

Applied Microeconometrics

Jiaming Mao

This Version: Spring 2022

1 Introduction

- Imbens, G. W. and Wooldridge, J. M. (2009). Recent developments in the econometrics of program evaluation. *Journal of Economic Literature*, 47(1)
- Angrist, J. D. and Pischke, J.-S. (2010). The credibility revolution in empirical economics: How better research design is taking the con out of econometrics. *Journal of Economic Perspectives*, 24(2)
- Varian, H. R. (2014). Big data: New tricks for econometrics. *Journal of Economic Perspectives*, 28(2)
- Athey, S. and Imbens, G. W. (2017b). The state of applied econometrics: Causality and policy evaluation. *Journal of Economic Perspectives*, 31(2)
- Abadie, A. and Cattaneo, M. D. (2018). Econometric methods for program evaluation. *Annual Review of Economics*, 10(1)
- Athey, S. and Imbens, G. W. (2019). Machine learning methods that economists should know about. *Annual Review of Economics*, 11(1)
- Imbens, G. W. (2020). Potential outcome and directed acyclic graph approaches to causality: Relevance for empirical practice in economics. *Journal of Economic Literature*, 58(4)

2 Randomized Experiment

Method

- Deaton, A. (2010). Instruments, randomization, and learning about development. *Journal of Economic Literature*, 48(2)

- Bloniarz, A., Liu, H., Zhang, C.-H., Sekhon, J. S., and Yu, B. (2016). Lasso adjustments of treatment effect estimates in randomized experiments. *Proceedings of the National Academy of Sciences*, 113(27)
- Kasy, M. (2016). Why experimenters might not always want to randomize, and what they could do instead. *Political Analysis*, 24(3)
- Wager, S., Du, W., Taylor, J., and Tibshirani, R. J. (2016). High-dimensional regression adjustments in randomized experiments. *Proceedings of the National Academy of Sciences*, 113(45)
- Athey, S. and Imbens, G. W. (2017a). The econometrics of randomized experiments. In Banerjee, A. V. and Duflo, E., editors, *Handbook of Economic Field Experiments*, volume 1 of *Handbook of Field Experiments*
- Deaton, A. and Cartwright, N. (2018). Understanding and misunderstanding randomized controlled trials. *Social Science & Medicine*, 210
- Kasy, M. and Sautmann, A. (2021). Adaptive treatment assignment in experiments for policy choice. *Econometrica*, 89(1)

Application

- LaLonde, R. J. (1986). Evaluating the econometric evaluations of training programs with experimental data. *American Economic Review*, 76(4)
- Krueger, A. B. (1999). Experimental estimates of education production functions. *The Quarterly Journal of Economics*, 114(2)
- Sacerdote, B. (2001). Peer effects with random assignment: Results for dartmouth roommates. *The Quarterly Journal of Economics*, 116(2)
- Bertrand, M. and Mullainathan, S. (2004). Are emily and greg more employable than lakisha and jamal? a field experiment on labor market discrimination. *American Economic Review*, 94(4)
- Miguel, E. and Kremer, M. (2004). Worms: Identifying impacts on education and health in the presence of treatment externalities. *Econometrica*, 72(1)
- Ho, D. E. and Imai, K. (2006). Randomization inference with natural experiments. *Journal of the American Statistical Association*, 101(475)
- Kling, J. R., Liebman, J. B., and Katz, L. F. (2007). Experimental analysis of neighborhood effects. *Econometrica*, 75(1)

- Gerber, A. S., Green, D. P., and Larimer, C. W. (2008). Social pressure and voter turnout: Evidence from a large-scale field experiment. *American Political Science Review*, 102(1)
- Jensen, R. T. and Miller, N. H. (2008). Giffen behavior and subsistence consumption. *American Economic Review*, 98(4)
- Shadish, W. R., Clark, M. H., and Steiner, P. M. (2008). Can nonrandomized experiments yield accurate answers? a randomized experiment comparing random and nonrandom assignments. *Journal of the American Statistical Association*, 103(484)
- Bandiera, O., Barankay, I., and Rasul, I. (2009). Social connections and incentives in the workplace: Evidence from personnel data. *Econometrica*, 77(4)
- Dupas, P. (2011). Do teenagers respond to HIV risk information? evidence from a field experiment in kenya. *American Economic Journal: Applied Economics*, 3(1)
- Bond, R. M., Fariss, C. J., Jones, J. J., Kramer, A. D. I., Marlow, C., Settle, J. E., and Fowler, J. H. (2012). A 61-million-person experiment in social influence and political mobilization. *Nature*, 489(7415)
- Crepon, B., Duflo, E., Gurgand, M., Rathelot, R., and Zamora, P. (2013). Do labor market policies have displacement effects? evidence from a clustered randomized experiment. *The Quarterly Journal of Economics*, 128(2)
- Banerjee, A., Duflo, E., Glennerster, R., and Kinnan, C. (2015). The miracle of microfinance? evidence from a randomized evaluation. *American Economic Journal: Applied Economics*, 7(1)
- Eckles, D., Kizilcec, R. F., and Bakshy, E. (2016). Estimating peer effects in networks with peer encouragement designs. *Proceedings of the National Academy of Sciences*, 113(27)
- Caria, S., Gordon, G., Kasy, M., Quinn, S., Shami, S., and Teytelboym, A. (2020). An adaptive targeted field experiment: Job search assistance for refugees in jordan. *CESifo Working Paper No. 8535*

