



Horizontal mergers with synergies: Cash vs. profit-share auctions [☆]



Wei Ding ^a, Cuihong Fan ^b, Elmar G. Wolfstetter ^{c,d,*}

^a Bonn Graduate School of Economics, University of Bonn, Adenauerallee 24-42, 53113 Bonn, Germany

^b Shanghai University of Finance and Economics, School of Economics, Guoding Road 777, 200433 Shanghai, China

^c Institute of Economic Theory I, Humboldt University at Berlin, Spandauer Str. 1, 10178 Berlin, Germany

^d Dept. of Economics, Korea University, Seoul, Republic of Korea

ARTICLE INFO

Article history:

Received 3 August 2011

Received in revised form 24 June 2013

Accepted 25 June 2013

Available online 4 July 2013

MSC:

G34

D44

H23

L13

D43

Keywords:

Horizontal mergers

Takeovers

Auctions

Externalities

Oligopoly

ABSTRACT

We consider takeover bidding in a Cournot oligopoly when firms have private information concerning the synergy effect of merging with a takeover target and bidders can influence rivals' beliefs through their bids. We compare cash and profit-share auctions, first- and second-price, supplemented by entry fees. Since non-merged firms benefit from a merger if synergies are low, bidders are subject to a positive externality with positive probability; nevertheless, pooling does not occur. Unlike cash auctions, profit-share auctions are not revenue equivalent, and the second-price profit-share auction is more profitable than the other auctions.

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1. Introduction

In the present paper we consider horizontal mergers, assuming that a takeover target is auctioned among competing firms and firms have private information concerning their synergy effect of a merger.

Our analysis has several distinct features:

- the takeover target is auctioned to the highest bidder, either in a standard cash auction or a profit-share auction (either first- or second-price)
- bidders are competitors in a downstream Cournot market game and synergies take the form of cost reductions

- bidders have private information concerning the synergy effect of merging their firm with the takeover target
- before firms play the oligopoly game they observe either the merged firm's synergy parameter or the winning bid
- bidders may influence their rivals' beliefs through their bid.

The presence of synergies assures that mergers are potentially profitable for the coalition of merged and merging firms, and the presence of private information makes auctions an appealing mechanism for matching the takeover target with another firm.

Under the predominant corporate law in the U.S., "once a takeover offer has been made, the board of directors is actually obliged to act like an auctioneer, and get the best price for the stockholder of the company, which is one of the reasons why a takeover offer must remain open for at least 20 business days" (Cramton, 1998).¹ And indeed, auctions are not only advised but also widely used in takeovers (see the empirical study by Boone and Mulherin, 2007).

The fact that bidders are competitors in a downstream oligopoly implies that the takeover bidding is a somewhat peculiar auction where bidding is subject to externalities. In particular, because non-merged firms benefit from a merger if synergies are low, bidders are subject to

[☆] We would like to thank the associate editor Yossi Spiegel and two anonymous referees for their comments. Financial support was received from the Deutsche Forschungsgemeinschaft (DFG), SFB Transregio 15, "Governance and Efficiency of Economic Systems," the Humanities and Social Sciences Research Foundation of Ministry of Education of China (Grant 09YJA790133), and the "Innovation Program of Shanghai Municipal Education Commission" (Grant 12ZS076).

* Corresponding author at: Institute of Economic Theory I, Humboldt University at Berlin, Spandauer Str. 1, 10178 Berlin, Germany. Tel.: +49 3020935652; fax: +49 3020935619.

E-mail addresses: wv.ding@gmail.com (W. Ding), cuihongf@mail.shufe.edu.cn (C. Fan), wolfstetter@gmail.com (E.G. Wolfstetter).

¹ As ruled in Revlon vs. MacAndrews & Forbes, 1986.

a positive externality with positive probability. Whereas if synergies are sufficiently high, bidders are subject to a negative externality.

A second peculiar feature of takeover auctions is the fact that they can use a somewhat unusual but highly profitable auction format. Ownership stakes in the merged firm make post-merger profits verifiable to all co-owners. This makes it feasible to make the price to be paid by the winner of the auction conditional on the post-merger profit by adopting a profit-share auction in lieu of a standard cash auction. In a profit-share auction the winner of the auction awards the owners of the takeover target an ownership stake in the merged firm, which entitles them to a share of its profit.

Profit-share auctions are widely used in takeover bidding. An example is the takeover of “GE Insurance Solutions” (a major reinsurer) by “Swiss Re”, which made Swiss Re the world’s largest player in the oligopolistic reinsurance market. Several bidders participated in that takeover contest, including Warren Buffett who was however outbid by Swiss Re. Interestingly, the winning bid offered GE a significant ownership stake which made GE a major shareholder of Swiss Re (see Boyle, 2005).

In the present paper we combine these unique features of takeover auctions: the presence of significant externalities, due to the downstream interaction among bidders, the possible use of profit-share auctions in lieu of standard cash auctions, and the potential to signal strength through the winning bid.

We consider two specifications of our model that differ in the information available to firms after the auction: when the cost-cutting synergy of the winning bidder is public information before the downstream oligopoly game is played and when it is not, but the competitors try to infer it from the observed winning bid. In the latter model, the bidding games give rise to a signaling issue because firms may use their bids to influence rivals’ beliefs concerning their synergy parameter, with the intention to gain a strategic advantage in the oligopoly game.

