

Some Observations on the British 3G Telecom Auction: Comments on Börgers and Dustmann

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Some Observations on the British 3G Telecom Auction: Comments on Börgers and Dustmann*

By *Paul Klemperer*

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I offer an explanation for some of the bidding in the year 2000 British 3G telecom auction, and observe that Börgers' and Dustmann's (2002) results are consistent with the outcome having been efficient.

I. Introduction

Börgers and Dustmann (2002a), henceforth B-D, is a very valuable and insightful paper that is full of useful detail about the actual bidding in the UK 3G auction and will become a key reference for anyone studying it.

As discussed in Klemperer (2002 a,c) and Binmore and Klemperer (2002), the UK auction was one of the most successful of the western European 3G auctions. Indeed in terms of revenue raised per capita it was *the* most successful of all the auctions, and it is therefore appropriate to examine, as B-D do, whether the auction's outcome was also as efficient as is often claimed. Furthermore, B-D draw attention to many previously unnoted features of the bidding in the UK auction which do not fit well with standard theory, and which may have important implications for future auctions.

I have learnt a lot from B-D's analysis. In what follows, I discuss just two issues about which my interpretation is slightly different.¹

* Acknowledgements: I was the principal auction theorist advising the UK government's Radiocommunications Agency, which designed and ran the UK mobile-phone license auction discussed here, but the views expressed in this paper are mine alone. I do not intend to suggest that any of the behaviour discussed below violates any applicable rules or laws. I am very grateful to *Tilman Börgers* for useful comments, and to *Marco Pagnozzi* for our collaboration in the study of the 3G auctions and for his helpful suggestions about this essay.

II. Efficiency of the UK Auction

B-D's analysis makes clear that an ascending auction like the UK's runs the risk of an at least slightly inefficient outcome arising in some circumstances. However, it also seems clear that the actual outcome of the UK auction was efficient, or very close to efficient, in the sense of maximising the sum of the valuations of the licence holders.

Klaus Schmidt's (2002) excellent comment explains that the evidence from the bidding in the auction itself suggests that the UK auction was probably efficient. Evidence subsequent to the auction supports the same claim. It seems clear after the fact – and especially after the other European auctions – that the four incumbents had the highest valuations², so were efficient winners. And there is no evidence that any losing entrant had a value for a license that exceeded TIW-Hutchison's. Finally, the evidence subsequent to the auction, as well as from within it (including the interpretation of the bidding offered below), suggests Vodafone had a higher incremental value for a large license than did any other incumbent, and therefore that the allocation of licenses among winners was also correct.

In short, all the available evidence suggests that the UK auction's outcome was efficient in the sense claimed.³

III. BT's Bidding Behavior

B-D also suggests that some of the behavior they document is very hard to rationalise, but I conjecture that doing sufficient research into the environment in which the auction took place will yield good explanations, as I will illustrate by examining the main "puzzle"-BT's bidding.⁴

BT's bidding was such that the prices bid for the large (2 x 15 MHz) "B" and small (2 x 10 MHz) "C", "D", and "E" licences differed by roughly a constant in the early stages of the auction (phase 1 of the auction in B-D's terminology), and then switched to differing by roughly a fixed proportion (fifty per cent of the price level of the small licenses) in the later stages of the auction (phases 2 and 3 in B-D's terminology).⁵ This pattern seems unusual, but reviewing analysts' reports

¹ I was the principal auction theorist advising the Radiocommunications Agency which designed and ran the UK auction, but the views expressed in this paper are mine alone.

² See *van Damme* (2002) and *Fortis* (2000) for evidence and discussion of these value differences. (Indirect evidence is also provided by the fact that only one out of the thirty incumbent bidders in the eight western European ascending auctions failed to win a license – and even this single failure was attributed to collusion or organizational strife within the bidder, rather than to the incumbent having a low value, see *Klemperer* 2002a).

³ *Cable* et al (2001) use stockmarket data to argue that "there is no evidence that the outcome of the auction was anything but efficient".

⁴ However, B-D are to be congratulated on having already explained so much; they also looked at evidence from outside the auction to explain behaviour within it.