3 Treatment Effects under Unconfoundedness

Method

- Imbens, G. W. (2004). Nonparametric estimation of average treatment effects under exogeneity: A review. *The Review of Economics and Statistics*, 86(1)

- Chernozhukov, V., Chetverikov, D., Demirer, M., Duflo, E., Hansen, C., and Newey, W. (2017). Double/debiased/neyman machine learning of treatment effects. *American Economic Review*, 107(5)
- Semenova, V. and Chernozhukov, V. (2020). Debiased machine learning of conditional average treatment effects and other causal functions. *The Econometrics Journal*, 24(2)
- Farrell, M. H., Liang, T., and Misra, S. (2021). Deep neural networks for estimation and inference. *Econometrica*, 89(1)

4 Heterogeneous Treatment Effects

Method

- Imbens, G. W. and Angrist, J. D. (1994). Identification and estimation of local average treatment effects. *Econometrica*, 62(2)
- Scornet, E., Biau, G., and Vert, J.-P. (2015). Consistency of random forests. *The Annals of Statistics*, 43(4)
- Athey, S. and Imbens, G. (2016). Recursive partitioning for heterogeneous causal effects. *Proceedings of the National Academy of Sciences*, 113(27)
- Wager, S. and Athey, S. (2018). Estimation and inference of heterogeneous treatment effects using random forests. 113(523)
- Athey, S., Tibshirani, J., and Wager, S. (2019). Generalized random forests. *The Annals of Statistics*, 47(2)
- Kunzel, S. R., Sekhon, J. S., Bickel, P. J., and Yu, B. (2019). Metalearners for estimating heterogeneous treatment effects using machine learning. *Proceedings of the National Academy of Sciences*, 116(10)
- Oprescu, M., Syrgkanis, V., and Wu, Z. S. (2019). Orthogonal random forest for causal inference. *36th International Conference on Machine Learning, ICML 2019*
- Kennedy, E. H. (2020). Optimal doubly robust estimation of heterogeneous causal effects. *arXiv:2004.14497 [math, stat]*
- Knaus, M. C., Lechner, M., and Strittmatter, A. (2021). Machine learning estimation of heterogeneous causal effects: Empirical monte carlo evidence. *The Econometrics Journal*, 24(1)

- Nie, X. and Wager, S. (2021). Quasi-oracle estimation of heterogeneous treatment effects. *Biometrika*, 108(2)

5 High-dimensional Methods

Method

- Fan, J. and Li, R. (2001). Variable selection via nonconcave penalized likelihood and its oracle properties. *Journal of the American Statistical Association*, 96(456)
- Zou, H. (2006). The adaptive lasso and its oracle properties. *Journal of the American Statistical Association*, 101(476)
- Belloni, A., Chernozhukov, V., and Wang, L. (2011). Square-root lasso: pivotal recovery of sparse signals via conic programming. *Biometrika*, 98(4)
- Belloni, A. and Chernozhukov, V. (2013). Least squares after model selection in high-dimensional sparse models. *Bernoulli*, 19(2)
- Zhang, C.-H. and Zhang, S. S. (2014). Confidence intervals for low dimensional parameters in high dimensional linear models. *Journal of the Royal Statistical Society. Series B (Statistical Methodology)*, 76(1)
- Belloni, A., Chernozhukov, V., and Hansen, C. (2014a). High-dimensional methods and inference on structural and treatment effects. *Journal of Economic Perspectives*, 28(2)
- Belloni, A., Chernozhukov, V., and Hansen, C. (2014b). Inference on treatment effects after selection among high-dimensional controls. *The Review of Economic Studies*, 81(2)
- Belloni, A., Chernozhukov, V., and Wang, L. (2014c). Pivotal estimation via square-root lasso in nonparametric regression. *The Annals of Statistics*, 42(2)
- Lockhart, R., Taylor, J., Tibshirani, R. J., and Tibshirani, R. (2014). A significance test for the lasso. *The Annals of Statistics*, 42(2)
- Chernozhukov, V., Hansen, C., and Spindler, M. (2015). Post-selection and post-regularization inference in linear models with many controls and instruments. *American Economic Review*, 105(5)
- Taylor, J. and Tibshirani, R. J. (2015). Statistical learning and selective inference. *Proceedings of the National Academy of Sciences*, 112(25)

