THE EUROPEAN UMTS-AUCTIONS[*]

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Abstract: In this paper we review, and draw some lessons from, the UMTS-auctions that have taken place in Europe during 2000 and 2001. We address several design issues and, in particular, focus attention on asymmetries between the bidders and on possibilities for collusion. An outlook is provided to several other auctions in which the stakes may not be so high, but the design issues perhaps somewhat more complex.

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1. INTRODUCTION

The UMTS (third generation mobile telecommunication) auctions that have taken place in Europe during 2000 have drawn a lot of attention from academics, practitioners and from the public at large. Newspapers have focused on the very high prices that were paid in some countries and in the sharp drop in market values of telecommunication companies after these auctions. From the time when the UK-auction started (March 2000) to August 2001, when Denmark was about the last Western European country to auction, the Dow Jones European telecom index lost two-thirds of its value, a drop considerably deeper than that of about $1/4^{th}$ in the overall index. In one extreme case, the share price of Dutch KPN dropped from a high of around €73 to a low of €2.03. Of course, this market drop may simply be the bursting of a bubble; the market realizing that previous expectations about the bright future of UMTS were exaggerated. Nevertheless, in the eyes of the public, the auctions were a major factor in explaining the loss in market value for telecommunications firms, see The Economist (2000, 2001).

Academics, while intrigued by the high absolute amounts paid in some countries, focused more on the large variation in prices across countries. Table 1 lists the auction revenue (in € per capita) in the various countries that used the auction mechanism. While some variability might be expected as a result of country differences (for example, in per capita income or in the cost of rolling out a network), the variability is too large to be explained by this factor alone. In Table 1, the countries are ordered according to the time at which they auctioned the licenses, and it is obvious that the order mattered: the earlier, the higher the revenue. Some of this may be explained by changing perceptions of the market through time. Alternatively, countries moving first may have had a genuine advantage; they did not only sell licenses to operate in their country, but also an option to create a pan-European network. A third factor is that, over time, firms learned to play the game better. At the start of the auction season, consolidation of the industry had not yet taken place, and firms had not yet realised that it was better to co-operate (agree before the auction) than to compete head-on in the auction. Obviously, also existing (2G-) market structure mattered: in the Netherlands, 5 licenses were auctioned in a market in which already 5 2G-operators were active, which partly accounts for the low revenue there. Academics noted that

the various countries used different auction methods and knowing that details may matter, they addressed the question how much these design differences contributed to explaining the differences in revenue.

Country	2G	3G	Revenue	Country	2G	3G	Revenue
UK	4	5	650	**Austria**	4	6	105
Netherlands	5	5	170	**Switzerland**	3	4	20
Germany	4	6	620	**Belgium**	3	4	45
Italy	4	5	210	**Denmark**	4	4	95

Table 1: Auction revenues (2G denotes the number of incumbent operators, 3G the number of 3G-licenses auctioned, revenue is in € per capita)

In this paper, we draw some lessons that can be learned from the European UMTS-auctions. The aim of the paper is not to contribute to auction theory as such. The paper rather focuses on the applications side. When it comes to designing an auction, a great number of issues have to be addressed, such as:

i) what is the goal to be achieved?
ii) what is to be sold, and how should supply be packaged?
iii) how to attract bidders and how to create a "level playing field" amongst them?
iv) which auction mechanism can best be used?
v) how to enforce the rules of the game?

These questions deal with objectives, supply, demand, the market institution (including the payment mechanism), and legal (competition) issues respectively. Auction theory focuses mainly on the fourth question, taking the other aspects as given, and it has generated many valuable insights. While it is true that, as Klemperer (2000) has put it, in auction design "the devil is in the details", this should not make us blind for the fact that the other four aspects are extremely relevant as well. Furthermore, we should bear in mind that frequently an auction is not an isolated event, but that it takes place in the context of a larger game. In this paper, we focus on these other aspects, the aim being to provide a framework for thinking that makes auction theory even more useful for applications. Through various examples of other

auctions, we illustrate the added value of taking a somewhat more general perspective.

