Auctions with endogenous valuations: the snowball effect revisited

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Summary. This paper looks at the determination of ownership of capacity when there are two ex-ante symmetric agents bidding for many units of capacity which are sold sequentially. It is shown that convexity of payoffs in the final stage of the game is sufficient to ensure monopolization of capacity, but that increasing returns to scale are not sufficient to ensure monopolization.

Keywords and Phrases: Sequential auctions, Endogenous valuations, Evolution of market structure.

JEL Classification Numbers: C72, D43, D44, D45.

1 Introduction

When additional scarce resources become available over time in a duopoly, will these be acquired by one firm so that it snowballs into a dominant firm or not? In a paper entitled “The Snowball Effect,” Ghemawat (1990) argues that with price competition and capacity constraints there will be such a “snowball effect.” However, his argument is based on the value of a single unit of capacity to two different sized firms. He finds that it is more valuable to the larger firm. For this reason he argues that a “snowball effect” would result whereby the larger firm would keep getting larger. However, the analysis of this paper suggests that considering the overall game may not lead to such a conclusion. Simple sufficient conditions which do result in one firm capturing the entire market are provided.

In oligopolistic situations, the value that one firm attaches to an additional unit of capacity depends on the allocation of all other units, as value is

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determined endogenously from the outcome of market interactions. This dependence of value on the allocation itself is what is meant by “endogenous valuations” in Krishna (1993). The model developed here, with only two firms, is a special case of such endogenous valuations. In this case, if one firm does not get the capacity, the other does. Hence, the assumption of endogenous valuation with only two firms is technically equivalent to allowing for nonlinear valuations. Hence, from here on in this paper, the two terms will be used interchangeably. Of course, when capacity is auctioned off sequentially, a firm’s willingness to pay for earlier units depends on how it anticipates future units to be allocated. This point emerges from solving such games backwards in the usual way and is common in the literature.

Endogenous valuations occur naturally when profits of firms are interrelated either through costs or through prices. Price interrelations are to be expected with imperfect competition. For example, prices for airline tickets, and hence for the landing slot, are likely to be higher if one agent owns all the takeoff and landing slots than if many do. Cost interrelations can also lead to endogenous valuations if costs of production depend on the allocation of the scarce resource. For example, the value of fishing rights to a particular fishery can depend on who owns the other rights. If they are owned by one agent there is less of a common property problem so that the value of a permit is likely to be higher than if they are owned by many different agents.

The focus of most of the literature on auction design is on the implications of uncertainty in the valuation of the object or objects auctioned. A standard assumption made in the literature on multiple object auctions is that the marginal valuations of successive units are constant and independent of the allocation of other units. Alternatively, it is assumed that each bidder has a downward sloping demand curve. Neither formulation seems appropriate when valuations for the objects auctioned are determined as a result of market interactions. In such cases, value is derived from a secondary market which is imperfectly competitive, so that these assumptions need not obtain.

The value of a scarce resource used in production is derived from the value of the product it helps produce. The value of this product is in turn determined by the operation of its market. If this market is imperfectly competitive, the value of the scarce resource depends on its allocation across the firms in the final product market, and marginal valuations could rise or fall. Hence, it is impossible to specify an exogenous distribution of valuations: valuations must be endogenously determined by the operation of the secondary market, in this case, that of the final product produced.

If the secondary market is perfectly competitive, then it is quite appropriate to define the valuations of agents exogenously, i.e., independent of the allocation of other units. With perfect competition, the price in the secondary market is taken as given. The valuation of an agent is then the marginal value product of the resource, which may be constant or not. Thus, valuations, even if they are exogenous, need not be constant and independent of the

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1 See Milgrom (1985) for an excellent survey.