- Belloni, A., Chernozhukov, V., Hansen, C., and Kozbur, D. (2016). Inference in high-dimensional panel models with an application to gun control. *Journal of Business & Economic Statistics*, 34(4)
- Hansen, B. (2016). Efficient shrinkage in parametric models. *Journal of Econometrics*, 190(1)
- Lee, J. D., Sun, D. L., Sun, Y., and Taylor, J. E. (2016). Exact post-selection inference, with application to the lasso. *The Annals of Statistics*, 44(3)
- Belloni, A., Chernozhukov, V., Fernandez-Val, I., and Hansen, C. (2017). Program evaluation and causal inference with high-dimensional data. *Econometrica*, 85(1)
- Abadie, A. and Kasy, M. (2019). Choosing among regularized estimators in empirical economics: The risk of machine learning. *The Review of Economics and Statistics*, 101(5)
- Dukes, O. and Vansteelandt, S. (2021). Inference for treatment effect parameters in potentially misspecified high-dimensional models. *Biometrika*, 108(2)

6 Matching

Method

- Abadie, A. and Imbens, G. W. (2006). Large sample properties of matching estimators for average treatment effects. *Econometrica*, 74(1)
- Ho, D. E., Imai, K., King, G., and Stuart, E. A. (2007). Matching as nonparametric pre-processing for reducing model dependence in parametric causal inference. *Political Analysis*, 15(3)
- Sekhon, J. S. (2009). Opiates for the matches: Matching methods for causal inference. *Annual Review of Political Science*, 12(1)
- Stuart, E. A. (2010). Matching methods for causal inference: A review and a look forward. *Statistical sciences*, 25(1)
- Diamond, A. and Sekhon, J. S. (2013). Genetic matching for estimating causal effects: A general multivariate matching method for achieving balance in observational studies. *The Review of Economics and Statistics*, 95(3)
- Imbens, G. W. (2015). Matching methods in practice: Three examples. *The Journal of Human Resources*, 50(2)

- Otsu, T. and Rai, Y. (2017). Bootstrap inference of matching estimators for average treatment effects. *Journal of the American Statistical Association*, 112(520)
- Athey, S., Imbens, G. W., and Wager, S. (2018). Approximate residual balancing: debiased inference of average treatment effects in high dimensions. *Journal of the Royal Statistical Society: Series B (Statistical Methodology)*, 80(4)
- Abadie, A. and Spiess, J. (2020). Robust post-matching inference. *Journal of the American Statistical Association*, 1(13)
- Ozery-Flato, M., Thodoroff, P., Ninio, M., Rosen-Zvi, M., and El-Hay, T. (2020). Adversarial balancing for causal inference. *arXiv:1810.07406 [cs, stat]*
- Rosenbaum, P. R. (2020). Modern algorithms for matching in observational studies. *Annual Review of Statistics and Its Application*, 7(1)

Application

- Angrist, J. D. (1998). Estimating the labor market impact of voluntary military service using social security data on military applicants. *Econometrica*, 66(2)
- Dale, S. B. and Krueger, A. B. (2002). Estimating the payoff to attending a more selective college: An application of selection on observables and unobservables. *The Quarterly Journal of Economics*, 117(4)
- Jalan, J. and Ravallion, M. (2003). Does piped water reduce diarrhea for children in rural india? *Journal of Econometrics*, 112(1)
- Black, D. and Smith, J. (2004). How robust is the evidence on the effects of college quality? evidence from matching. *Journal of Econometrics*, 121(1)
- Arceneaux, K., Gerber, A. S., and Green, D. P. (2006). Comparing experimental and matching methods using a large-scale voter mobilization experiment. *Political Analysis*, 14(1)
- Colak, G. and Whited, T. (2007). Spin-offs, divestitures, and conglomerate investment. *Review of Financial Studies*, 20(3)
- Dearden, L., Emmerson, C., Frayne, C., and Meghir, C. (2009). Conditional cash transfers and school dropout rates. *The Journal of Human Resources*, 44(4)
- Heinrich, C., Mueser, P., Troske, K., Jeon, K.-S., and Kahvecioglu, D. (2013). Do public employment and training programs work? *IZA Journal of Labor Economics*, 2(1)

7 Propensity Score Methods

Method

- Rosenbaum, P. R. and Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, 70(1)
- Hahn, J. (1998). On the role of the propensity score in efficient semiparametric estimation of average treatment effects. *Econometrica*, 66(2)
- Hirano, K. and Imbens, G. W. (2001). Estimation of causal effects using propensity score weighting: An application to data on right heart catheterization. *Health Services and Outcomes Research Methodology*, 2(3)
- Ichimura, H. and Taber, C. (2001). Propensity-score matching with instrumental variables. *American Economic Review*, 91(2)
- Smith, J. A. and Todd, P. E. (2001). Reconciling conflicting evidence on the performance of propensity-score matching methods. *American Economic Review*, 91(2)
- Dehejia, R. H. and Wahba, S. (2002). Propensity score-matching methods for nonexperimental causal studies. *The Review of Economics and Statistics*, 84(1)
- Hirano, K., Imbens, G. W., and Ridder, G. (2003). Efficient estimation of average treatment effects using the estimated propensity score. *Econometrica*, 71(4)
- Bang, H. and Robins, J. M. (2005). Doubly robust estimation in missing data and causal inference models. *Biometrics*, 61(4)
- A. Smith, J. and E. Todd, P. (2005). Does matching overcome LaLonde's critique of nonexperimental estimators? *Journal of Econometrics*, 125(1)
- Tan, Z. (2007). Comment: Understanding or, PS and DR. *Statistical Science*, 22(4)
- Imai, K. and Ratkovic, M. (2014). Covariate balancing propensity score. *Journal of the Royal Statistical Society: Series B (Statistical Methodology)*, 76(1)
- Abadie, A. and Imbens, G. W. (2016). Matching on the estimated propensity score. *Econometrica*, 84(2)
- Benkeser, D., Carone, M., Laan, M. J. V. D., and Gilbert, P. B. (2017). Doubly robust nonparametric inference on the average treatment effect. *Biometrika*, 104(4)