2. THE EUROPEAN UMTS-AUCTIONS

With the above checklist in mind, we briefly discuss here some salient aspects of the European UMTS-auctions. Motivated by these observations, the next sections then discuss some of these issues in somewhat greater detail.

Most governments adopted as their goals to ensure efficient use of spectrum, to create a competitive 3G-market, and, subsidiary, to generate revenue. In the next section we discuss why auctions may, or may not allow efficiency and revenue objectives being reached.

As far as supply is concerned, 60 MHz of paired spectrum was auctioned in all countries[2]. Technical requirements imply that this spectrum be split in blocks of 5 MHz, while for a viable network at least 10 MHz is needed. It follows that market structures with 3 players (3 x 20), 4 players (4 x 15), 5 players (2 x 15 and 3 x 10), and with 6 players (6 x 10) are possible. A first question is whether the government or the market should determine the market structure, i.e. should the number of license winners be fixed exogenously or should it be determined endogenously? Austria and Germany opted for the second alternative, all other countries fixed the market structure beforehand. Belgium, Switzerland and Denmark followed the proposal of the UMTS-forum (an expert group from the industry) and allocated 4 licenses of 15 MHz each. In the UK and the Netherlands, 2 large licenses and 3 small ones were auctioned. In each of these countries, bidders knew the full technical details of all licenses at the start of the auction. Italy, Germany, and Austria auctioned abstract lots that appeared identical to the bidders: bidders knew what quantity of spectrum they would get, but not which frequencies. Italy auctioned 5 licenses, each one consisting of 10 MHz, with new entrants having the option to buy an additional block of 5 MHz at a reduced price. In Germany and Austria, 12 abstract lots of 5 MHz were offered,

[2] We do not discuss the unpaired spectrum that was auctioned at the same time, but for which no profitable use was known at the time of the auction.

with bidders allowed to be active on at most 3 lots in each round and with a bidder who was active only on 1 lot forced to quit the auction. Hence, in these countries outcomes with 4, 5 of 6 winners were possible.

All countries had a light qualification procedure before the auction in which interested parties had to prove that they were capable of offering the 3G-service. In both Germany and Italy one bidder did not pass this test. Countries differed in the extent to which new entrants got some preferential treatment. In the UK, one (large) license was set aside for a newcomer, and new entrants also had the right of roaming, according to regulated rates, on existing 2G-networks. No such preferential treatment was given in Germany and in the Netherlands. In Italy, in addition to having roaming rights, a newcomer could buy additional spectrum at a reduced rate.

Most countries used a variant of the simultaneous multiround ascending auction, which had been pioneered in the US; see Milgrom (2000) for description and analysis. In the UK, bidders were fully informed about all bids that were made; hence, this auction was very transparent. The Dutch government was worried that transparency might make collusion easier, hence, it made less information available: bidders only knew the currently highest bids and currently highest bidders. Similar, limited, information was available in the German and Austrian auctions. In these latter countries twelve abstract lots were auctioned that appeared identical to the bidders. Each bidder started with three bidding rights, but a bidding right was permanently lost if a bidder was active (i.e. bidding, or standing high) on only two lots. As one did not always know how many bidding rights a competitor still had, these auctions were not fully transparent. Note that, while the German and Austrian governments were selling 12 units of a homogeneous commodity, they were using a design that had been developed to auction heterogeneous lots. With abstract lots, a much simpler design could have been used, with bidders simply expressing their demand at the current (single) price, and the price being raised until demand equals supply. In essence, the Italian design had this property. In that auction, bidders were ranked according to their bids and each bidder who was not among the five current highest bidders had to raise his bid above the fifth highest or to quit the auction. The Italian auction was discriminatory, with winners having to pay their final bid, which induced a game of trying to avoid being the winner with the highest final bid.

The only country that did not use a multi-round format was Denmark, and deliberately so. The Danish regulator wanted to stimulate entry and argued that an ascending auction would be less likely to attract new entrants than a sealed bid discriminatory auction. At the same time, it apparently was considered undesirable that winners pay different amounts for identical licenses. As a compromise, a fourth-price sealed bid auction was adopted, hence, all winners paid the lowest accepted price. With a minimum price of DKr 500 million and four bids, the resulting auction price was DKr 950 million, with one newcomer winning a license (and one incumbent 2G-player not bidding), hence, the objectives appear to be achieved.

