

Causal Inference for Economists

May 21-24, 2024

Lecturer

Prof. Benjamin Elsner, Ph.D
University College Dublin
School of Economics
Newman Building G206
Belfield, Dublin 4
Email: benjamin.elsner@ucd.ie
Webpage: www.benjaminelsner.com

Aim & Scope

This course introduces students to the most important causal research designs in economics. We begin with directed acyclic graphs (DAGs) as a systematic framework for thinking about causality and uncovering common pitfalls in causal research designs. The main part of the course covers canonical research designs that are common in many fields of economics: selection on observables, instrumental variables, regression discontinuity and difference-in-differences and delves into more recent developments such as staggered adoption designs, regression kink designs or (time permitting) bunching. For each technique, we will discuss theory and applications. Students are expected to do short group presentations of recent papers using causal research designs. I will also provide R codes that allows students to perform their own analyses. Advice for Stata can be provided upon request.

Reading

The course is mainly based on papers. Much of the material takes inspiration from the following textbooks:

- Scott Cunningham. *Causal Inference: The Mixtape*. Yale University Press, 2020. URL <http://scunning.com>
- Nick Huntington-Klein. *The Effect: An Introduction to Research Design and Causality*. Chapman and Hall/CRC, 2022. URL <https://theeffectbook.net>
- Joshua Angrist and Jörn-Steffen Pischke. *Mostly Harmless Econometrics - An Empiricist's Companion*. Princeton University Press, 2009

For more modern applications, including causal machine learning, I recommend

- Martin Huber. *Causal Analysis: Impact Evaluation and Causal Machine Learning with Applications in R*. MIT Press, 2023
- Victor Chernozhukov, Christian Hansen, Nathan Kallus, Martin Spindler, and Vasilis Syrgkanis. *Applied Causal Inference Powered by ML and AI*. 2024. URL <https://www.causalm1-book.org/>. Free e-book

Content

Foundations of Causal Inference

- Directed Acyclic Graphs (DAGs): how to think about causality and spot common pitfalls (confounders, colliders, bad controls). [Cunningham \[2020\]\[Ch. 3\]](#), [Huntington-Klein \[2022\]\[Ch. 6-11\]](#)
- Potential outcomes. [Cunningham \[2020\]\[Ch. 4\]](#)

Key references : Krueger [1999], Knox et al. [2020]

Other references: Pearl [2009], Pei et al. [2019], Imbens [2020], Montgomery et al. [2018], Schneider [2020].

Selection on Observables

- Regression and causality: Huntington-Klein [2022][Ch. 3]
- Matching: Cunningham [2020][Ch. 5], Huntington-Klein [2022][Ch. 14]

Key references : Dehejia and Wahba [1999]

Other references: Krueger [1999], Imbens [2015], DiNardo et al. [1996], Słoczyński [2022], Ho et al. [2007], Spenkuch et al. [2023], Illing et al. [2021], Jäger and Heining [2022], Broockman [2013].

Instrumental Variables

- IV Basics and LATE Cunningham [2020][Ch. 7], Huntington-Klein [2022][Ch. 19]
- Canonical IV Designs (same textbook chapters)

Key references : Kling et al. [2007], Angrist [1990], Angrist et al. [1996], Angrist and Evans [1998]

Other references: Stock et al. [2002], Mogstad and Torgovitsky [2018], Goldsmith-Pinkham et al. [2020], Rotemberg [1983], Anderson and Rubin [1949], Borusyak et al. [2021], Borusyak and Hull [2020], Andrews et al. [2019], Montiel Olea and Pflueger [2013], Mogstad et al. [2018], Young [2022], Card [1995], Lee et al. [2022].

Regression Discontinuity and Kink Designs

- Fuzzy and Sharp Regression Discontinuity Designs Cunningham [2020][Ch. 6], Huntington-Klein [2022][Ch. 20].
- Regression Kink Design. Card et al. [2015].

Key references : Angrist and Lavy [1999], Carpenter and Dobkin [2009].

Other references: Ganong and Jäger [2018], Landais [2015], Green et al. [2009], Simonsen et al. [2016], Imbens and Kalyanaraman [2012], Lee and Lemieux [2010], Gelman and Imbens [2019], Cattaneo et al. [2020].

Difference-in-Differences

- Basics of DiD and advanced topics. Cunningham [2020][Ch. 18], Huntington-Klein [2022][Ch. 20]
- Synthetic Control. Cunningham [2020][Ch. 10].

Key references : Card and Krueger [1994], Dufo [2001], Miller et al. [2021], Goodman-Bacon [2021], Callaway and Sant'Anna [2021], Abadie and Gardeazabal [2003].

