (4) in the paper

\[ Y_{ict} = \alpha_1^H \text{AfterFirstHighAuction}_{ict} + \alpha_2^H \text{AfterSecondHighAuction}_{ict} + \alpha_1^L \text{AfterFirstLowAuction}_{ict} + \alpha_2^L \text{AfterSecondLowAuction}_{ict} + \beta X_{ict} + \delta_i + \delta_c + \delta_t + \epsilon_{ict} \]  

Contains in $\delta_i$?  

$X_{ct}$ as they do not vary across operators?
Thank you