In several countries, there were accusations of anti-competitive behaviour. Below, we discuss the case of the Netherlands. In Germany, the CEO of France Telecom offered Debitel, a weak entrant, access to its network in case Debitel would not win a license. In Austria, the CEO of Telekom Austria (the largest player on the market) informed the market before the auction that he would be satisfied with just two of the blocks, and that, if the others behaved similarly, it should be possible to get the frequencies on sensible terms. He also made it clear that his firm was willing to bid on 3 blocks if other bidders would pursue such an aggressive strategy. (See Total Telecom "? ustrian UMTS auction unlikely to scale peaks", October 31, 2000.) The competition authorities challenged none of the above actions. In Italy, the competition authority investigated the exit of Blu, a weak incumbent, that happened unexpectedly early, but no violations of the auction rules, or of the competition laws were found.

By now several detailed descriptions of the behaviour in these auctions are available, sometimes including game theoretic analysis. Plott and Salmon (2001) and Börgers and Dustman (2001) study the UK-auction, among others addressing the question whether behaviour is consistent with the independent private values model. Van Damme (2001) studies the Dutch auction. Jehiel and Moldovanu (2001) is an insightful paper that, among others, argues that the German design may risk resulting in a too concentrated market structure. Grimm, Riedel and Wolfstetter (2001) offer an explanation for why the German auction did not stop in round 125, when the 7th bidder, Debitel had dropped out, but instead continued till round 173, when the 6

winners collectively were € 20 billion poorer. In Jehiel and Moldovanu (2001) that outcome had been called "bizarre", but Grimm et al. derive it as a sequential equilibrium outcome, given uncertainty about the willingness to pay of Telefonica/Sonera 3G-consortium. Wolfstetter (2001) compares the Austrian auction to the Swiss and concludes that a design in which the number of licenses is endogenous is to be preferred. Klemperer (2001) discusses various of these aspects in more detail than I do here.

In all of these papers, each single auction is analysed in isolation. While many insights can be derived from such an analysis, it should not be forgotten that these auctions were "subgames" of one large game, in which the objectives of players may have been to create a pan-European 3G-network. This perspective may offer new insights. For example, in the UK, players may have been willing to bid more than the stand-alone value of a UK-license: winning meant winning an option on a European network. Similarly, the German auction may be viewed as a battle between KPN (owner of E-plus) and Telefonica. These two parties had been involved in (failed) merger negotiations before the auction. If Telefonica had not won a German license, the networks of KPN and Telefonica would have been largely complementary, while, with networks overlapping in Germany, Telefonica emerges much stronger in possible follow-up negotiations. Aspects of this type have received little attention up to now, with Maasland and Onderstal (2001) perhaps being an exception. That paper argues that, if bidders meet each other in multiple markets, losers may have an incentive to drive up the price the winner pays now, in order to make him a less fierce competitor later, and it investigates the consequences of such financial externalities in a standard auction context.

3. AUCTIONS, GOALS AND EFFICIENCY

Some European countries (in particular Spain and the Nordic countries) used a beauty contest instead of an auction to award the licenses.[3] For these countries, generating revenue apparently was not a goal. For most governments the primary objective was to guarantee that spectrum be efficiently utilised and to establish a competitive telecommunications market; auction revenue was specified only as a secondary goal, if it was a goal at all. This already raises the question whether revenue should indeed only be a secondary goal; after all an auction might be the least distorting way to tax. In any case, with two mechanisms being used, one wonders about their comparative properties: which one is best suited to reach the stated goals?