- Kennedy, E. H., Ma, Z., McHugh, M. D., and Small, D. S. (2017). Non-parametric methods for doubly robust estimation of continuous treatment effects. *Journal of the Royal Statistical Society: Series B (Statistical Methodology)*, 79(4)
- Fong, C., Hazlett, C., and Imai, K. (2018). Covariate balancing propensity score for a continuous treatment: Application to the efficacy of political advertisements. *The Annals of Applied Statistics*, 12(1)
- King, G. and Nielsen, R. (2019). Why propensity scores should not be used for matching. *Political Analysis*, 27(4)
- Ning, Y., Sida, P., and Imai, K. (2020). Robust estimation of causal effects via a high-dimensional covariate balancing propensity score. *Biometrika*, 107(3)
- Fan, J., Imai, K., Lee, I., Liu, H., Ning, Y., and Yang, X. (2021). Optimal covariate balancing conditions in propensity score estimation. *arXiv:2108.01255 [math, stat]*

Application

- Dehejia, R. H. and Wahba, S. (1999). Causal effects in nonexperimental studies: Reevaluating the evaluation of training programs. *Journal of the American Statistical Association*, 94(448)

8 Ensemble Methods

Method

- Hjort, N. L. and Claeskens, G. (2003). Frequentist model average estimators. *Journal of the American Statistical Association*, 98(464)
- Hansen, B. E. (2007). Least squares model averaging. *Econometrica*, 75(4)
- Hansen, B. E. and Racine, J. S. (2012). Jackknife model averaging. *Journal of Econometrics*, 167(1)
- Ando, T. and Li, K.-C. (2014). A model-averaging approach for high-dimensional regression. *Journal of the American Statistical Association*, 109(505)
- Moral-Benito, E. (2015). Model averaging in economics: An overview. *Journal of Economic Surveys*, 29(1)
- Kitagawa, T. and Muris, C. (2016). Model averaging in semiparametric estimation of treatment effects. *Journal of Econometrics*, 193(1)

- Ando, T. and Li, K.-C. (2017). A weight-relaxed model averaging approach for high-dimensional generalized linear models. *The Annals of Statistics*, 45(6)
- Steel, M. F. J. (2020). Model averaging and its use in economics. *Journal of Economic Literature*, 58(3)

9 Instrumental Variables

Method

- Bound, J., Jaeger, D. A., and Baker, R. M. (1995). Problems with instrumental variables estimation when the correlation between the instruments and the endogenous explanatory variable is weak. *Journal of the American Statistical Association*, 90(430)
- Angrist, J. D., Imbens, G. W., and Rubin, D. B. (1996). Identification of causal effects using instrumental variables. *Journal of the American statistical Association*, 91(434)
- Angrist, J. D., Graddy, K., and Imbens, G. W. (2000). The interpretation of instrumental variables estimators in simultaneous equations models with an application to the demand for fish. *The Review of Economic Studies*, 67(3)
- Angrist, J. D. and Krueger, A. B. (2001). Instrumental variables and the search for identification: From supply and demand to natural experiments. *Journal of Economic Perspectives*, 15(4)
- Abadie, A. (2003). Semiparametric instrumental variable estimation of treatment response models. *Journal of Econometrics*, 113(2)
- Kleibergen, F. and Zivot, E. (2003). Bayesian and classical approaches to instrumental variable regression. *Journal of Econometrics*, 114(1)
- Newey, W. K. and Powell, J. L. (2003). Instrumental variable estimation of nonparametric models. *Econometrica*, 71(5)
- Hall, P. and Horowitz, J. L. (2005). Nonparametric methods for inference in the presence of instrumental variables. *Annals of Statistics*, 33(6)
- Murray, M. P. (2006). Avoiding invalid instruments and coping with weak instruments. *Journal of Economic Perspectives*, 20(4)
- Chernozhukov, V., Imbens, G. W., and Newey, W. K. (2007). Instrumental variable estimation of nonseparable models. *Journal of Econometrics*, 139(1)

