

# Research Statement

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My primary research is in the area of **Empirical Industrial Organization**. I am also interested in the theoretical and econometric problems (**Mechanism Design** and **Econometrics**) motivated by IO applications. My current projects focus on developing game-theoretical frameworks to model corporate takeovers and empirically assess such models. In this statement, I discuss my recent works and the research agenda for the next three to five years.

## Current Research

**“Information Disclosure Discounts in Takeover Auctions,”** with Dong-Hyuk Kim [**Job Market Paper**]

In takeover auctions, sellers incur information cost because bidders discount their synergy value as the losing competitors obtain the competitive information via due diligence and may exploit it in the future. This explains the common practice of takeover auctions that the seller limits bidders' entry. We develop an auction model that allows such information disclosure discount (IDD) and establish the identification of the model with the confidential information, which is inherently latent. Handling the latent factors in the Bayesian framework, we analyze a sample of 287 M&A deals of U.S. public companies. The result shows that bidders lower their synergy values by 7.3% for each rival conducting the due diligence and the confidential information explains 77.6% of the variation of synergy values. We also find that both the information cost and the operation cost, recovered via counterfactual analysis, consume a significant portion of the takeover premiums. Finally, we show that the English auction can generate higher revenues for some takeovers.

**“Optimal Shortlisting Rule with Entry Control by An Informed Seller,”** (work in progress)

This study is a theoretical extension of my job market paper of takeover auctions, where indicative bidding and shortlisting is a common practice. I first develop a two-stage auction model with entry control by an informed seller who observes bidders' initial types (signals). Then I study how the seller, who has information valuable to the bidders, maximizes his expected profit by shortlisting potential bidders into the final-stage auction. The shortlisted bidders are asymmetric in

their types (private valuation plus beliefs) because their private beliefs about the other shortlisted bidders rely on their private initial types.

In addition to takeover auctions, this model also describes many real-world auctions with the qualification stage, such as a real estate sale. This study is related to the literature on optimal shortlisting rule in two-stage auctions, e.g., Ye (2007), Quint and Hendricks (2015) and Lu and Ye (2016) and also related to the literature on auctions with informed sellers, e.g., Skreta (2011).

### “Optimal Auction Design with Selective Entry,”<sup>1</sup> (work in progress)

This paper studies the optimal auction design by a revenue-maximizing seller in a two-stage auction model with selective entry. Following Stegeman (1996) and Lu (2009), I consider the feasible semidirect mechanism with a symmetric threshold-entry. In order to implement the optimal entry threshold, we need to consider a generalized *virtual value*, which is non-monotone in general. To handle the non-monotonicity of the *generalized virtual value*, I use the ironing technique described in Myerson (1981) to get a monotone (ironed) virtual value. Then we select the optimal mechanism to maximize the (ironed) virtual value.

### Research Agenda

In the near future, I plan to conduct more structural works to better understand the corporate takeover process by taking into account important features of the takeover contests, such as

- Asymmetric Bidders: Two types of bidders, i.e., strategic and financial bidders, compete in takeover contests. A strategic bidder values a company by its unique synergy with the company, while a financial bidder considers the resale price of the company.<sup>2</sup> I plan to develop a theoretical model to capture the valuation asymmetry and study the optimal bidding strategies and the type-symmetric equilibrium. The model would involve the strategic interaction between private-value (strategic) bidders and common-value (financial) bidders.
- Choice of Sale Methods: The takeover literature documents that about half of the deals are fulfilled by negotiation.<sup>3</sup> Aktas, de Bodt, and Roll (2010) develop a model to justify negotiation as the seller’s optimal sale choice. The successful negotiated price reflects the expectation on the latent competition. Using this framework, I plan to structurally analyze the takeover prices from both negotiations and auctions. The study would involve both the optimal bidding strategy by the bidders and the optimal choice of sale methods by the seller.
- Auctions with Positive Externality: Bidders may purchase stock in a target before a formal bid. A bidder with a toehold position bids more aggressively because of the positive externality induced by the toehold. Bulow, Huang, and Klemperer (1999) derive a unique equilibrium

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<sup>1</sup>Thanks to Professor Jingfeng Lu (National University of Singapore) for suggesting this project.

<sup>2</sup> See the discussion in Gorbenko and Malenko (2014).

<sup>3</sup> See Boone and Mulherin (2007, 2009).

result in a two-bidder common value environment.<sup>4</sup> I plan to extend the model to the  $N$ -bidder case and possibly in an APV paradigm to reflect bidders' unique synergy value with the company. Eventually, I would conduct counterfactual analysis to quantify the “toehold effect” by separating it from the “competition effect”.

### **Longer Term Plan**

When I complete my current and near-future projects, I plan to expand my research into other applications of auction theory/mechanism design in the field of **Corporate Finance**.<sup>5</sup> For example, bookbuilding in the IPO process.

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<sup>4</sup> Also see the works by Betton and Bodt (2000); Betton, Eckbo, and Thorburn (2009).

<sup>5</sup> See Dasgupta and Hansen (2007).

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