

ABSTRACT

This work is composed of three essays on choices to allocate the spectrum licenses by auction.

In the first essay, we model the spectrum-license allocation based on the sequential second-price auction. We deviate from Parke (2006) and Menezes and Monteiro (1999) in which our model has small but multiple spectrum licenses to allocate and the bidder has preferences exhibits positive synergies; two licenses are worth more as a bundle than as separate licenses.

We treat the auction model as Bayesian game. Bidders' types differ in their private value of the licenses and this value is a bidder's private information. In this model, each bidder's types is redrawn overtime. By backward induction, we solve for the equilibrium bidding strategy from the auction rule.

We then show that, both synergy structures and independent second drawn are jointly determine our equilibrium bidding strategy. The synergy structure can drives up the bidding strategy in some cases, which increases the auctioneer's revenue. Finally, we prove that it is not always efficient to allocate the spectrum licenses in sequential second-price auction when the positive synergy is presented

In the second essay, we change the auction rule to the simultaneous auction. We deviate from Das Varma (2003) in which our model has large, multiple and endogenously determine number of spectrum licenses to allocate.

Again, we treat the model as Bayesian game. Bidders' types differ in their ability to reduce their costs by using a spectrum license and this ability is a bidder's private information. We deviate from existing literature by assuming that the acquisition of a license of one bidder imposes a negative externality on the other bidders. We derive the value of winning a license and how this value varies with the number of licenses auctioned.

We then show that the standard auctions are revenue-equivalent. The auction revenue, however, changes with the number of licenses and the auctioneer can maximize its revenue by optimally choosing the number of licenses. Finally, we show that in the presence of negative externalities, it is optimal to auction multiple licenses when the level of product differentiation among the bidders is high.

In the third essay, a framework is proposed to analyze the allocation of multiple spectrum licenses when the bidder has multi-unit demand. Bidders differ in their ability to reduce their costs by obtaining a spectrum license. A licensee imposes a negative externality on others. The payoff of each bidder depends on the number and signals of the licensees. The auctioneer maximizes its revenue by optimally choosing the licensees. The optimal mechanism is determined both when each bidder's ability to reduce cost is publicly observable and when it is not.

We also show the role of product market factors in the determination of the optimal number of spectrum licensees.