- Frolich, M. (2007). Nonparametric IV estimation of local average treatment effects with covariates. *Journal of Econometrics*, 139(1)
- Horowitz, J. L. and Lee, S. (2007). Nonparametric instrumental variables estimation of a quantile regression model. *Econometrica*, 75(4)
- Conley, T. G., Hansen, C. B., McCulloch, R. E., and Rossi, P. E. (2008). A semi-parametric bayesian approach to the instrumental variable problem. *Journal of Econometrics*, 144(1)
- Kuersteiner, G. and Okui, R. (2010). Constructing optimal instruments by first-stage prediction averaging. *Econometrica*, 78(2)
- Darolles, S., Fan, Y., Florens, J.-P., and Renault, E. (2011). Nonparametric instrumental regression. *Econometrica*, 79(5)
- Horowitz, J. L. (2011). Applied nonparametric instrumental variables estimation. *Econometrica*, 79(2)
- Belloni, A., Chen, D., Chernozhukov, V., and Hansen, C. (2012). Sparse models and methods for optimal instruments with an application to eminent domain. *Econometrica*, 80(6)
- Bollen, K. A. (2012). Instrumental variables in sociology and the social sciences. *Annual Review of Sociology*, 38(1)
- Florens, J.-P. and Simoni, A. (2012). Nonparametric estimation of an instrumental regression: A quasi-bayesian approach based on regularized posterior. *Journal of Econometrics*, 170(2)
- Gagliardini, P. and Scaillet, O. (2012a). Nonparametric instrumental variable estimation of structural quantile effects. *Econometrica*, 80(4)
- Gagliardini, P. and Scaillet, O. (2012b). Tikhonov regularization for nonparametric instrumental variable estimators. *Journal of Econometrics*, 167(1)
- Koop, G., Leon-Gonzalez, R., and Strachan, R. (2012). Bayesian model averaging in the instrumental variable regression model. *Journal of Econometrics*, 171(2)
- Okui, R., Small, D. S., Tan, Z., and Robins, J. M. (2012). Doubly robust instrumental variable regression. *Statistica Sinica*, 22(1)
- Chesher, A. and Rosen, A. M. (2013). What do instrumental variable models deliver with discrete dependent variables? *American Economic Review*, 103(3)
- Newey, W. K. (2013). Nonparametric instrumental variables estimation. *American Economic Review*, 103(3)

- Imbens, G. W. (2014). Instrumental variables: An econometrician's perspective. *Statistical Science*, 29(3)
- Kasy, M. (2014). Instrumental variables with unrestricted heterogeneity and continuous treatment. *The Review of Economic Studies*, 81(4)
- Kitagawa, T. (2015). A test for instrument validity. *Econometrica*, 83(5)
- Chetverikov, D. and Wilhelm, D. (2017). Nonparametric instrumental variable estimation under monotonicity. *Econometrica*, 85(4)
- Mogstad, M. and Torgovitsky, A. (2018). Identification and extrapolation of causal effects with instrumental variables. *Annual Review of Economics*, 10(1)
- Andrews, I., Stock, J. H., and Sun, L. (2019). Weak instruments in instrumental variables regression: Theory and practice. *Annual Review of Economics*, 11(1)
- Kennedy, E. H., Lorch, S., and Small, D. S. (2019). Robust causal inference with continuous instruments using the local instrumental variable curve. *Journal of the Royal Statistical Society: Series B (Statistical Methodology)*, 81(1)
- Syrgkanis, V., Lei, V., Oprescu, M., Hei, M., Battocchi, K., and Lewis, G. (2019). Machine learning estimation of heterogeneous treatment effects with instruments. *arXiv:1905.10176 [cs, econ, stat]*
- Bennett, A., Kallus, N., and Schnabel, T. (2020). Deep generalized method of moments for instrumental variable analysis. *arXiv:1905.12495 [cs, econ, stat]*
- Gold, D., Lederer, J., and Tao, J. (2020). Inference for high-dimensional instrumental variables regression. *Journal of Econometrics*, 217(1)
- Goldsmith-Pinkham, P., Sorkin, I., and Swift, H. (2020). Bartik instruments: What, when, why, and how. *American Economic Review*, 110(8)

Application

- Angrist, J. D. (1990). Lifetime earnings and the vietnam era draft lottery: Evidence from social security administrative records. *American Economic Review*, 80(3)
- Angrist, J. D. and Krueger, A. B. (1991). Does compulsory school attendance affect schooling and earnings? *The Quarterly Journal of Economics*, 106(4)
- Levitt, S. (1997). Using electoral cycles in police hiring to estimate the effect of police on crime. *American Economic Review*, 87(3)

