

## QUESTIONS:

Q1) How the recent developments in Economic Theory can help on the design of real world markets, such as Spectrum Auctions, On-Line Auctions, and so forth? Could you explain in simple terms that can be understood by lay readers, what are the main insights, advances and recommendations that we can derive on those topics, and mainly for public auctions?

That's a huge question! Let's break it down into smaller chunks, focusing on one important principle: making it cheap and easy for participants to achieve good results.

- For online bidding, a similar principle applies: eliminate the need to game the system to participate effectively. For example, the advertising slots next to Internet search results are sold using auctions. In old systems, winning bidders had to pay whatever they bid to acquire an advertising slot, so they needed to monitor the bidding constantly to adjust to changes in how others were bidding. But the rules are now different and better informed by economic theory. For most of the last decade, winning bidders pay a price equal to the bid that would be just high enough to win, even if the actual bid was higher. That way, bidders don't have to worry as much about adjusting their bids up or down when competitors change. That makes it cheaper and easier for bidders to bid effectively.
- For spectrum auctions, the situation is more subtle, because bidders can have very different objectives. For an established mobile phone company that can expand its coverage by purchasing spectrum in any of several bands, the modern auctions allow the bidder to compare their options and decide which band to buy when each band is sold separately in simultaneous ascending auctions. But a new entrant into the business may have different needs. A big entrant may want to achieve efficient scale and national scope to create a successful business, and that is hard to do if the entrant needs to acquire each bit of spectrum one piece at a time. So, rules that work best depend both on the context and what the regulator hopes to achieve.

Q2) I understand that you are well known for having devised the simultaneous auction rules that have been used in the US and many other countries for radio spectrum sales, and have generated hundreds of billion dollars in revenue for governments. Could you explain what the main features of those rules are? And what was your role in such design?

This is a system that Professor Robert Wilson and I devised in 1993 and that came into use in the US in 1994. The idea was inspired by thinking about a common type of charity auction called a "silent auction," in which many items are being sold at the same time in ascending auctions, all in the same room, but with no auctioneer or outcry. The auction is "silent": bidders record their bids on a piece of paper that is next to the item being sold (or to a description of the item). There is a fixed ending time, and I noticed that bidders often gamed that system by waiting until just seconds before the auction closing time to write down a bid, hoping to get a low price.

Our design works in a similar way, but with two changes. First, there is no fixed ending time. The auction does not end until there is a period with no new bids. That way, nobody can sneak in a bid and hope to prevent a competitor from responding. Second, I invented a new kind of rule that was incorporated into our design and is now widely used in various auctions. According to the simplest version of my "activity rule," no bidder can increase its activity during the auction. So, for example, in order to be eligible to win 10 items at the end of the auction, a bidder has got to be the standing high bidder or actively placing bids for 10 items in every period during the auction. This rule ensured that bidders could keep track of the amount of demand by other bidders and adjust their plans accordingly, so it contributes to the goal of making it easy for bidders to participate effectively.

Q3) How are the rules of the Simultaneous Ascending Auctions (SAA) different from what we have done in Brazil so far? Are the SAA's rules still the state-of-the-art?

The last auction in Brazil sold licenses for different areas one-at-a-time, in sequence, rather than all together in a simultaneous ascending auction. That makes it harder for a bidder to allocate a fixed budget to buy multiple licenses, since it does not know how much to set aside for the later licenses when it bids on the earlier ones.

What has happened is that there are now more choices of good auctions which have advantages and disadvantages. Good policy requires choosing the design that is right for the particular situation. For example, if there are some bidders who are seeking to become new competitors in a mobile telephone market, they may need to achieve sufficient scale to make buying licenses worthwhile. The SAA makes it hard for bidders like that, because they need to make bids without knowing how many will eventually become winning.

