MIT Economics

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DOCTORAL STUDIES

Massachusetts Institute of Technology (MIT)
PhD, Economics, Expected completion June 2026
DISSERTATION: "Essays in Econometrics"

DISSERTATION COMMITTEE AND REFERENCES

Professor Alberto Abadie
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Professor Victor Chernozhukov
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PRIOR EDUCATION

University of Tokyo, Japan — 2021
M.A. in Economics

University of Tokyo, Japan — 2020
B.A. in Economics

CITIZENSHIP Japan **GENDER:** Male

LANGUAGES English (fluent), Japanese (native)

FIELDS Primary Fields: Econometrics, Statistics

Secondary Fields: Economic Theory

TEACHING EXPERIENCE	14.382 Econometrics, MIT TA to Professor Isaiah Andrews and Anna Mikusheva	2024
	14.384 Time Series Analysis, MIT TA to Professor Anna Mikusheva	2023
RELEVANT POSITIONS	RA to Professor Alberto Abadie and Whitney Newey	2022-2024
	Research Fellow-DC1, JSPS	2021
	Goldman Sachs, Global Investment Research Internship	2020-2021
	Nowcast, Data Scientist Internship	2017-2020
FELLOWSHIPS, HONORS, AND AWARDS	Jerry A. Hausman Graduate Dissertation Fellow	2024-2025
	Jerry A. Hausman Fellow	2021-2023
	Funai Overseas Scholarship	2021-2023
	Shin-Nihon Scholarship	2020
	Grand Prize of President's Award, University of Tokyo	2020
	Distinguished Undergraduate Thesis Award, University of Tokyo	2020
PRESENTATIONS	Econometric Society World Congress, Seoul	2025
	Summer Workshop on Economic Theory, Hokkaido	2025
	Econometric Society North America Summer Meeting, Vanderbilt	2024
	Asian School in Economic Theory, Econometric Society, Keio	2023
	Decision: Theory, Experiments, and Applications, HEC	2023
	Risk, Uncertainty, and Decision, Kyoto	2023
	Japanese Joint Statistics Meeting, online	2020

PUBLICATIONS

"Well-Posedness of Second-Order Uniformly Elliptic PDEs with Neumann Conditions" *Applied Mathematics Letters*, Vol. 171, 109670, 2025. Journal. arXiv.

Extending the results of Nardi (2015), this note establishes an existence and uniqueness result for second-order uniformly elliptic PDEs in divergence form with Neumann boundary conditions. A Schauder estimate is also derived.

"Semiparametric Efficiency Gains from Parametric Restrictions on Propensity Scores" *Biometrika*, Vol. 112, Issue 1, 2025. Journal. arXiv.

We explore how much knowing a parametric restriction on propensity scores improves semiparametric efficiency bounds in the potential outcome framework. For stratified propensity scores, considered as a parametric model, we derive explicit formulas for the efficiency gain from knowing how the covariate space is split. Based on these, we find that the efficiency gain decreases as the partition of the stratification becomes finer. For general parametric models, where it is hard to obtain explicit representations of efficiency bounds, we propose a novel framework that enables us to see whether knowing a parametric model is valuable in terms of efficiency even when it is high dimensional. In addition to the intuitive fact that knowing the parametric model does not help much if it is sufficiently flexible, we discover that the efficiency gain can be nearly zero even

though the parametric assumption significantly restricts the space of possible propensity scores.

"Consistent Bayesian Information Criterion Based on a Mixture Prior for Possibly High-Dimensional Multivariate Linear Regression Models" (with Tatsuya Kubokawa) *Scandinavian Journal of Statistics*, Vol. 50, No. 3, 1022–1047, 2023. Journal. arXiv.

In the problem of selecting variables in a multivariate linear regression model, we derive new Bayesian information criteria based on a prior mixing a smooth distribution and a delta distribution. Each of them can be interpreted as a fusion of the Akaike information criterion (AIC) and the Bayesian information criterion (BIC). Inheriting their asymptotic properties, our information criteria are consistent in variable selection in both the large-sample and the high-dimensional asymptotic frameworks. In numerical simulations, variable selection methods based on our information criteria choose the true set of variables with high probability in most cases.