- Angrist, J. D. and Evans, W. N. (1998). Children and their parents' labor supply: Evidence from exogenous variation in family size. *American Economic Review*, 88(3)
- Acemoglu, D., Johnson, S., and Robinson, J. A. (2001). The colonial origins of comparative development: An empirical investigation. *American Economic Review*, 91(5)
- Card, D. (2001). Estimating the return to schooling: Progress on some persistent econometric problems. *Econometrica*, 69(5)
- Kling, J. R. (2001). Interpreting instrumental variables estimates of the returns to schooling. *Journal of Business & Economic Statistics*, 19(3)
- Abadie, A., Angrist, J., and Imbens, G. (2002). Instrumental variables estimates of the effect of subsidized training on the quantiles of trainee earnings. *Econometrica*, 70(1)
- Edin, P.-A., Fredriksson, P., and Aslund, O. (2003). Ethnic enclaves and the economic success of immigrants - evidence from a natural experiment. *The Quarterly Journal of Economics*, 118(1)
- Black, S. E., Devereux, P. J., and Salvanes, K. G. (2005). The more the merrier? the effect of family size and birth order on children's education. *The Quarterly Journal of Economics*, 120(2)
- Bennedsen, M., Nielsen, K. M., Perez-Gonzalez, F., and Wolfenzon, D. (2007). Inside the family firm: The role of families in succession decisions and performance. *The Quarterly Journal of Economics*, 122(2)
- Angrist, J. D., Chen, S. H., and Song, J. (2011). Long-term consequences of vietnam-era conscription: New estimates using social security data. *American Economic Review*, 101(3)
- Nunn, N. and Qian, N. (2011). The potato's contribution to population and urbanization: Evidence from a historical experiment. *The Quarterly Journal of Economics*, 126(2)
- Autor, D. H., Dorn, D., and Hanson, G. H. (2013). The china syndrome: Local labor market effects of import competition in the united states. *American Economic Review*, 103(6)
- Angrist, J. D., Cohodes, S. R., Dynarski, S. M., Pathak, P. A., and Walters, C. R. (2016). Stand and deliver: Effects of boston's charter high schools on college preparation, entry, and choice. *Journal of Labor Economics*, 34(2)
- Shue, K. and Townsend, R. R. (2017). How do quasi-random option grants affect CEO risk-taking? *The Journal of Finance*, 72(6)

- Acemoglu, D. and Restrepo, P. (2020). Robots and jobs: Evidence from US labor markets. *Journal of Political Economy*, 128(6)
- Manacorda, M. and Tesei, A. (2020). Liberation technology: Mobile phones and political mobilization in africa. *Econometrica*, 88(2)

10 Difference-in-Differences

Method

- Bertrand, M., Duflo, E., and Mullainathan, S. (2004). How much should we trust differences-in-differences estimates? *The Quarterly Journal of Economics*, 119(1)
- Abadie, A. (2005). Semiparametric difference-in-differences estimators. *The Review of Economic Studies*, 72(1)
- Athey, S. and Imbens, G. W. (2006). Identification and inference in nonlinear difference-in-differences models. *Econometrica*, 74(2)
- Lechner, M. (2011). The estimation of causal effects by difference-in-difference methods. *Foundations and Trends in Econometrics*, 4(3)
- Doudchenko, N. and Imbens, G. W. (2017). Balancing, regression, difference-in-differences and synthetic control methods: A synthesis. *arXiv:1610.07748 [stat]*
- de Chaisemartin, C. and D'Haultfoeulle, X. (2018). Fuzzy differences-in-differences. *The Review of Economic Studies*, 85(2)
- Sant'Anna, P. H. C. and Zhao, J. (2020). Doubly robust difference-in-differences estimators. *Journal of Econometrics*, 219(1)
- Arkhangelsky, D., Athey, S., Hirshberg, D. A., Imbens, G. W., and Wager, S. (2021). Synthetic difference-in-differences. *American Economic Review*, 111(12)
- Callaway, B. and Sant'Anna, P. H. C. (2021). Difference-in-differences with multiple time periods. *Journal of Econometrics*, 225(2)
- D'Haultfoeulle, X., Hoderlein, S., and Sasaki, Y. (2021). Nonparametric difference-in-differences in repeated cross-sections with continuous treatments. *arXiv:2104.14458 [econ]*
- Goodman-Bacon, A. (2021). Difference-in-differences with variation in treatment timing. *Journal of Econometrics*, 225(2)

- Imai, K. and Kim, I. S. (2021). On the use of two-way fixed effects regression models for causal inference with panel data. *Political Analysis*, 29(3)
- Athey, S. and Imbens, G. W. (2022). Design-based analysis in difference-in-differences settings with staggered adoption. *Journal of Econometrics*, 226(1)
- de Chaisemartin, C. and D'Haultfoeuille, X. (2022). Two-way fixed effects and differences-in-differences with heterogeneous treatment effects: A survey. *arXiv:2112.04565 [econ]*
- Roth, J. (2022). Pre-test with caution: Event-study estimates after testing for parallel trends. *American Economic Review: Insights*, forthcoming
- Roth, J., Sant'Anna, P. H. C., Bilinski, A., and Poe, J. (2022). What's trending in difference-in-differences? a synthesis of the recent econometrics literature. *arXiv:2201.01194 [econ, stat]*