The European Commission had expressed reservations about using auctions, as it was thought that auctions could lead to higher consumer prices and delayed innovation, see European Commission (1994). Of course, (sunk) auction cost will not be passed through if the standard assumptions of profit maximisation are made but, in reality, pricing may result from different principles. In this respect, the experimental results reported in Offerman and Potters (1999) are interesting. In their setting, subjects can acquire licenses to play a Bertrand game with differentiated products, with the licences being distributed randomly, or allocated through auction to those subjects that are willing to pay most for them. The authors observe that auction winners charge higher prices than lottery winners do. Furthermore, the higher the auction price, the higher the price charged in the market. While one may be sceptical about sunk cost influencing prices in real life markets, economists have conceded that, if auction prices would go very high, this could lead to an increase in the cost of capital, which in turn could delay innovation, see McMillan (1998). The cost of capital of telecommunication firms has indeed gone up after the auctions. The resulting increase in WACC's may possibly feed through to higher prices in the regulated sector, either because firms that are subject to some form of return regulation, or because or because of a reduction in the efficiency parameter X in an RPI-X scheme is based on it.

[3] France used a hybrid mechanism; it intended to allocate, by means of a beauty contest, four licenses to parties that were willing to pay a license fee of approximately € 85 per capita. As only 2 firms were willing to pay this price, the French government has had to change its plans; in particular it had to lower the price.

The countries that used the auction mechanism did this because of the claimed efficiency properties of auctions. Frequently, however, the official documents remain somewhat vague about what is actually meant with efficiency. Furthermore, the claims in these documents, that auctions produce efficient outcomes, have to be qualified. There are at least two reasons why auctions need not lead to an efficient outcome:

i) asymmetries between the bidders;

ii) value maximization does not guarantee efficiency.

Vickrey (1961) already showed that, if players are in asymmetric positions, the standard first price sealed bid auction need not generate an efficient outcome. The intuition is simple: the player that is in the weaker position needs to bid more aggressively, while the other bidder can relax a bit; as a result, the weaker bidder may win even though the stronger bidder has the higher value. While, given independent private values, the ascending auction guarantees efficiency, Vickrey showed that the first price auction may result in higher revenue. The second reason for inefficiency is of particular importance for license auctions, as Jehiel and Moldovanu (2001) have stressed. In these auctions, only firms are active, and the interests of consumers are not directly taken into account. Consequently, the firms that attach the highest values to the licenses do not necessarily generate the highest consumer surplus, nor the highest total welfare.[4]

Gilbert and Newberry (1981) already linked these two reasons for inefficiency. In a situation where a license to compete on a currently monopolistic market is auctioned, they show that the present monopolist will win as he values this license more than any competitor. The argument is simply that, if he wins the license, the monopoly profit $?_m$ remains intact, whereas an entrant can expect only duopoly profits $?_d$. Since $?_m - ?_d > ?_d$, the monopolist values the license more, while

[4] The consumers' desire for product differentiation may drive a wedge between efficiency and value maximization. A concrete example is radio broadcasting. Popular formats raise more advertising revenue than say classical music, so that, if no formats are pre-specified, an ordinary auction may result in all license winners adopting a "middle of the road" format, hence, little diversity, see Steiner (1952). In the Netherlands, confusion about the goals to be reached, and a limited understanding of what auctions could achieve, led to auctions being criticized as a mechanism for allocating licenses for commercial radio stations; the end result may be that a beauty contest will be used to allocate this valuable spectrum.

maximisation of welfare demands that an entrant wins the additional license. Clearly, if we want the desirable outcome to result, we should not use an ordinary auction, rather we should ban the monopolist from the auction, or handicap him in some other way.

In the UMTS-auctions, both of these aspects are relevant. These are license auctions and, in addition, there are important asymmetries and value differences between bidders, for example, between incumbents and entrants. One such difference arises from the fact that, upon not winning a license, an incumbent might loose not only his new 3G-costumers, but also his existing 2G-business. Another element of asymmetry is the cost of rolling out a network, which may be much lower for an incumbent than for an entrant. For example, Fortis (2000) estimates the capital cost (associated with base stations) to be some 30% higher for new entrants than for incumbents. A back of the envelope calculation may show how large the resulting value differences may be. Assume that, for a certain small country, the ARPU (average revenue per user) is € 40 per month and that firms discount future profit with 1 percent per month. If it takes two years to roll out a network and if from that time the market size is constant, at say 6 million users, then total gross value is € 18 bln. If an incumbent has capital cost of € 1 bln and an expected market share of 1/3, one gets a net value of € 5 bln. A new entrant can expect only a lower market share. If it calculates with a market share of 10% and, consistent with the Fortis-estimates incurs capex of € 1.3 bln., then its value is only € 0.5 bln. The resulting difference is not marginal, it is an order of magnitude.

