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Optimal equity auctions with heterogeneous bidders

Tingjun Liu

Faculty of Business and Economics, The University of Hong Kong, Pokfulam Road, Hong Kong

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Abstract

I analyze the effects of heterogeneity in terms of bidders' valuation distributions and standalone values in equity auctions—auctions in which bidders offer equities rather than cash. Heterogeneity misaligns equity bids' face values, monetary values, and bidder types, making the seller's revenues sensitive to the auction design. Given heterogeneity, I identify the mechanism that maximizes the expected revenue among all incentive-compatible mechanisms of equity auctions. I show how different sources of heterogeneity alter the optimal design, revenues, and allocational efficiency. Unlike optimal cash auctions (Myerson, 1981), where bidders' standalone values are irrelevant, the allocation of optimal equity auctions favors bidders with lower standalone values, because the seller can extract a larger proportion of their rents. By contrast, when bidders differ only in valuation distributions, optimal equity auctions feature more efficient allocations than optimal cash auctions.

JEL classification: D44; D82

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1. Introduction

Equity auctions have the core feature that bidders pay with equity shares (rather than cash) that entitle the seller to a fraction of the value of the combined entity of the bidder and the auctioned asset. Such auctions are widespread: Andrade et al. (2001) report 58% of mergers and

E-mail address: tjliu@hku.hk.

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acquisitions are paid entirely in equity, and 70% involve at least some equity[1]; Skrzypacz (2013) reports oil and gas lease auctions typically feature equity payments in the form of royalties; and venture capital financing, procurement auctions, and lead-plaintiff auctions all use securities with predominantly equity components.

The equity-auction literature has focused on ex-ante identical bidders with the same standalone values, investment costs, and distributions of valuations. In their seminal papers, Hansen (1985) and Riley (1988) obtain an important finding that equity bids can generate higher expected revenues than cash bids; and DeMarzo et al. (2005) (henceforth DKS) study general security-bid auctions and derive an elegant irrelevance result that standard (e.g., first- and second-price) formats of equity auctions yield the same expected revenue when bidders are ex-ante identical.

While the assumption of ex-ante identical bidders simplifies the analysis and provides many insights into the workings of equity auctions, an understanding of the impact of bidder heterogeneity is of practical importance. Bidders in auctions often differ ex ante in their characteristics, such as standalone values or distributions of valuations.[2] For example, in takeover auctions, bidders usually have different market values. In project-rights auctions, bidders could face different opportunity or financing costs. In addition, the findings of Gorbenko and Malenko (2014) suggest that bidders (e.g., strategic versus financial) in takeover auctions draw valuations from different distributions.

I show bidder heterogeneity is important for the design and performance of equity auctions—more so than for those of cash auctions. The key reason is that unlike cash bids, the monetary values of equity bids are not transparent: the values depend not only on the bids' face values (i.e., equity fractions), but also on bidders' observable characteristics (e.g., standalone values) and private types (e.g., valuations). Concretely, in a takeover auction, an acquirer's offer to pay a fraction θ of the merged firm's equity has a monetary value of $\theta\,(V_A + V_T + s)$, where V_A and V_T are the standalone market values of the acquirer and target, respectively, and s is the synergy gain the acquirer can realize in the target, which is typically the acquirer's private information. By contrast, the value of a cash offer does not vary with a bidder's standalone value or synergy value.

Bidder heterogeneity exacerbates this lack of transparency, affecting the performance of equity auctions.[3] If bidders are ex-ante identical, expected revenue is insensitive to the auction design, and standard equity formats always generate higher expected revenues than cash auctions (Hansen, 1985; Riley, 1988; DKS). By contrast, if bidders are heterogeneous, expected revenues for different auction formats can vary widely and are sensitive to the nature of the heterogeneity. Indeed, standard equity-auction formats can even generate lower revenues than cash auctions—highlighting the need for equity-auction design.

I contribute to the literature by investigating the optimal design of equity auctions with heterogeneous bidders. Despite allowing for bidder heterogeneity, I obtain a tractable formulation for the expected revenue in incentive-compatible mechanisms of equity auctions. Among all such mechanisms, I identify the one that maximizes expected revenue. I show how bid-

[1] Cash constraints and institutional rigidities (e.g., existing leverage, bankruptcy risk concerns, and tax considerations) can lead to the use of equities; see Faccio and Masulis (2005) and Eckbo et al. (2015), among others.

[2] Although heterogeneity in standalone values is not relevant for cash auctions, it is for equity auctions.

[3] Heterogeneity affects the evaluation of equity offers. When bidders are ex-ante identical and employ symmetric strategies, bids' face values, monetary values, and bidder types align: higher-type bidders submit bids with higher face and monetary values. This alignment facilitates the winning bid selection. By contrast, when bidders differ ex ante, this alignment breaks down and the bid ranking becomes ambiguous.