Application

- Card, D. (1990). The impact of the mariel boatlift on the miami labor market. *ILR Review*, 43(2)
- Card, D. and Krueger, A. (1994). Minimum wages and employment: A case study of the fast-food industry in new jersey and pennsylvania. *American Economic Review*, 84(4)
- Gruber, J. (1994). The incidence of mandated maternity benefits. *American Economic Review*, 84(3)
- Eissa, N. and Liebman, J. B. (1996). Labor supply response to the earned income tax credit. *The Quarterly Journal of Economics*, 111(2)
- Jayaratne, J. and Strahan, P. E. The finance-growth nexus: Evidence from bank branch deregulation. *The Quarterly Journal of Economics*, 111(3)
- Card, D. and Krueger, A. B. (2000). Minimum wages and employment: A case study of the fast-food industry in new jersey and pennsylvania: Reply. *The American Economic Review*, 90(5)
- Donohue, III, J. J. and Levitt, S. D. (2001). The impact of legalized abortion on crime. *The Quarterly Journal of Economics*, 116(2)
- Duflo, E. (2001). Schooling and labor market consequences of school construction in indonesia: Evidence from an unusual policy experiment. *American Economic Review*, 91(4)
- Di Tella, R. and Schargrodsky, E. (2004). Do police reduce crime? estimates using the allocation of police forces after a terrorist attack. *American Economic Review*, 94(1)

- Galiani, S., Gertler, P., and Schargrodsky, E. (2005). Water for life: The impact of the privatization of water services on child mortality. *Journal of Political Economy*, 113(1)
- Qian, N. (2008). Missing women and the price of tea in china: The effect of sex-specific earnings on sex imbalance. *The Quarterly Journal of Economics*, 123(3)
- Abadie, A. and Dermisi, S. (2008). Is terrorism eroding agglomeration economies in central business districts? lessons from the office real estate market in downtown chicago. *Journal of Urban Economics*, 64(2)
- Bleakley, H. (2010). Malaria eradication in the americas: A retrospective analysis of childhood exposure. *American Economic Journal: Applied Economics*, 2(2)
- Butler, A. W. and Cornaggia, J. (2011). Does access to external finance improve productivity? evidence from a natural experiment. *Journal of Financial Economics*, 99(1)
- Gormley, T. A. and Matsa, D. A. (2011). Growing out of trouble? corporate responses to liability risk. *The Review of Financial Studies*, 24(8)
- Morse, A. (2011). Payday lenders: Heroes or villains? *Journal of Financial Economics*, 102(1)
- Becker, B. and Stromberg, P. (2012). Fiduciary duties and equity-debtholder conflicts. *The Review of Financial Studies*, 25(6)
- Hayes, R. M., Lemmon, M., and Qiu, M. (2012). Stock options and managerial incentives for risk taking: Evidence from FAS 123r. *Journal of Financial Economics*, 105(1)
- Naritomi, J. (2019). Consumers as tax auditors. *American Economic Review*, 109(9)

11 Synthetic Control

Method

- Abadie, A., Diamond, A., and Hainmueller, J. (2010). Synthetic control methods for comparative case studies: Estimating the effect of california's tobacco control program. *Journal of the American Statistical Association*, 105(490)
- Abadie, A., Diamond, A., and Hainmueller, J. (2015). Comparative politics and the synthetic control method. *American Journal of Political Science*, 59(2)
- Li, K. T. (2020). Statistical inference for average treatment effects estimated by synthetic control methods. *Journal of the American Statistical Association*, 115(532)

- Abadie, A. (2021). Using synthetic controls: Feasibility, data requirements, and methodological aspects. *Journal of Economic Literature*, 59(2)
- Abadie, A. and L'Hour, J. (2021). A penalized synthetic control estimator for disaggregated data. *Journal of the American Statistical Association*, 116(536)
- Ben-Michael, E., Feller, A., and Rothstein, J. (2021). The augmented synthetic control method. *Journal of the American Statistical Association*, 116(536)
- Ferman, B. (2021). On the properties of the synthetic control estimator with many periods and many controls. *Journal of the American Statistical Association*, 116(536)
- Ferman, B. and Pinto, C. (2021). Synthetic controls with imperfect pretreatment fit. *Quantitative Economics*, 12(4)
- Kellogg, M., Mogstad, M., Pouliot, G. A., and Torgovitsky, A. (2021). Combining matching and synthetic control to tradeoff biases from extrapolation and interpolation. *Journal of the American Statistical Association*, 116(536)

Application

- Abadie, A. and Gardeazabal, J. (2003). The economic costs of conflict: A case study of the basque country. *American Economic Review*, 93(1)
- Andersson, J. J. (2019). Carbon taxes and CO₂ emissions: Sweden as a case study. *American Economic Journal: Economic Policy*, 11(4)
- Peri, G. and Yasenov, V. (2019). The labor market effects of a refugee wave: Synthetic control method meets the mariel boatlift. *Journal of Human Resources*, 54(2)

