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# Tender auctions with existing operators bidding

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ABSTRACT

Consider a government tendering a facility, such as an airport or railway, when one of the bidders is an 'existing operator' who owns another facility that is a substitute or complement to the tendered facility. In 'standard auctions', bidders compete on how much to pay to the government. We find that, all else equal, the existing operator offers to pay more than a 'new bidder' and the operator is therefore more likely to win the auction. In consumer-price auctions, bidders compete on the price they will charge. New bidders offer to set the price at their marginal cost. With complements, the existing operator strategically offers a price that is below its marginal cost; with substitutes, it offers a price that is above its marginal cost. Price auctions are better for welfare than standard auctions: they lead to lower mark-ups and are less affected by having an existing operator in the auction.


## 1. Introduction

Tender auctions are often used to decide who will operate a transport facility such as an airport, railway or road. The tendered facilities are inevitably part of a larger network of transport facilities. In many situations, the decisions made by the operator of an auctioned facility affect other facilities that are part of the broader network. That is, the revenues and profits on these other facilities are influenced by what happens on the facility that is auctioned. The operators of the related facilities will therefore have a special interest in the auction and may decide to participate. The behaviour of such an existing operator may well be different from that of bidders who do not operate related parts of the network.

Examples of this situation abound. Nash (2008) notes that many European countries auction single lines or small networks. When a railway is tendered, operators controlling connecting parts of the network are probable bidders, if only because there tends to be a limited number of potential rail operators. Hensher and Wallis (2005) discuss that in many countries with bus tendering it is common that routes or small networks are tendered. Hence, it will be common that other bus networks will interact with the tendered one. Borenstein (1988) discusses the auctioning of a slot at an airport when some bidding airlines own other slots there, which allows for complementary hubbing of flights or substituting flights (e.g. to the same destination but later on in the day). If an airport is tendered, operators of a geographically close substitute airport or a complementary airport that is a frequent destination will have a natural interest in the outcome, which may induce them to participate in the auction.

These examples show that existing operators should be expected to be present in transport tenders. Moreover, they suggest a connection with market power on parts of the transport network, which makes one expect that the behaviour of such bidders from that of others. Therefore, it is important to see how such a presence affects different auction formats and how this presence changes the resulting market structure and societal welfare.

This paper investigates this. We analyse a situation in which an auctioned facility is a complement of or substitute for an existing facility. We compare the situation in which the operator of the related facility is one of the bidders with when the operator is not. This bidder who operates the existing facility will be referred to as an 'existing operator'. The other bidders are 'new bidders'.

We focus on situations in which there are two bidders. We study two types of auctions: (1) a 'standard auction' where bidders compete on how much they will pay the government for the new

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**Nomenclature**

| | |
|---|---|
| $f[t_k]$ | Density function of the 'signal' $t_k$ for bidder $k$, where its marginal cost decreases in $t_k$. |
| $F[t_k]$ | Cumulative distribution function (CDF) of 'signal' $t_k$: $f[t_k] \equiv \partial F[t_k]/\partial t_k$ |
| $g_j[w]$ | Density function of the *belief* of a bidder on another bidder $j$'s offer $w$ (either payment or consumer-price offer) |
| $G_j[w]$ | Cumulative distribution function (CDF) of the belief on bidder $j$'s offer $w$: $g_j[w] \equiv \partial G_j[w]/\partial w$ |
| $mc_{A,k}[t_k]$ | Marginal cost of facility $A$ for bidder $k$ when its 'signal' is $t_k$. |
| $mc_B$ | Marginal cost of facility $B$ for the existing operator |
| $O_k$ | Objective of bidder $k$ that equals its expected pay-off |
| $p_i$ | The price on facility $i = A,B$ |
| $q_i$ | The number of users of facility $i = A,B$ |
| $p^*_{A,k}[t_k]$ | Consumer-price offer of bidder $k$ for facility $A$ as a function of its 'signal' $t_k$ |
| $T_k[t_k]$ | Transfer offer by bidder $k$ (i.e. the amount $k$ offers to pay the government for the control of facility $A$) as a function of its 'signal' $t_k$ |
| $t_k$ | Signal $t_k$ is private information for bidder $k$. It determines how efficient the firm is and hence its marginal cost decreases in its signal. |
| $\Pi$ | Profit |

facility and (2) a regulatory 'price auction' where bidders compete on the price they will charge to consumers. In both cases, we consider 'second-offer auctions', where the winner has to match the loser's offer. In a standard auction, the winner has to pay the amount the loser offered to pay. In a price auction, the winner has to set a consumer price that is no higher than the loser's offer.

