Auctioning licenses to different quality firms

Abstract

We consider a situation where firms differing in product quality compete for a limited resource like spectrum in an auction setting to compete in a duopoly aftermarket. Aftermarket is characterized by heterogeneous consumers who value different qualities differently. The two winning firms compete in prices given their qualities. This paper analyses the bidding behavior of different quality firms under different degrees of consumer heterogeneity. We argue that under the assumption of full market coverage, the firm with the highest quality and the firm with the lowest quality win the auction.

Keywords: product differentiation, aftermarkets, auctions

Introduction

In many countries, governments use auctions to sell the rights (licenses) of scarce resources to firms. After such an auction is conducted, winning firms compete with each other in an aftermarket. Important examples of such auctions are spectrum auctions that have been held in the past years in many countries. Firms can differ in quality (for e.g. telecom companies can differ in network services aspects like packet loss, bit rate, transmission delay etc.). The qualities of the firms can be exogenous if they have made an investment in technological infrastructure which is a sunk cost.

In our model, we consider different quality firms competing for two licenses. Consumers are heterogeneous who value different qualities differently i.e. they have different taste parameters (Tirole, 1988). The qualities of the firms are exogenous. Gabszewicz and Thisse (1979) and Shaked and Sutton (1982) first analyzed oligopolies where firms decide product quality first and then engage in price competition. Tirole (1988) showed that with the
assumption of firms covering the market, firms maximize product differentiation over the
available range of qualities. Xavier Wauthy (1996) showed that if the degree of heterogeneity
among consumers is high, quality choices will be such that the market is served partially and
the quality differential is independent of consumers’ attributes. Our model considers a case
with such price competition, however, in our case qualities are exogenous and firms
participate in an auction to enter the market. We look at the firms’ bidding behavior in this
situation and analyze the effects of degree of heterogeneity on the bidding behavior.

Model and Results

There are \( n \) firms competing in auctions for the aftermarket. Firms have zero marginal cost.
Two licenses are available. Each firm has a quality which is private information. These
qualities are distributed according to an increasing distribution function \( F \) which is common
knowledge. Consumers are uniformly distributed between a minimum and a maximum taste
parameter. The firms participate in a sealed bid multi-unit auction where winning firms are
the firms with the highest bids, and they pay a license fee which is equal to the highest non-
winning bid.

We use backward induction to solve the game. We assume that the quality of the two winning
firms is revealed after the auction. Given the quality of the winning firms and market
heterogeneity, firms choose optimal prices to maximize profit. Thus, a firm, given its quality,
can determine the expected profit from winning the auction which is back substituted in the
auction stage to get the bids as the function of qualities.

If there is only one license, firms with the higher quality would have bid the most since the
cost of each of the firm is same. However, the situation becomes complicated when there are
two licenses. One of our key results is that, under the assumption of full market coverage,
firms with the maximal quality difference come out as the winners of the auction.
REFERENCES