Jakub Kastl, Research Statement, July 2013

My research agenda broadly falls within the field of industrial organization (IO). My main research focus is on empirical analyses of auction markets, with particular emphasis on financial markets. My initial work on treasury bill auctions made me realize that many of the methodological contributions to the study of empirical auctions from the 1990s and early 2000s can be applied more broadly to study many interesting questions that are well outside the traditional auction design questions that were the focus of the earlier work. I have since focused my research on how to apply the various existing methodological contributions, or develop new ones when needed, in order to address market design issues in some of the most important contexts of the economy: treasuries, short-term loans, monetary policy, etc. Indeed, some of my recent and ongoing work is focused on the whole financial market and on the development of systemic risk measures, early indicators of financial distress, costs and benefits of primary dealer system, or the elasticity of demand for treasury bills. I have worked with treasury bill and liquidity auctions data from Canada, the Czech Republic, the Euro-zone, and I am currently starting to work with the U.S. Treasury data. This puts me in a unique position to analyze these crucial markets in broader perspective and my research will hopefully directly contribute to smoother monetary policy implementation, more precise risk evaluation and better design of these markets. I will now summarize the main contributions of my work.[1]

Auctions and Financial Markets

In many countries, including the Euro-zone or Canada, the monetary policy, which aims to maintain a certain level of interest rates in the economy, is in practice implemented via auctions in which central banks offer to provide short-term (usually weekly) liquidity loans in exchange for collateral and banks bid for the loans. After a week, these loans get repaid and another auction is run. The central bank steers the interest rates in the economy by setting the rates at overnight lending and depositing facilities so that they define an interval, the midpoint of which is the minimum acceptable bid (or public reserve price) in the weekly auctions. The banks in need of liquidity then have two main options: either bid in the auction and obtain a one-week loan from the central bank or engage in trade with a counterparty (another bank) with excess liquidity and agree on a price and term that is more favorable for both than depositing with or lending from the central bank.

In an auction, we usually think about bidders having a certain willingness-to-pay (WTP) that is transformed to bids using equilibrium bidding strategies. The structure of the financial market described above links together the WTP and the interest rates that a bank would have to pay when obtaining liquidity in the interbank market: they should be equal. Therefore, if we were able to back out the WTP from the observed bids, we would obtain a window allowing us to peak into the opaque over-the-counter interbank market. I (with Cassola and Hortacsu) made use of this argument in "The 2007 Subprime Market Crisis Through the Lens of European Central Bank Auctions for Short-Term Funds" (ECMA, 2013), where we use these auctions to study the heterogeneous impact of the recent financial crisis on over 400 individual banks. We document that bidding became much more aggressive after the onset of the crisis in August 2007. We find, however, that one third of the participants were not directly affected by the crisis, and started bidding aggressively only as a competitive response, but not due to any change in their perceived cost of funding. We quantify the impact of the crisis on the banks' funding costs and show that it is

[1] In my further research, I argue that vertical contractual arrangements can be used by firms strategically not only to limit competition, but also to affect incentives within firms. In "When Should Manufacturers Want Fair Trade?': New Insights from Asymmetric Information when Supply Chains Compete" (JEMS, 2011) (with Martimort and Piccolo) we study an environment of competing hierarchies in the presence of moral hazard and adverse selection. We show that a laissez-faire approach towards vertical price control might not always promote productive efficiency. In "Delegation, Ownership Concentration and R&D Spending: Evidence From Italy" (JIndEc, 2013) we study the effect of vertical contracts on the incentives to innovate. We show that giving more residual control rights to a manager can have positive impact on the incentives to invest in R&D and can thus be beneficial even in the presence of agency cost. I use historical data to evaluate the benefits of Siemens starting one of the first internal pension funds in "Wily Welfare Capitalists: Werner von Siemens and the Pension Fund" (Cliometrica, 2010) (with Moore). Using estimates of Siemens' production function we concluded that it increased productivity and that if it were to avert a relatively short strike every year, then its benefits would have easily exceeded its cost.

positively related to the banks' riskiness as captured by the prices of credit default swap contracts. Our results suggest that bids in liquidity auctions may provide useful information about banks' own financial health, but that looking only at the bids, without accounting for the competitive response, could be sometimes misleading. We use data from banks' balance sheets to show that the changes in the estimated cost of funding that we obtain are correlated with various accounting measures of performance, but bids are not. This can be seen as evidence that before engaging in further analysis, it is necessary to parse the bids through the economic model in order to eliminate the strategic component contained therein.

My current work builds on this project further. In "Liquidity Auctions, Fixed Rate Tenders & Bailouts in the EURO Zone" I (with Cassola and Hortacsu) analyze the European financial market during 2008, the period in which the collapse of Lehman Brothers forced the central bank to abandon running an auction and start a full allotment procedure instead. We show that the bad (i.e., increasing) dynamics in our measure of cost of funding is correlated with actual bailouts. Many economists attribute the recent crisis to inter-connectedness of banks, which made it hard for banks to reliably asses the risks involved in extending loans to other counterparties. To address this issue, I (with Bonaldi and Hortacsu) estimate the financial network among the European banks in "Empirical Analysis of Systemic Risk in the EURO Zone." By exploiting the dynamics in the estimated funding costs and applying the LASSO estimation technique to the panel of estimated funding costs, we estimate links between banks and their strength. Based on these estimates we propose a new measure of the systemic-ness and vulnerability of each bank. The main idea is to quantify the externality that one bank would impose on the other banks' funding costs, if it suffered a negative shock. We argue that our measure based on information that is not publicly observable (the bids) may be preferred to other measures proposed in the literature that are based on publicly observable data.

