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October 2018

Academic position

Assistant professor, University of Chicago Booth School of Business, February 2016

Research faculty, University of Chicago Booth School of Business (London), Fall 2015

Education

PhD Business Administration, Stanford GSB, Fall 2010 - Summer 2015
Dissertation: Commitment, Vertical Restraints, and Dynamic Pricing of Durable Goods.

UC Berkeley, 2009
Visiting scholar

Norwegian School of Economics and Business Administration, Autumn 2008

University of Oslo, Autumn 2004
Courses in Economics

London School of Economics, Autumn 2003 - Spring 2004
MSc Economics.

University of Oslo, Autumn 1998 - Spring 2003
Cand. Mag, Interdisciplinary degree from Department of Economics, Department of History and Philosophy and Department of Mathematics.

Publications

Homogenous Contracts for Heterogenous Agents: Aligning Salesforce Composition and compensation

joint with Sanjog Misra and Harikesh Nair, in *Journal of Marketing Research*

Observed contracts in the real-world are often very simple, partly reflecting the constraints faced by contracting firms in making the contracts more complex. We focus on one such rigidity, the constraints faced by firms in fine-tuning contracts to the full distribution of heterogeneity of its employees. We explore the implication of these restrictions for the provision of incentives within the firm. Our application is to salesforce compensation, in which a firm maintains a salesforce to market its products. Consistent with ubiquitous real-world business practice, we assume the firm is restricted to fully or partially set uniform commissions across its agent pool. We show this implies an interaction between the composition of agent types in the contract and the compensation policy used to motivate them, leading to a "contractual externality" in the firm and generating gains to sorting. This paper explains how this contractual externality arises, discusses a practical approach to endogenize agents and incentives at a firm in its presence, and presents an empirical application to salesforce compensation contracts at a US Fortune 500 company that explores these considerations and assesses the gains from a salesforce architecture that sorts agents into divisions to balance

firm-wide incentives. Empirically, we find the restriction to homogenous plans significantly reduces the payoffs of the firm relative to a fully heterogeneous plan when it is unable to optimize the composition of its agents. However, the firm's payoffs come very close to that of the fully heterogeneous plan when it can optimize both composition and compensation. Thus, in our empirical setting, the ability to choose agents mitigates the loss in incentives from the restriction to uniform contracts. We conjecture this may hold more broadly.

Comment on "Identification and Semiparametric Estimation of a Finite Horizon Dynamic Discrete Choice Model with a Terminating Action"

joint with Denis Nekipelov and Minjung Park, *Quantitative Marketing and Economics*

Bajari et al (2017) showed that in a finite horizon optimal stopping model, a class of DDC models that includes marketing relevant applications such as adoption of durable goods, the discount factor is point identified under an assumption of stationary utilities, an easily interpretable assumption that can be economically motivated in many settings. In this note, we show that the Bajari et al's approach gives identification for a much larger class of problems. We first reformulate the identification result Bajari et al in terms of exclusion restrictions on time as a state variable. We then extend the identification result to both finite horizon and infinite horizon optimal stopping models under more general exclusion restrictions, as in Abbring and Daljord (2018). Finally, we show how a similar approach gives identification of general discount functions in a finite horizon optimal stopping problem. For all of the models we consider, the discount functions are shown to be closed form solutions to well-behaved moment conditions that are functions of identified features of the data distribution. The results directly suggest estimators that are robust to biases from finite sample approximations to the unknown utility function and can be implemented as simple linear regressions using pooled choice data.

Identification of the Discount Factor in Dynamic Discrete Choice Models

joint with Jaap Abbring, forthcoming in *Quantitative Economics*

Empirical applications of dynamic discrete choice models usually either take the discount factor to be known or rely on ad hoc functional form assumptions to identify and estimate it. We give identification results under economically motivated exclusion restrictions on primitive utilities. We show that each such exclusion restriction leads to an easily interpretable moment condition with the discount factor as the only unknown parameter. The identified set of discount factors that solves this condition is finite, but not necessarily a singleton. Consequently, in contrast to common intuition, an exclusion restriction does not provide point identification. In applications, multiple exclusion restrictions are often available. The discount factor can be set estimated from the corresponding moment conditions using existing methods without solving the choice model. Finally, we show that exclusion restrictions have nontrivial empirical content: The implied moment conditions impose restrictions on choices that are absent from the unconstrained model.

A Comment on "Estimating Dynamic Discrete Choice Models with Hyperbolic Discounting" by Hanming Fang and Yang Wang

Joint with Jaap Abbring, forthcoming *International Economic Review*

The recent literature often cites Fang and Wang (2015) for analyzing the identification of time preferences in dynamic discrete choice under exclusion restrictions (e.g. Yao et al., 2012; Lee, 2013; Ching et al., 2013; Norets and Tang, 2014; Dubé et al., 2014; Gordon and Sun, 2015; Bajari et al., 2016; Chan, 2017; Gayle et al., 2018). Fang and Wang's Proposition 2 claims generic identification of a dynamic discrete choice model with hyperbolic discounting. This claim uses a definition of "generic" that does not preclude the possibility that a generically identified model is nowhere identified. To illustrate this point, we provide two simple examples of models that are generically identified in Fang and Wang's sense, but that are, respectively, everywhere and nowhere identified. We conclude that Proposition 2 is void: It has no implications for identification of the dynamic discrete choice model. We show that its proof is incorrect and incomplete and suggest alternative approaches to identification.