⁵ That BT's behaviour in the later stages of the auction can be described in this way was observed independently, by B-D and myself, after the conference in Munich to which their

suggests a clue: some analysts assumed the value of the large license must be $1\frac{1}{2}$ times the value of a small license (reflecting an assumption that $1\frac{1}{2}$ times the amount of spectrum would allow offering $1\frac{1}{2}$ times the service⁶), while several other analysts insisted the large license was worth a fixed sum more than a small one (reflecting the additional costs – base stations, etc. – required to run the same service with a smaller licence), and it was clearly well understood in the industry that different bidders might make different choices between these two different valuation models.

Of course, if one or more bidders valued the large licence at $1\frac{1}{2}$ times the value of the small license, this cannot on its own explain the price difference being a fixed proportion of the value of the small license. For example, if BT's private valuations for small and large licences were £ 4 billion and £ 6 billion, respectively, while Vodafone's were £ 6 billion and £ 9 billion, respectively, and other bidders were closer to indifferent between small and large licences, then with "straightforward bidding" (in B-D's terminology) the absolute value of the price difference would quickly move to equal £ 2 billion (since whenever the price difference was less than £ 2 billion, both BT and Vodafone would regard the large license as the best deal, and so would bid on it).⁷

However, it seems plausible that BT intrinsically valued a large license more than a smaller license by a fixed value that was considerably below 50% of the final price of a small license. BT may also have become very confident that Vodafone valued a large licence at 50% more than a small license. (Apart from any information from outside the auction, Vodafone never placed a bid on any license other than the large license in the auction.) Furthermore, BT may have wished to make Vodafone pay as much as possible for its license⁸ for at least two reasons. First, this would reduce Vodafone's budget and so make Vodafone a weaker competitor in subsequent auctions (the British auction was the first of nine western European 3G auctions, and was also followed by others elsewhere in the world). And second, making Vodafone pay more would make "the market"

paper was contributed. The details are reported in B-D's companion paper, *Börgers and Dustmann* (2002b).

⁶ The technology might actually allow offering slightly more than $1\frac{1}{2}$ times the service, hence the value ratio might be slightly more than $1\frac{1}{2}$.

⁷ And even if, as I will argue, some of the early bidding was non-serious, the price difference would move to the fixed amount, £ 2 billion, as soon as the bidding became serious.

⁸ After the auction BT claimed it had deliberately pushed up the price that Vodafone had paid, and this was reported in the press, see *Cane and Owen* (2000). (At the time, this claim was pooh poohed by auction theorists as implausible, since it was hard to reconcile with the evidence without realising that BT and Vodafone might both have had different valuation models and also have had a reasonably clear idea of the other's valuation model.)

think Vodafone had not done better than BT in the auction. There is anecdotal evidence that BT was very concerned both about the stock-market's perceptions of its performance, and about the wider market's view of its position relative to Vodafone. Allowing Vodafone to win the larger license at a lower per-MHz price than BT was paying might suggest BT's managers had got a bad deal. Or it might suggest that BT was not able to make effective use of a larger license in the way that Vodafone could, and hence that BT thought it was in a weak market position, while Vodafone was clearly "number one".⁹ So bidding up the large license's price to 50% more than the current small license price may have seemed a reasonable risk to take, even given the small chance of ending up winning the large license at hundreds of millions of pounds more than BT valued it at.^{10,11}

Of course, even a small risk of winning the large license might seem to have a significant expected cost. But it was also possible that if BT did end up winning the large license, it might have been able to resell part of it at little or no loss, given that the auction prices would then have established a clear price per MHz. (The possibilities for resale were unclear, but Hutchison did in effect resell a fraction of the licence it won, very shortly after the auction, to KPN and Docomo at almost exactly the price per MHz that BT and Vodafone paid in the auction.¹²) And, anyway, observers might not think BT's managers had made a bad decision, even if BT did end up winning (and keeping) the large license for 50% more than the price of a small license.¹³

This theory, of course, leaves an important question unanswered. Why did BT not push up the price of the large license in the early stages of the auction? One reason is that much of the bidding in the early stages of the contest, when it was clear that there was no realistic chance of the auction ending very quickly (B-D's

⁹ *Klemperer (2002c)* discusses the importance of bidders' concerns about relative performance in the German auction.