Bidding firms are heterogeneous as they differ in their marginal cost of operating the auctioned facility. A firm's marginal cost per customer on the tendered facility is modelled as a random draw from a known distribution, where the value of realised draw is private information. An important effect of this setup is that the auction is imperfectly competitive.

In the auction literature, settings related to ours have been examined. Gilbert and Newbery (1982) and Chen (2000) investigate R&D battles. They find that a monopolist producing a related product is willing to invest more in creating a new product than an entrant because the monopolist wants to maintain its monopoly. Krishna and Rosenthal (1996) study spectrum-frequency auctions for multiple regions with local and global bidders. Global bidders gain synergies if they win in multiple regions. Therefore, all else being equal, global bidders bid higher than local bidders. Burkart (1995), Singh (1998) and Bulow et al. (1999) study a takeover battle of a firm when one bidder owns part of it. In a second-offer auction, this bidder bids above its valuation of the firm: if it wins the takeover battle, it may overpay, but this is compensated for by the fact that, if it loses, it gains a higher payment for its current shares. Borenstein (1988) studies auctions for slots at airports, where a slot could be used to serve different markets: e.g. either to New York or Miami or Shanghai. He investigates why standard auctions may not ensure efficiency, for instance, because a slot may be used to start serving a market with a high profit gain but a low welfare gain.[2] This related literature focuses on standard auctions under imperfect competition but does not include the issue of substitutes vs. complements. There is one exception. Chen (2000) does consider this issue but uses a perfectly competitive auction.

Our auction formats have been studied before in the transport literature (e.g. Verhoef (2007, 2008), Ubbels and Verhoef (2008) and van den Berg (2013)) but not while considering the presence of an existing operator and only with perfect competition in the auction. Perfect competition seems unrealistic. In reality, costs and demands vary across firms (Gómez-Ibáñez and Meyer, 1993), and there is substantial uncertainty (Flyvbjerg et al., 2003). Moreover, there are often a limited number of bidders. Consequently, bidders have power in the auction.

The contributions of this paper can be summarised as follows. It is first paper to consider the effects of the presence of an existing operator on the outcome of transport tendering and the resulting market structure. It does so while allowing the auction to be imperfectly competitive and the facilities to be imperfect substitutes or complements. Previous studies used perfect competition and perfect complements or substitutes, which is unrealistic. Moreover, these restrictive assumptions greatly affect the results, especially with an existing-operator bidder. The derivations for and results of the standard auction follow the related general auction literature rather closely, but for the price auction, this is not the case.

For the standard auction, we find that, all else being equal, an existing operator has a higher 'value' of winning than a normal bidder because when the operator wins it has a monopoly on two facilities instead of owning one facility in a duopoly. Therefore, the operator offers a premium and is more likely to win the auction than a new bidder is. The operator always wins if the facilities are relatively strong complements/substitutes or the ex-ante range of possible marginal costs is small. This shows the importance of considering the strength of substitution/complementarity and the degree of heterogeneity of the bidders.

In the price auction, the existing operator's offer is affected by two strategic considerations. First, as in the standard auction, it wants to become a monopolist. Second, the existing operator wants to affect the price its competitor may set when losing the auction. Conversely, with a standard auction, there is only the one strategic consideration of wanting to be a monopolist.

There are two reasons for considering the price auction. First, governments often care about consumer welfare, and a price auction makes consumers better off by lowering prices. Conversely, direct regulation of the market may be difficult due to lack of information or the cost of such regulation. Second, the price auction is illustrative for many alternative auction formats, such as on present-value-of-revenue (Engel et al., 1997), on number of users (Verhoef, 2007) and on quality. In all these formats, the existing operator has two strategic considerations. Service quality auctions are, for instance, used in tendering public transport in the Netherlands (Mouwen and Rietveld, 2013). Outside the field of transport, government procurement often scores bids on cost and quality (Asker and Cantillon, 2010).

The remainder of this paper is structured as follows. Section 2 presents the general set-up of the model. Section 3 studies the standard auction and presents a numerical example. Section 4

[2] Other examples are tender auctions when one firm has information on potential customers or a well-known brand name (Klemperer, 1998), dissolutions of partnerships (Cramton et al., 1987) and creditors bidding in bankruptcy auctions (Burkart, 1995). In Laffont and Tirole (1993), an incumbent currently has the procurement contract, but the contract is reauctioned. If investments are non-transferable and sunk, the incumbent is more likely to win the reauction. Finally, a firm that won a previous procurement auction might have developed expertise or might be too busy to start a new project affecting its costs for a new auctioned project (e.g. De Silva et al. (2003))