There are new “combinatorial” auctions which make that easier. One key idea is that a bidder who only wants to buy a package of items, for example five spectrum licenses, should be allowed to make a bid that says just that. My academic publications about how best to enable combinatorial bidding introduced the model that has now been adopted by several European countries.

Recently, I have invented a new kind of multi-product sealed-bid auction to compete with the SAA. It accomplishes much the same thing, but much faster and more cheaply because it uses a sealed-bid format. The key is to allow bidders an easy way to express what they are trying to achieve and to bid accordingly. Then, there is no need for many rounds of bidding to determine what the outcome should be.

Q4) How different can the rules be for different auctions? What are some key elements for successful design? Do they depend on the objectives (revenue, efficiency) of the designer? What kind of trade-off do we have to take into account when designing an auction?

Auction rules can differ in very many ways. Items can be sold one-at-a-time, or simultaneously. They can be sold with bids on each individual item, or participants can be allowed to bid for packages, or bidders might bid a maximum price per package and an overall maximum budget. Actually, there are many different kinds of bids that are possible.

The rules can call for a single round of sealed bids, or multiple rounds of an ascending auction. In multi-round auctions, the bidders can be informed about all of the previous bids, or they can be given more limited information. The round-to-round bid increments can be determined in various ways. Prices can be called by the auctioneer, or by the bidders themselves. The ending rules can vary: for example, there may be a fixed ending time, or the auction may end when some condition is met. Starting prices and reserve prices can be determined in a variety of ways.

And there are many more decisions, too. Will there be limits on what bidders can buy? Are only cash bids allowed? Is financing offered to the bidders? What is being sold? Will the government impose build-out requirements? Or require service across the whole nation? The list of questions goes on and on.

A successful design naturally depends on the definition of success. Sometimes, the government wants to encourage the rapid development of the industry, or wide roll-out of services to consumers, or participation by small businesses, and so on. If the government cared only about revenue from a spectrum auction, it might limit the amount of spectrum for sale, creating intense competition among the bidders to be the only winner. Or, it might divide the spectrum into big chunks, to ensure that the bidders could not coordinate to share what is available.

There are certainly differences between designing for revenue and efficiency. To maximize revenue, one wants to encourage lots of bidders and make it easier for weaker bidders to compete effectively, to force the stronger bidders to become more aggressive. And, to promote higher revenues, it is critical to prevent coordination among bidders, even though allowing it may lead to a more efficient spectrum allocation.

There are other kinds of trade-offs, too. We like auctions to be as simple as possible, so that bidders can bid well and the public can be sure there are no shenanigans. But, we need to add features to accomplish objectives, like deterring collusion or advantaging weaker bidders. So, that is another trade-off the designer may face.

Q5) In the last spectrum auction in Brazil, 5 bidders (Vivo (Telefónica de España), TIM (Telecom Italia Mobile), OI (the Brazilian player), Claro (Mexico's America Móvil) and Nextel) bid nationally on some 90Mhz of spectrum. The licenses were auctioned-off sequentially, i.e., in each local market a license auctions took place one after the other. Is this a good design in terms of maximizing the revenues to the auctioneer? How about in terms of increasing the odds that an entrant can successfully win enough licenses to be a viable competitor?

In this context, the first thing a good design needs to do is to encourage a market structure that provides useful services for consumers. The government should decide about how many licenses and how much spectrum to allocate to each with that overriding goal in mind. I don't know enough about the details in this case, but that is the single most important decision in this situation.

Next, let's talk first about entry. One of the key steps in designing a successful auction is getting to know the bidders and their needs. To encourage entry into the wireless communications business, the auction designer can offer an entrant the chance to bid for what it needs all at once, rather than forcing it to bid for one license at a time, hoping to acquire a set that makes a viable business. If the entrant can be successful just by entering in the big cities, then the best sequenced auction has bidding on the big cities first, so that the entrant can figure out whether to bid for licenses covering other areas. So, again, evaluating what the government did depends on a detailed knowledge of the particulars of the Brazilian situation.