The paper is related to the ongoing debate on horizontal merger. A starting point of that literature is the “merger paradox” which observes that “small” mergers are not profitable if firms compete in a Cournot market game where goods are substitutes and mergers do not involve synergy benefits (see Salant et al., 1983).

However, small mergers become profitable for the coalition of merged firms if synergies are sufficiently high (see Farrell and Shapiro, 1990) or firms produce differentiated goods in a Bertrand market game (Deneckere and Davidson, 1985).

Mergers can also be profitable if firms are uncertain about their post-merger synergy benefit (Amir et al., 2009; Choné and Linnemer, 2008). Mergers can be profitable even if, in expectation, there are no synergy benefits, provided the variance of the unknown synergy benefit is sufficiently high (see Hamada, 2012).

The use of auctions in horizontal mergers was considered by Jehiel and Moldovanu (2000) for whom takeover bidding in a Cournot oligopoly is a prime example of auctions with positive externalities if synergies are sufficiently low. Auctions with positive externalities are viewed as interesting outliers where pooling occurs if bidders are subject to a reserve price requirement.

Signaling in auctions with downstream interaction has been introduced in the analysis of auctions with resale opportunities by Haile (2003), and in the context of patent licensing by Das Varma (2003), Goeree (2003), and Fan et al. (2013).

Auctions that make the price contingent on the ex post verified valuation were introduced by Hansen (1985), Crémer (1987), and Samuelson (1987), and recently revived and extended by Rhodes-Kropf and Viswanathan (2000), DeMarzo et al. (2005) and others. Apart from takeover bidding, contingent payment auctions are widely used for example in book publishing and in oil-lease auctions.²

While the existing literature on auctions in contingent payments focuses on the standard case of no externalities and the literature

on auctions with externalities does not allow for bids in contingent payments, the present paper explores how the ability to undertake auctions in contingent claims on future payoffs interacts with externalities among bidders in the merger context.

Similar to Jehiel and Moldovanu (2000), we assume that firms have private information concerning their synergy parameter while firms’ pre-merger unit costs are common knowledge. However, unlike Jehiel and Moldovanu (2000), we consider profit-share auctions in addition to standard cash auctions, allow for nonlinear demand, more than three firms, and, in particular, assume that firms observe only an imperfect signal of the merged firm’s synergy parameter before the oligopoly game is played. Moreover, whereas their auction analysis assumes externalities of a constant sign (either positive or negative), our analysis indicates that takeover bidding involves both positive and negative externalities for different realizations of the synergy parameter. Another essential difference is that Jehiel and Moldovanu take the valuation interdependency as endogenously given. However, in order to solve the merger game, especially in the case when the oligopoly game is one of incomplete information, one needs to explicitly incorporate the informational intricacies of the downstream continuation subgames that are reached on and off the equilibrium path of bids.

Similar to the literature on signaling in license auctions with downstream interaction, we obtain existence of a symmetric separating equilibrium in sealed-bid auctions and find that first- and second-price cash auctions are revenue equivalent. However, revenue equivalence does not extend to profit-share auctions.

Similar to DeMarzo et al. (2005) we find that profit-share auctions are more profitable than cash auctions and confirm that first- and second-price profit-share auctions are revenue equivalent if there is no information linkage between markets, as in our benchmark model. However, in our full scale model with incomplete information in the auction as well as in the downstream market, we find that first- and second-price profit-share auctions are no longer revenue equivalent and the second-price profit-share auction is more profitable for the seller than all other considered auctions.

We mention that not all contingent payment mechanisms are more profitable than cash auctions. A case in point is the royalty licensing of an innovation by an outside innovator to an oligopoly. As Kamien and Tauman (1986) and Katz and Shapiro (1986) showed, a cash auction is more profitable than a contingent payment scheme in the form of an output based royalty contract.³ This is due to the fact that royalty licensing gives rise to an output distortion. Such distortions occur neither in cash nor profit-share auctions.

Our analysis is also related to the literature on auctions with resale. Similar to the bulk of that literature⁴ our analysis is based on a closed model where all private information is given at the outset, when the auction takes place.

However, there are important differences. Whereas in our model the downstream oligopoly game occurs independent of the outcome of the auction, in the literature on auctions with resale the downstream resale transaction occurs only if the outcome of the initial auction is inefficient. Inefficiency is notorious in asymmetric first-price auctions and does not occur in our symmetric framework. Moreover, in our analysis bidders have an incentive to signal strength through the winning bid, whereas in auctions with resale the winning bid conveys no useful information and hence signaling is not an issue, unless the auction is a first-price auction and the auctioneer reveals the losing bid(s), in which case

³ However, adding royalty contracts to the losers of the auction further increases the expected profit of the innovator (see Giebe and Wolfstetter, 2008 and Fan et al., 2013).

⁴ See Garratt and Troeger (2006), Hafalir and Krishna (2008), Virág (2013), Lebrun (2012), and Garratt et al. (2009).

² For these and other examples and related literature see the survey by Skrzypacz (2013).

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