Of course, the above calculations are only indicative. In practise there will be uncertainty about the new services to consumers, hence about the ARPU's, and this will introduce a common value component, which may actually be rather large. Secondly, firms may differ in their discount rates (WACC's) and this introduces another asymmetry. However, the fact remains that the differences in objective network cost and market shares are rather large, so that the playing field is not level and incumbents have better chances of winning than new entrants.

4. THE LAW AND ECONOMICS OF ASYMMETRIES

In real life situations, asymmetries may be the rule rather than the exception. I briefly describe two other auction settings, both actual examples from the Netherlands where they played a role. The first is the gasoline market. In a special report, a government committee concluded that the Dutch market was characterised by a lack of competition. A set of remedies was proposed, including the auctioning of new licenses. A study, however, revealed the existing of network effects, possibly caused by loyalty schemes. Specifically, it was shown that revenue of a station did not only depend on the location of the station, but also on the market share of the operator, with a larger market share being accompanied with a larger revenue per location. This study suggested that the value of an additional license may be increasing in the number of licenses that one already has and that there is a snowballing effect. If that would be true, an ordinary auction, in which all bidders are treated symmetrically may not do very well in creating a more competitive market (see Onderstal (2001), Krishna (1999)).

A second example is provided by the electricity market. The European Commission tries to create a unified European electricity market, but, at the moment, the market is still rather fragmented and large price differences exist. For example, prices in Germany are much lower than in the Netherlands. The price difference can persist because there is scarcity of transport capacity across the border. In 2000, it was decided to auction this capacity and a bureau was set up to implement the auctions, see www.tso-auction.org for details. Here one might imagine that transport capacity is more valuable for the Dutch incumbents than for the German entrants to the Dutch market. Consequently, if one wants to realize the benefits of competition, one should not organize an ordinary auction. One possibility would be to ban Dutch producers from this auction. Such a drastic decision was not taken: incumbents can acquire part of the capacity and that part is subject to a "use or lose" clause. A simple model may, however, suggest that such a clause is not sufficient to get the benefits of competition, that full exclusion would be better.

Recognizing asymmetries is one thing, what to do to incorporate the fact that the playing field is unlevel is quite another. Klemperer (2000) and others have argued that, in case of asymmetries, it may be desirable to have a first price sealed bid auction rather than an ascending, open second price auction. The intuition underlying this argument is already contained in Vickrey (1961): a second price auction produces an efficient outcome, so that an entrant, who expects to have a lower value, may decide not to participate. In a first price auction, the weaker bidder has a positive probability of winning, hence, a higher expected utility and this may therefore induce him to participate. In other words, a first price auction may attract more bidders, which in turn may lead to a higher price and a more competitive market structure. Abbink et al. (2001) describe experiments that aim at testing this intuition. Their paper is motivated by the problem faced by the UK-authorities, when they thought they could only sell four 3G-licenses in a four player market. The paper compares the Anglo-Dutch design proposed in Klemperer (1998) with the ascending format. It concludes that, given their assumptions on the value distributions, these formats are comparable in their efficiency properties, but that the ascending auction induces more entry. Further work is clearly needed to judge the robustness of this conclusion.

Myerson (1981) suggests an alternative, more direct route: if the playing field is not level because of asymmetries between the bidders, then one may choose to discriminate against the stronger bidders by handicapping them in the auction. One could use an auction mechanism in which players are treated asymmetrically: the rules would differentiate among incumbents and entrants. In the domain of regulation, such asymmetric treatment is not unusual. For example, in the telecommunications sector, firms with "significant market power" have stricter obligations imposed upon them than operators without SMP. Also in auctions asymmetric treatment has been used: in the UK one license was reserved for new entrants, with incumbents not allowed to bid on it. Myerson (1981) suggests, however, that full exclusion is not optimal, that it may be desirable to give bidding credits to weaker bidders. For example, in the UMTS-context described above, if it really costs a newcomer € 300 million more to construct a network, then the government could decide to give the newcomer a compensation equal to this amount in case he would win. In effect this would allow newcomer to bid more aggressively, and this would drive up the price.