Equally important is avoiding collusion, which keeps prices low in many poorly run auctions. Selling items in sequence, as Brazil, is not especially vulnerable to collusion, so that part of the rules passes muster on those grounds.

Q6) In 2011 band H spectrum will be auctioned-off (how much spectrum). The government wants to suppress competition in the auction to guarantee product market competition. Is that a good idea? Or can we still have auction competition and induce product market competition? How can we balance those two desirable aims?

There is some pretty well established economic analysis showing that incumbents have an advantage in auctions, even if they are less efficient than new competitors. The reason is that they can count on higher profits from market concentration. The whole point of entry from the government's perspective is to make the market more competitive, which makes it less profitable for entrants.

There are two main options for the government to use. The first is to set aside some spectrum for the entrant, which is what I understand will be done for band H. The second, which trades off competition in the auction for competition in the retail market, allows entrants a discount when they acquire spectrum. For example, an entrant might only be required to pay 75% of its bids if it wins. That encourages the entrant to bid and still allows active competition in the auction. But one needs to get the discount right for entrants to win some spectrum and auction competition to be sustained.

Q7) The Brazilian government will auction-off the right to explore pre-salt layer blocks worth billions of dollars. Can economic theory be of any help for those designing the rules and for those who will bid for such rights?

Yes, absolutely! The auction analysis needs to begin with an analysis of the industry and the government's goals. Who are the potential bidders? Does the government want a long-term revenue stream or a big initial cash payment? How important will follow-on auctions be and how does the industry structure affect the likely revenues from those?

To get a high price, it is also important to make sure that the weaker bidders are not too disadvantaged in the auction. What do they want to buy? Is it easy for them to bid for that?

I have also been working on some new ideas about how to encourage competition by bidders facing limited budgets. The idea is to allow bidders to express both maximum bids for individual properties and a maximum overall budget, and to take both into account in awarding the mineral rights.

Q8) The Brazilian government will cease rights to Petrobras of pre-salt layer blocks that are adjoining to existing Petrobrás pre-salt blocks. The argument is that Petrobras has "better information on the viability of these blocks". Is that a good idea? Or should they also be auction-off?

This appears to be a classic example of the "winner's curse," and it also describes a situation in which the auctioneer does best by distinguishing between weak and strong bidders. The winner's curse works like this: if one bidder – say Petrobras – is much better informed than others and if the less-informed bidder wins the auction, then the winner is cursed: the rights probably aren't worth much. The reason is that if the rights were worth a lot, Petrobras would likely have bid aggressively to win it.

One simple way to deal with the winner's curse is to exclude the strong, well-informed bidder. The question about whether that is a good idea depends on a close analysis. For example, one needs to evaluate the possibility that Petrobras might distort the outcome anyway, by selling or trading its information with another bidder. Another issue concerns the number of other bidders. And, depending on the facts, there may be other ways to mitigate the winner's curse that are less costly than excluding Petrobras.

Q9) Should the Brazilian government auction-off all pre-salt blocks at once, or should it do it sequentially?

By sequentially, I think you mean sequentially over a period of years. Often, for large finds, that is the best strategy, because exploration and development takes place over years anyhow. But there is far too much money at stake to answer a question like this casually. In large auctions, the economic analysis begins by looking at all the options, seeing who the bidders might be and how that might change over time, taking into account legal and regulatory and political constraints, and figuring out what is best among the choices that are feasible.

Q10) The Brazilian government wants to change oil auctions rules. Up until now, bidders bid on signing bonus, i.e., a fixed amount for the right to explore the block. Now bidders will bid on equity, i.e., on the share they want to retain from future oil proceedings. Is this a good idea? What are the advantages and disadvantages of each approach?