Finally, in "Crisis Management: Analyzing Default Risk and Liquidity Demand during Financial Stress," I (with Allen and Hortacsu) look at the Canadian financial markets during the crisis. In addition to the liquidity auctions, we obtained access to detailed data including the overnight transactions between banks. We are thus able to paint a detailed picture of how the crisis played out in the Canadian financial market and what were the impacts of the various policy interventions by the Bank of Canada.

Auctions and Market Structure

Primary dealers are essential part of most financial markets. One of the benefits of being a primary dealer is the access to information contained in orders placed by their customers (other banks, pension funds, etc.) prior to the actual execution of the order. This issue, sometimes dubbed "frontrunning," is quite important in many financial markets. In "Valuing Dealers' Informational Advantage: A Study of Canadian Treasury Auctions" (ECMA, 2012) (with Hortacsu) we quantify the value of observing customers' orders. To achieve this goal, we use the dynamics of bidding within an auction in Canadian treasury bill auctions. In particular, we often observe a dealer submitting her own bid, which is later followed by a bid submitted on behalf of a customer, and which is again followed by an updated bid of the dealer herself. This allows us to test for whether the primary dealers learn only about competition or whether they use the customers' bids as if it also conveyed information about the value of the auctioned security. We fail to reject the null hypothesis of dealers learning only about competition (i.e., in the language of auction theory, of private values). We then estimate that the primary dealers derive about one third of their expected profits from observing customers' order flow by comparing the expected profits accruing to a primary dealer given her initial bid (before the arrival of the customer's bid) to the updated bid, which takes into account the information about competition.

Methodology of Estimating Models of Multiunit Auctions

Using bids to recover bidders' actual values by using equilibrium mapping from game theory and sophisticated econometrics has become state of art. Yet, many interesting settings such as electricity or treasury bill markets cannot be modeled as the well-understood single-unit auctions. Multi-unit auctions are much harder to model both theoretically and empirically. An impediment to the early empirical work was

that observed data have bidders submitting step functions as their bids, whereas the usual theoretical model assumes, for tractability, differentiable bid schedules. This made it difficult to easily generalize the econometrics of single-unit auctions to multi-unit settings. In "Discrete Bids and Empirical Inference in Divisible Good Auctions" (REStud, 2011), originally my 2006 job market paper, I show that this seemingly innocuous feature of actual auction mechanisms can have important consequences for the identification of bidders' values and the results of counterfactual exercises of interest, and I propose a model that takes it explicitly into account. I show that bidders may submit bids that exceed their marginal values in a uniform price auction; this is impossible in the standard (differentiable) model. I develop a method for evaluating the performance of the auction mechanism based on data on bidding. Using data on Czech treasury bill auctions, I demonstrate that uniform price auction performed well in that context and that ignoring the discreteness of bidding could have significant consequences. In a related theoretical work "On the Properties of Equilibria in Private Value Divisible Good Auctions with Constrained Bidding" (JMathEc, 2012) I study the properties of equilibrium bidding in divisible good auctions when bidders are required to submit step functions. I extend existing results from price discrimination to demonstrate that few steps may be enough to get bidders very close to their optimal expected profits in these auctions, which rationalizes the empirical regularity of bidders submitting few steps. I further provide characterization and existence results for auctions with restricted strategy sets, which serve as building blocks for empirical work.

Research with US Treasury

Recently, my paper on the primary dealer system in Canada spurred interest from the U.S. Department of Treasury. I and my coauthor Ali Hortacsu have been approached and recently approved to start collaboration with the Treasury's research department. This will allow us to use bidder level data from auctions of various debt instruments of the U.S. government. Apart from analyzing the costs and benefits of the U.S. primary dealer system, in another project we will analyze complementarity/substitutability between debt instruments of various maturities. For example, to what extent does a larger issuance of 30-year bonds crowd out (or increase) demand for shorter-term papers? Another important question we hope to address involves estimating the elasticity of demand for treasury bills. With the tools that we have developed earlier, we can recover the demand curve from the bids and hence we plan to analyze what interesting variables, such as growth of the debt, unemployment rate or GDP growth might be correlated with the demand elasticity. This should help the policymakers when deciding on how to allocate issuances across the various maturities.

Teaching and Advising

Since arriving at Stanford, I have taught an upper-division undergraduate class on Imperfect Competition (Econ 157), and graduate Industrial Organization (Econ 257 and Econ 258). In 157 I introduce the advanced undergraduate students to the issues of market power, collusion, price discrimination and price discovery. My plan for the near future is to develop a full undergraduate class on financial crises and financial markets. In Econ 257 I introduce the students to the tools and methods of modern IO. As I am myself focusing more and more on the microstructure of the financial markets and on applying methods from IO there, my part of Econ 258 is more and more centered around these topics as well, even though I also introduce the students to the broader empirical literature on auctions. My goal is to convey to the students that the tools from well-developed auction literature have many interesting applications that go well beyond the narrower set of auction design questions that were popular in the past, and can therefore lead to promising dissertations.

In addition to the standard advising to undergraduates who major in economics, much of my advising activities are at the graduate level. In IO, much of our current advising is "team advising," and all members of the group are involved in advising virtually all students. Formally, I have served as a committee member for 3 graduate students (Andrea Pozzi '09, Saar Golde '10, Charlene Zhou '11) and as the advisor for 1 undergraduate honors thesis (Edward Marks '09).