12 Regression Discontinuity

Method

- Hahn, J., Todd, P., and Van der Klaauw, W. (2001). Identification and estimation of treatment effects with a regression-discontinuity design. *Econometrica*, 69(1)
- Cook, T. D. (2008). "waiting for life to arrive": A history of the regression-discontinuity design in psychology, statistics and economics. *Journal of Econometrics*, 142(2)
- Imbens, G. W. and Lemieux, T. (2008). Regression discontinuity designs: A guide to practice. *Journal of Econometrics*, 142(2)

- Lee, D. S. (2008). Randomized experiments from non-random selection in u.s. house elections. *Journal of Econometrics*, 142(2)
- Lee, D. S. and Lemieux, T. (2010). Regression discontinuity designs in economics. *Journal of Economic Literature*, 48(2)
- Frandsen, B. R., Frolich, M., and Melly, B. (2012). Quantile treatment effects in the regression discontinuity design. *Journal of Econometrics*, 168(2)
- Calonico, S., Cattaneo, M. D., and Titiunik, R. (2014). Robust nonparametric confidence intervals for regression-discontinuity designs. *Econometrica*, 82(6)
- Card, D., Lee, D. S., Pei, Z., and Weber, A. (2015). Inference on causal effects in a generalized regression kink design. *Econometrica*, 83(6)
- Cattaneo, M. D., Idrobo, N., and Titiunik, R. (2019). A practical introduction to regression discontinuity designs: Foundations. *arXiv:1911.09511 [econ, stat]*
- Cattaneo, M. D. and Titiunik, R. (2022). Regression discontinuity designs. *arXiv:2108.09400 [econ, stat]*
- Villamizar-Villegas, M., Pinzon-Puerto, F. A., and Ruiz-Sanchez, M. A. (2022). A comprehensive history of regression discontinuity designs: An empirical survey of the last 60 years. *Journal of Economic Surveys*, forthcoming

Application

- Angrist, J. D. and Pischke, J. V. (1999). Using maimonides' rule to estimate the effect of class size on scholastic achievement. *The Quarterly Journal of Economics*, 114(2)
- DiNardo, J. and Lee, D. S. (2004). Economic impacts of new unionization on private sector employers: 1984-2001. *The Quarterly Journal of Economics*, 119(4)
- Lee, D. S., Moretti, E., and Butler, M. J. (2004). Do voters affect or elect policies? evidence from the u. s. house. *The Quarterly Journal of Economics*, 119(3)
- Chay, K. and Greenstone, M. (2005). Does air quality matter? evidence from the housing market. *Journal of Political Economy*, 113(2)
- Oreopoulos, P. (2006). Estimating average and local average treatment effects of education when compulsory schooling laws really matter. *American Economic Review*, 96(1)
- Carpenter, C. and Dobkin, C. (2009). The effect of alcohol consumption on mortality: Regression discontinuity evidence from the minimum drinking age. *American Economic Journal: Applied Economics*, 1(1)

- Hoekstra, M. (2009). The effect of attending the flagship state university on earnings: A discontinuity-based approach. *The Review of Economics and Statistics*, 91(4)
- Dell, M. (2010). The persistent effects of peru's mining mita. *Econometrica*, 78(6)
- Keys, B. J., Mukherjee, T., Seru, A., and Vig, V. (2010). Did securitization lead to lax screening? evidence from subprime loans. *The Quarterly Journal of Economics*, 125(1)
- Chen, Y., Ebenstein, A., Greenstone, M., and Li, H. (2013). Evidence on the impact of sustained exposure to air pollution on life expectancy from china's huai river policy. *Proceedings of the National Academy of Sciences*, 110(32)
- Abdulkadiroglu, A., Angrist, J., and Pathak, P. (2014). The elite illusion: Achievement effects at boston and new york exam schools. *Econometrica*, 82(1)
- Almeida, H., Fos, V., and Kronlund, M. (2016). The real effects of share repurchases. *Journal of Financial Economics*, 119(1)
- Cohen, P., Hahn, R., Hall, J., Levitt, S., and Metcalfe, R. (2016). Using big data to estimate consumer surplus: The case of uber. *Working Paper*
- Malenko, N. and Shen, Y. (2016). The role of proxy advisory firms: Evidence from a regression-discontinuity design. *The Review of Financial Studies*, 29(12)
- Ebenstein, A., Fan, M., Greenstone, M., He, G., and Zhou, M. (2017). New evidence on the impact of sustained exposure to air pollution on life expectancy from china's huai river policy. *Proceedings of the National Academy of Sciences*, 114(39)
- Dell, M., Lane, N., and Querubin, P. (2018). The historical state, local collective action, and economic development in vietnam. *Econometrica*, 86(6)
- Dube, A., Giuliano, L., and Leonard, J. (2019). Fairness and frictions: The impact of unequal raises on quit behavior. *American Economic Review*, 109(2)
- Bleemer, Z. and Mehta, A. (2022). Will studying economics make you rich? a regression discontinuity analysis of the returns to college major. *American Economic Journal: Applied Economics*, forthcoming