For an auction like this to work well, the devil is in the details. (Do you have that expression in Portuguese?) Many things can go wrong. First, because the payments are not due until the future, there is a risk that the terms might be renegotiated, or that a bidder might default on its payments. So, the auction needs to account for that. Second, the equity needs to be based on something easy to measure, so that the government is not exploited by accounting tricks. Third, if net revenues are the basis of payments, the bidders may have bad incentives to develop marginal properties, for which they incur all the costs but enjoy only a portion of the revenues. Fourth, if the government is responsible for environmental or other regulations, it could come under pressure to be lax about the regulations in order to ensure a flow of revenue. There may be tax accounting issues, too.

But there are also real advantages to collecting a payment in the form of equity if the details are gotten right. The government ensures that it collects something of value if the rights are valuable. If the developer is worried about being held up, it might welcome an alignment of interests in developing the rights, and the government might find this a good way to make such a commitment. Also, if bidders are financially sound and the other issues are well resolved, then economic theory tells us that this sort of auction can be very effective in generating high revenues.

Q11) You have also been an active advisor for bidders in many radio spectrum auctions around the world. How do you advise bidders in such auctions? Can you give us some examples of specific advises you have made, and how they worked?

My single biggest success was advice I offered in the US\$14 billion auction in 2006 for “Advanced Wireless Services.” My client paid about US\$2.4 billion to buy more spectrum than T-Mobile acquired in the same auction for US\$4.2 billion. We did a couple of special things. Most spectacularly, we made a US\$750 jump bid in the middle of the auction to achieve a particular strategic objective while posing a difficult problem for the satellite telephone companies who were competing with us. This bid drove those companies out of the auction. Even more importantly, based on advice that my colleagues and I offered, my client bid to acquire coverage of large areas by assembling a collection of many small licenses, which we correctly forecast would be much cheaper than covering the same area with big licenses. We wound up with much lower prices than the other big bidders, such as Verizon, T-Mobile, AT&T and Cingular (which was then a separate company).

Q12) How do different auction rules and bidders’ characteristics affect the type of advice you give?

It is easiest to answer by example. There were two giant spectrum auctions completed this spring in Germany and India. In this year’s German auction, there were just four bidders for a large amount of spectrum - 290MHz of “paired” spectrum used for mobile phone services and a large amount of additional “unpaired” spectrum for new data services, so there was plenty for all of the bidders to expand their spectrum holdings. The government hoped for intense competition and estimated the prices would add up to about €9 billion, but they got only €4 billion. The best advice for bidders in an auction like that is to find a way to coordinate expectations about who would buy what and to minimize direct price competition for most of the bands.

In India, the situation was very different. There was about 30MHz of spectrum and seven large bidders, so there were bound to be losers and intense competition, and bidders needed to prepare for that.

Q13) Do you also advise governments in auction rules? Is there a “right way” for a government to set the rules of an auction, or does it always depend on what are the objectives of the government?

Perhaps it is best to answer with an analogy. Is there a right way to build a bridge? There are principles and some tried-and-true designs, but the best construction depends on a long list of factors. So, too, with auctions.

The consultant asks about the range of circumstances in which an auction will be used, the goals, the amounts at stake, the risks of collusion and coordination among bidders, and so on, and either selects a simple, standard design, or makes a small change to a standard design, or tailors something well-suited to the special circumstances.

Q14) What is next for both theoretical and real world market design? What are key questions that remain to be studied and for what type of markets?

I gave my Nemmers Prize lecture about this subject at Northwestern University last year. There is still quite a gap between the theories that appear in the academic journals and the challenges in running real auctions. For me, the big challenge is to write more relevant theory to close the gap.

But the real problems are hard and varied, while theorists have the advantage of being able to study idealized situations and focus on elements that are common to many situations.

It is pretty clear, though, that the main issues lie in markets with multiple different inter-related goods for sale, or markets in which the value of the item depends on subsequent decisions, like mineral rights whose value depends on later development decisions. Those are the areas in which I expect to see continuing work.