"Corrigendum to Crawford and Sobel (1982) "Strategic Information Transmission" (with Michihiro Kandori) *Econometrica*, Vol. 89, No. 4, 1-10, 2021. Journal.

In their analysis of strategic information transmission, Vincent Crawford and Joel Sobel (1982) showed the existence of partition equilibria (Theorem 1). Although the theorem itself is correct, the proof contains some incorrect statements. We present a counter-example and provide a correct version of the proof.

RESEARCH PAPERS

"Non-Crossing Quantile Regression with Shape Constraints" (Job Market Paper) Link.

Quantile regression is a widely used tool for studying heterogeneous effects of covariates across the outcome distribution. However, standard estimators such as Koenker and Bassett's (1978) often violate fundamental shape restrictions implied by probability or economic theory. Examples include the non-crossing property of conditional quantile functions, the monotonicity of output with respect to inputs, and the monotonicity of equilibrium bidding strategies in structural auction models. Such violations produce estimates that are theoretically inconsistent and risk undermining downstream economic analysis.

This paper develops a framework for shape-constrained quantile regression based on a variational characterization of quantile regression coefficients from optimal transport theory. We formulate an infinite-dimensional linear program whose unique solution defines the coefficients as a function of the quantile index.

This functional perspective allows restrictions to be imposed across the entire continuum of quantiles, including global non-crossing, derivative-based inequalities, and covariate monotonicity conditions. A computationally feasible estimator is obtained through finite-dimensional approximation, and its asymptotic properties are established.

Monte Carlo simulations demonstrate that the proposed estimator improves upon

both classical and existing non-crossing approaches. In an application to U.S. timber auctions, it delivers smooth, theory-consistent estimates of bid distributions, valuation distributions, and bidding strategies—contrasting with conventional methods that frequently violate basic economic restrictions.

"Random Utility with Unobservable Alternatives" (with Kota Saito and Alec Sandroni) Conditionally accepted at *American Economic Review*. arXiv.

The random utility model, a cornerstone in economics, is axiomatized by Falmagne (1978) with the assumption that all choice frequencies from every subset are observable. However, in practice, it is common for some choice frequencies to remain unobserved. To address this discrepancy, we obtain the testable implications of the random utility model given an incomplete dataset, which consist of nonredundant inequality constraints on observed choice frequencies. Our findings indicate that the widespread empirical practice of aggregating unobserved alternatives into a single "outside option" fails to capture significant implications of random utility models.

"Untestability of Average Slutsky Symmetry" arXiv.

Slutsky symmetry and negative semidefiniteness are necessary and sufficient conditions for the rationality of demand functions. While the empirical implications of Slutsky negative semidefiniteness in repeated cross-sectional demand data are well understood, the empirical content of Slutsky symmetry remains largely unexplored. This paper takes an important first step toward addressing this gap. We demonstrate that the average Slutsky matrix is not identified and that its identified set always contains a symmetric matrix. A key implication of our findings is that the symmetry of the average Slutsky matrix is untestable, and consequently, individual Slutsky symmetry cannot be tested using the average Slutsky matrix.

"Local Identification in Instrumental Variable Multivariate Quantile Regression Models" arXiv.

In the instrumental variable quantile regression (IVQR) model of Chernozhukov and Hansen (2005), a one-dimensional unobserved rank variable monotonically determines a single potential outcome. Even when multiple outcomes are simultaneously of interest, it is common to apply the IVQR model to each of them separately. This practice implicitly assumes that the rank variable of each regression model affects only the corresponding outcome, without impacting other outcomes. In reality, however, it is often the case that all rank variables together determine the outcomes, resulting in structural correlations between them. To address this issue, we propose a nonlinear IV model that incorporates multivariate unobserved heterogeneity, treating each component of this heterogeneity as a rank variable associated with an observed outcome. We show that, under the condition of a sufficiently positive correlation between the IV and the treatment variable, the structural function of our model is locally identified.