¹⁰ If BT was correct in its assessment that Vodafone's valuation of a large licence was (at least) 50% more than that for a small license, the (only) risk that BT faced was that Vodafone would quit the auction altogether. But this outcome was completely implausible, since it would imply that Vodafone's valuation for a small license was below that of Orange and One-2-One (which were both weaker incumbents), and at least one new entrant. The real risk would have been that BT had misjudged Vodafone's valuation difference between the licenses, and BT perhaps knew this risk was small.

¹¹ It was reported after the auction that BT said it had deliberately pushed up the price that Vodafone had paid, but this was pooh poohed by auction theorists as implausible, since it was hard to reconcile with the evidence without realising that BT and Vodafone might both have different valuation models and also have a reasonably clear idea of the other's valuation model.

¹² The UK Government now seems likely to make resale relatively easy, but this was unclear at the time of the auction, and actual resale of part of a license may in any case be unattractive since bringing a new competitor into the industry makes the remaining spectrum less valuable. Bringing new partners into a joint-venture as Hutchison did therefore seems the most relevant form of resale.

¹³ Of course, the arguments of this paragraph are in effect postulating that there may have been important common-value elements to valuations. Note that with common value elements it is plausible that the large license might be worth a fixed amount (say £ 500 million – £ 1 billion) more than a small license at low prices, but a constant fraction (say 150%) of the small license at large prices.

phase 1) does not seem to have been very serious.¹⁴ In fact, some bids were probably slightly frivolous, or designed to attract media attention. For example, One-2-One raised its bid by slightly more than the minimum required in round 76 to bid £ 1,212,100,000!¹⁵ And BT did start pushing up the price difference between the large and small licences in round 99 when there were still 9 bidders left (so 4 more dropouts were still required to end the auction), and did not then stop pushing up the price difference until round 112 when the large license was more than 50% (and more than £ $1\frac{1}{2}$ billion) more expensive than the small licenses.

A more serious reason why BT did not push up the price difference earlier is that BT may not have wanted to influence other bidders too early to think that license values were very high (since these other bidders might need time to adjust their views, and get extra money approved by their Boards, etc.). For example, if BT's valuation for a small license was £ 5 billion, it might have been confident that Vodafone's value exceeded £ 4 billion for a small license, and therefore that Vodafone would pay at least £ 2 billion more for a large license. But pushing the price difference up to £ 2 billion immediately would have sent a very clear signal about what the ultimate prices might be at a time at which the auction prices for the smaller licences were still very low, and this could only have been damaging to BT's interests.

A final possible reason why BT did not push up the price difference early on is that BT may not have become confident that Vodafone's valuation of the large license was $1\frac{1}{2}$ times its valuation of the small license until later in the auction.

Most likely BT thought that the early bidding was probably not very important but that its best strategy was to roughly mimic what straightforward bidding would have been if it had had low valuations and a correspondingly low difference in valuations. Certainly this is consistent with the evidence.¹⁶

So it seems possible to give a reasonable explanation for BT's bidding. Of course, this may not be the only possible explanation.¹⁷ However, the moral is that understanding bidding in auctions often requires knowing a lot of real-world detail about the players and the context in which they are operating. Facts from outside the bidding itself – in this case knowing the differing valuation models that different analysts used – may be the key to explaining behaviour. In understanding auctions, as well as in designing them, “the devil is in the details”.¹⁸

¹⁴ Four bidders have informally confirmed this.

¹⁵ Additional 1's and 2's were ruled out, because all bids were required to be multiples of £ 100,000.

¹⁶ Although Vodafone only bid on the large license, it is very plausible that Vodafone was following a similar strategy, but mimicking a bidder with slightly less low valuations.

¹⁷ For example, there may have been much stronger common-value components to valuations than usually assumed.

¹⁸ See *Klemperer* (2002 a,b,d) for more discussion of the importance of understanding the wider context, and of apparently small details, in auction design.

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