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2017 (Written): Microeconomics, Macroeconomics

Dissertation Title: *Essays on Demand Estimation*

Committee:
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Professor Yuichi Kitamura

Degrees:
Ph.D., Economics, Yale University, 2024 (expected)
M.Phil., Economics, Yale University, 2019
M.A., Economics, Yale University, 2018
M.A., Economics, Seoul National University, 2016
B.A., Economics, Seoul National University, 2013

Fellowships, Honors, and Awards:
Samsung Scholarship, Samsung, 2016−2021
Alumni Association Award and Medal, Seoul National University, 2013
Social Science Korea Fellowship, National Research of Korea, 2012−2014

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Econometrics II (Doctoral), Prof. Edward Vytlacil, 2023
Microeconomics (Master's), Prof. Michael Boozer, 2022
Firms, Markets, and Competition (Undergraduate), Prof. Philip Haile, 2018

Seoul National University, Teaching Assistant:

Econometrics (Undergraduate), Prof. Yoon-Jae Whang, 2015, 2014, 2013
Introductory Statistics for Economists (Undergraduate), Prof. Yoon-Jae Whang, 2014

Research and Work Experience:

Yale University, Research Assistant:

Prof. Steven Berry and Prof. Philip Haile, 2019−2021
Prof. Jason Abaluck and Prof. Giovanni Compiani, 2019
Prof. José-Antonio Espín-Sánchez, 2018
Prof. Donald Andrews, 2017

Seoul National University, Research Fellow:

The Social Science Korea Project for Globalization and Inequality in the Korean Economy, 2012−2014

Working Papers:

"Computationally feasible identification-robust inference on discrete choice demand", *Job Market Paper*

"Distributional impacts of centralized school choice" with Suk Joon Son

Work in Progress:

"Correct standard errors in demand estimation when using Hausman instruments"

Publications:

"Long-term changes in old-age incomes: Results from cohort analyses" (2015) with Chulhee Lee, *Journal of Korean Economic Studies, 33(3)*, 5−34, in Korean

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Dissertation Abstract

Computationally feasible identification-robust inference on discrete choice demand
[Job Market Paper]

Endogeneity is an important issue in estimating the demand function, often addressed by using instrument variables. However, there have been growing concerns that the instrument variables may be weak. Although the econometrics literature has developed inference methods that are robust in the presence of weak instruments, they are computationally intensive, thereby hindering their application to empirical work. This paper, in the context of demand estimation, provides a technique to reduce computational cost when applying such a method.

Specifically, I apply the two-step identification-robust procedure proposed by Andrews (2018) to the discrete choice demand model by Berry, Levinsohn, and Pakes (1995; BLP). The first step provides an informal test of weak identification, and then the second step provides a confidence set that has correct coverage probability even under weak identification. However, the method introduces computational complexity because the method requires extensive grid searches over a potentially large parameter space. The number of grid points increases as a researcher wants finer grids, and grows exponentially as the number of parameters increases. Another issue is that the researcher does not know ex ante where to form a grid.

I show that under two assumptions (namely just-identification and homoscedasticity), the time complexity of the procedure is reduced from the total number of parameters to the number of a subset of parameters, often referred to as "nonlinear" parameters in the literature. The dimension reduction is accomplished by obtaining analytic representations of confidence sets involved in the procedure, and by using S-lemma to provide a fast way to check a set inclusion that the procedure requires.

Through Monte Carlo simulations, I show that the two-step confidence set, equipped with my dimension reduction technique, achieves the correct coverage probability. In contrast, the standard confidence set exhibits under-coverage under weak identification. It is also shown that the resulting confidence set still performs well when the true structural errors are heteroscedastic, although the technique is developed under the assumption of homoscedasticity. In this light, I propose using the dimension reduction technique to make feasible inferences on discrete choice models, or as a preliminary procedure to guide the formation of a grid in a large parameter space.

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Distributional impacts of centralized school choice
(with Suk Joon Son)

Informational frictions in centralized school choice can significantly influence its distributional consequences. Recognition of such frictions is also necessary to accurately measure welfare. We build a model of school applications, allowing applicants to consider only a limited set of schools and to have mistaken beliefs about their admission chances. Quasi-experimental variation and rich information in students' rank-ordered lists enable identification. Utilizing this model, we evaluate the impacts of centralized school choice in New York City on racial segregation and equity in welfare, further decomposing the contributions of various factors to these outcomes. We also quantify matching stability and deviations from truthful reporting. Our results show that while school choice improves welfare across races, these gains are substantially compromised by limited consideration. A counterfactual policy involving personalized school recommendations designed using our model is projected to recover 20–36% of the welfare losses.

Correct standard errors in demand estimation when using Hausman instruments
(Work in Progress)

Existing asymptotic results for the BLP estimator are based on the independence of the GMM moment function across markets. However, I find that a class of instruments, commonly referred to as Hausman instruments, violates this assumption by introducing correlation across markets, resulting in inaccuracies in the conventionally calculated standard errors. I confirm the phenomenon through Monte Carlo simulations. Then I apply techniques from spatial econometrics and time series econometrics to address the across-market correlation, discussing methods to correctly calculate the standard errors for different subclasses of Hausman instruments.