Asymmetric treatment of this more sophisticated type was part of the auction rules in some of the US-spectrum auctions: designated firms only had to pay a certain fraction of their bid when being successful winners. Would such forms of preferential treatment be possible in Europe as well? This primarily is a legal question and the answer may depend on how certain European regulations are interpreted. When economists proposed to use an asymmetric auction in the gasoline example mentioned above, lawyers mentioned two possible problems: asymmetric auctions may involve discrimination and they may involve state aid. The argument relating to state aid is the following. Assume, for example, that an incumbent bids 90, and an entrant (with a bidding credit of 25%) bids 100, so that the entrant wins and pays 75. According to certain lawyers, it could now be argued that the government gives an explicit subsidy of 15 to the entrant, which could be classified as state aid. Of course, this argument is not convincing at all, since the only reason that the incumbent bids 90 may be that he is handicapped. As has been empirically verified in Ayres and Cramton (1996), such asymmetric treatment may lead to higher revenues rather than to lower, hence, the state aid argument need not apply. Nevertheless it appears that some lawyers are not that easily convinced by this argument. In any case it seems clear that a discussion on whether those aspects that are desirable from an economics point of view are also feasible from the legal point of view could be very fruitful. This discussion would then also reveal how far one can go in introducing asymmetries: why would full exclusion be allowed, but other forms not?

5. **WHY PLAY ON AN UNLEVEL PLAYING FIELD?**

The Dutch UMTS-auction design has been criticized for the fact that 5 licenses were auctioned in a situation with 5 incumbents, see Klemperer (2001), Jehiel and Moldovanu (2001). These authors argue that, in such a situation, an entrant cannot expect to win a license and both attribute the fact that the Dutch auction only drew few entrants and generated low revenue to this aspect in the design. Even though this criticism is justified in part[5], the point is that, if correct, it implies that there should

[5] The Dutch government did not have revenue as an official goal, hence, the criticism is valid only if an entrant would have contributed to a more competitive market. To judge whether this could be true, one

not have been any entry at all. However, there was one newcomer in this auction: Versatel. Versatel participated even though it knew that it could not win a license. In fact, Versatel made every possible effort to communicate to the incumbents that it knew that it could not win. It started legal action, both at the Dutch and at the EU level against the Dutch 5-to-5 arrangement, in order (in my interpretation) to create a common knowledge that it could not win.

If Versatel did not participate to win, then it must have participated with some other goal in mind. A press release of Versatel shortly before the auction reveals Versatel's motives:

> *"We would however not like to see that we end up with nothing whilst other players get their licenses for free. Versatel invites the incumbent mobile operators to immediately start negotiations for access to their existing 2G networks as well as entry to the 3G market either as a part owner of a license or as a mobile virtual network operator"*

The message is clear: Versatel did not play to win, but rather to get concessions from the other players. Reading the above, one is reminded of a simple example from Brandenburger and Nalebuff (1996). The similarity is remarkable, but perhaps not too surprising given that Nalebuff was one of Versatel's advisors. In that example, a seller, who attaches value 0 to the single indivisible object that he owns, faces two prospective buyers with values v and V with $0 < v < V$. If this seller attracts the weak buyer, he will sell at a higher price (p=v) as when he does not succeed in doing so (p=0). Consequently, the seller is willing to pay the weak buyer to enter, while the strong buyer is willing to pay his competitor to stay out. Clearly, the weak buyer has some bargaining power, and, by playing cleverly, he should be able to derive a profit.

The actual auction context was slightly more complicated than this simple example. Presumably, the government could not be induced to pay, and the fact that there were multiple incumbents, introduced a free rider problem: all of them profit from Versatel staying out, but only one of them has to pay the price of allowing the

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should bear in mind that three of the incumbents have only entered the Dutch market relatively recently: they had bought their 2G-licenses in an auction in 1998, see Van Damme (1999).

entrant on its network. Another difficulty is that starting negotiations with Versatel might be viewed as collusion, hence, might be punished, possibly by exclusion from the auction. This raises the question of who will take up the gauntlet and whether doing so is an act of collusion.