Working papers

Commitment, Vertical Restraints and Dynamic Pricing of Durable Goods

R&R *Management Science*

The Norwegian book industry has historically been regulated by a fixed price agreement which lets the publisher fix the retail price for a limited time period. The agreement is enforced by the association of publishers and the association of booksellers and commits the retailers to not discount a title early in its lifecycle. A new competition act in 2005 forced a weakening of the agreement: the restraint period was shortened and the price restraint itself was softened. Two changes in the lifecycle sales followed: retailers started discounting titles earlier, and demand shifted towards the earlier discounts. In a market with forward-looking consumers, commitment to limited future discounts can be profitable by discouraging intertemporal substitution. I quantify the commitment value of the agreement relative to standard vertical restraints with and without commitment. The commitment value is evaluated using a dynamic market equilibrium model with forward-looking demand side and a forward-looking supply side at parameters estimated from the data. The profitability of a fixed price agreement with commitment is estimated to be less than the profitability from alternative vertical restraints without commitment.

The Status Quo Theory of Depletion Does not Explain Observed State Dependence: an Analysis of the Israeli Parole Decisions

joint with Oleg Urminsky and Jose-Manuel Ureta. R&R Journal of Marketing Research

Fatigue and depletion are phenomenons that have received wide interest in consumer behaviour research. In a field study that is much cited in this literature, Danziger et al. (2011a) conjectured that the strongly cyclical parole decisions of an Israeli court could be explained by a status quo theory of depletion. As judges tire over the course of the day, it conjectures that the judges would be more inclined to reach the decision of least resistance, which is to maintain the status quo by denying paroles. Danziger et al. (2011a) did not test its conjecture. We show that the empirical results in Danziger et al. (2011a) strongly refutes the status quo theory. The evidence is more mixed when we allow for judge specific depletion processes. We however find little support for the status quo theory of depletion overall. The parole frequencies may be consistent with a more general theory of depletion or fatigue that allows for a broader range of behaviour.

Identifying Present-Biased Discount Functions in Dynamic Discrete Choice Models

joint with Jaap Abbring and Fedor Iskhakov.

We derive conditions for identification of sophisticated, quasi-hyperbolic time preferences in a finite horizon, dynamic discrete choice model under a set of economically motivated exclusion restrictions. Identification is reduced to characterizing of the zero set of two bivariate polynomial moment conditions. The number of discount function parameters in the identified set is bounded by known features of the data distribution. We show that though the discount function parameters are formally identified, it is hard to precisely estimate these parameters compared to the geometric discount factor.

The Black Market for Beijing License Plates

joint with Mandy Hu, Guillaume Pouliot, and Junji Xiao. Under review

Black markets can reduce the effects of distortionary regulations by reallocating scarce resources towards those who value them the most. The illegal nature of black markets however creates transaction costs that reduce the gains from trade. We take a partial identification approach to infer gains from trade and transaction costs in the black market for Beijing car license plates which emerged following their recent rationing. We use optimal transport methods to non-parametrically estimate a lower bound on the volume of unobserved black market trade under weak assumptions using comprehensive car sales data. We find that at least 11% of the quota of license plates is illegally traded. We next infer gains from trade and transaction costs and tighten the bounds on the volume of trade under

further assumptions on black market transactions. The inferred size of the transaction costs suggests severe market frictions: between 61% and 82% of the realized gains from trade are lost to transaction costs, while between 7% and 28% of the potential gains from trade are realized in the black market.

Other publications

Daljord, Ø., Sørgard, L. and Thomassen, Ø. (2014): "Asymmetric Price Increase in Critical Loss Analysis: A Reply to Langenfeld and Li", (forthcoming) *Journal of Competition Law and Economics*

Daljord, Ø. (2009): "An Exact SSNIP Test for Asymmetric Products", *Journal of Competition Law and Economics*, Vol. 5

Daljord, Ø., Sørgard, L. and Thomassen, Ø. (2007): "The SSNIP test and Market Definition with the aggregate Diversion ratio: A Reply to Katz and Shapiro", *Journal of Competition Law and Economics*, Vol. 4

Invited talks

2019 University of Zurich, Choice Symposium

2018 UC Berkeley, 2nd Conference on Dynamic Structural Models

2017 University of Hong Kong, Australian National University, Chinese University of Hong Kong, Tsinghua University, Georgetown University, BRIQ Workshop on Structural Analysis of Inequality

2016 University of Toronto, University of Copenhagen

2015 Tilburg University

2014 LBS, UCSD, Wharton, Yale SOM, University of Rochester, Columbia, Duke University, University of Chicago, Carnegie Mellon, Northwestern, UCLA, MIT

Refereeing

Marketing Science, Management Science, Journal of Marketing Research, Quantitative Marketing and Economics,, Journal of Econometrics, Econometrics Journal, Journal of Political Economy, American Economic Review, Production and Operations Management