As a matter of fact, BT-subsidiary Telfort took up the gauntlet, and the Dutch competition authority, NMa, has meanwhile concluded that conducting negotiations about access while the auction is taking place does not constitute collusion. While an economist might find that surprising, one can also understand the decision of the NMa. Consider the hypothetical scenario in which an incumbent offers a contract of the type "we offer access under those and these conditions, provided that we acquire a license for less than € X". There is no explicit collusion, nor parallel conduct. However, the entrant might very well decide not to participate in the auction, but instead take up the offer.

We don't know whether Telfort made such an offer to Versatel, however, we do know that the negotiations were not successful. Some two weeks after the start of the auction, when Versatel was the highest bidder on a small lot with a bid of approximately € 25 per capita, Telfort sent a letter to Versatel stating:

> *"Expert opinion indicates to Telfort that you will soon reach a bid level that is not in the interest of your company and its shareholders (...) The ulterior motive for such a bid must be that Versatel is attempting to raise its competitors' cost or to gain access to their 2G or 3G networks. (...) A bid strategy with such a motive constitutes a tort towards Telfort, who will hold Versatel liable for all damages as a result of this (...) To conclude, Telfort intends to treat the matter as strictly confidential in the interest of the proper course of the auction."*

Versatel interpreted this statement as a credible threat preventing it from bidding any further. It communicated this to the auctioneer, and to Telfort, and requested that Telfort, hence, be eliminated from the auction. The auctioneer saw nothing wrong with the letter and allowed the auction to continue. On the last day, bidding continued for seven more rounds, with only Telfort and Versatel knowing that Versatel would

make no more bids. When Telfort finally overbid Versatel, thereby indeed terminating the auction, total revenue was 17 % higher than it had been at the point in time Telfort sent the letter. After the auction, the competition authority saw nothing wrong with Telfort's letter.

There are a couple of general points here. First, the auction is not an isolated event, it takes place in a certain context. Secondly, the anti-trust laws appear too weak to combat behavior that many economists would classify as being clearly anti-competitive. Consequently, if one wants to prevent such behavior, one should do it through the auction rules. For example, the Italian rules prohibited communications relating to strategy and contacts between the players. The press release of Versatel and the contacts between Versatel and Telfort would have been violations of the rules, subject to exclusion, in the Italian context. In other European auctions, even though not as extreme as in the Netherlands, also communication between players took place. Hence, also there was some evidence of anti-competitive behavior. As in the Netherlands, this behavior was not penalized. Finally, the above case shows that the government may find it difficult to commit itself to exclude players from the auction as it thereby hurts its own revenue. Clearly, the roles of the auctioneer and of the seller should be clearly separated.

6. CONCLUSION

The UMTS-auctions have offered a very instructive experience. The stakes in these auctions were high, so that they proved a rough test bed for auction theory. On the other hand, the auction setting was reasonably simple, as there were only few possibilities to structure supply and since each bidder was allowed to acquire at most one license. Nevertheless, even in this relatively simple setting a great many different design issues to be addressed, and many different designs were possible and tried. It has had become clear that details of the actual design matter, hence, that such details deserve attention. One may hope, and can expect, that in the future these details will receive more attention than they have gotten in the past.[6]

[6] It is easy to point to examples where improvement is possible. In the auction mentioned in Section 4, capacities at two interconnectors between Germany and the Netherlands is sold; capacities at these

While the theory gives a lot of insight in the actual auctions, it should also be clear from the material above that our understanding is far from perfect. A case in point is offered by the auctions in Denmark and Hong Kong, that both took place in September 2001. Both were designed by the same experts, involving ELSECO, and on the basis of the most recent insights. Both were essentially single shot sealed bid auctions, with one difference being that in Hong Kong the price was equal to the highest rejected bid, while in Denmark the price was equal to the lowest accepted bid. While both auctions resulted in a similar revenue per capita (around €100), the Hong Kong auction was typically regarded as a flop (of the 6 incumbent 2G operators, only 4 bid for a 3G-license and there were no new entrants, so that the price was the minimum price), while the Danish auction was considered a success. Is the difference due to the one essential difference in the design?

There is a lot of interesting work still to be done.

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