Other references: Sun and Abraham [2021], Bertrand et al. [2004], de Chaisemartin and D'Haultfoeulle [2020], Cortés and Pan [2013], Goldsmith-Pinkham et al. [2022], Abadie [2021], Roth et al. [2023], Wooldridge [2021], Schmidheiny and Siegloch [2023], Ben-Michael et al. [2021], Borusyak et al. [2023], Xu [2017], Stevenson and Wolfers [2006], Freyaldenhoven et al. [2019], Abadie et al. [2010], Arkhangelsky et al. [2021], Kaul et al. [2021], Born et al. [2019], Roth [2022], Botosaru and Ferman [2019], Dube et al. [2023], Acemoglu et al. [2016], Abadie and L'Hour [2021].

Bunching Designs

References: Best and Kleven [2018], Saez [2010], Chetty et al. [2013], Chetty et al. [2011], Garicano et al. [2016], Kleven [2016], Lacetera et al. [2012].

References

- Alberto Abadie. Using synthetic controls: Feasibility, data requirements, and methodological aspects. *Journal of Economic Literature*, 59(2):391–425, June 2021. doi: 10.1257/jel.20191450. URL <https://www.aeaweb.org/articles?id=10.1257/jel.20191450>.
- Alberto Abadie and Javier Gardeazabal. The economic costs of conflict: A case study of the basque region. *American Economic Review*, 93(1):113–132, 2003. URL <http://www.jstor.org/stable/3132164>.
- Alberto Abadie and Jérémy L’Hour. A penalized synthetic control estimator for disaggregated data. *Journal of the American Statistical Association*, 0(0):1–18, 2021. doi: 10.1080/01621459.2021.1971535. URL <https://doi.org/10.1080/01621459.2021.1971535>.
- Alberto Abadie, Alexis Diamond, and Jens Hainmueller. Synthetic control methods for comparative case studies: Estimating the effect of california’s tobacco control program. *Journal of the American Statistical Association*, 105(490):493–505, 2010. doi: 10.1198/jasa.2009.ap08746.
- Daron Acemoglu, Simon Johnson, Amir Kermani, James Kwak, and Todd Mitton. The value of connections in turbulent times: Evidence from the united states. *Journal of Financial Economics*, 121(2):368–391, 2016. URL <https://EconPapers.repec.org/RePEc:eee:jfinec:v:121:y:2016:i:2:p:368-391>.
- T. W. Anderson and Herman Rubin. Estimation of the parameters of a single equation in a complete system of stochastic equations. *Annals of Mathematical Statistics*, 20(1):46–63, 03 1949. doi: 10.1214/aoms/1177730090. URL <https://doi.org/10.1214/aoms/1177730090>.
- Isaiah Andrews, James H. Stock, and Liyang Sun. Weak instruments in instrumental variables regression: Theory and practice. *Annual Review of Economics*, 11(1):727–753, 2019. doi: 10.1146/annurev-economics-080218-025643. URL <https://doi.org/10.1146/annurev-economics-080218-025643>.
- Joshua Angrist and William Evans. Children and their parents’ labor supply: Evidence from exogenous variation in family size. *American Economic Review*, 88(3):450–77, 1998. URL <https://EconPapers.repec.org/RePEc:aea:aecrev:v:88:y:1998:i:3:p:450-77>.
- Joshua Angrist and Victor Lavy. Using maimonides’ rule to estimate the effect of class size on scholastic achievement. *The Quarterly Journal of Economics*, 114(2):533–575, 1999. URL <https://EconPapers.repec.org/RePEc:oup:qjecon:v:114:y:1999:i:2:p:533-575>.
- Joshua Angrist and Jörn-Steffen Pischke. *Mostly Harmless Econometrics - An Empiricist’s Companion*. Princeton University Press, 2009.
- Joshua D. Angrist. Lifetime earnings and the vietnam era draft lottery: Evidence from social security administrative records. *American Economic Review*, 80(3):313–336, 1990.
- Joshua D. Angrist, Guido W. Imbens, and Donald B. Rubin. Identification of causal effects using instrumental variables. *Journal of the American Statistical Association*, 91(434):444–455, 1996. URL <http://www.jstor.org/stable/2291629>.
- Dmitry Arkhangelsky, Susan Athey, David A. Hirshberg, Guido W. Imbens, and Stefan Wager. Synthetic difference-in-differences. *American Economic Review*, 111(12):4088–4118, December 2021. doi: 10.1257/aer.20190159. URL <https://www.aeaweb.org/articles?id=10.1257/aer.20190159>.
- Eli Ben-Michael, Avi Feller, and Jesse Rothstein. The augmented synthetic control method. *Journal of the American Statistical Association*, 116(536), 2021. doi: 10.1080/01621459.2021.1929245.
- Marianne Bertrand, Esther Dufo, and Sendhil Mullainathan. How much should we trust differences-in-differences estimates? *The Quarterly Journal of Economics*, 119(1):249–275, 2004. ISSN 00335533, 15314650. URL <http://www.jstor.org/stable/25098683>.
- Michael Best and Henrik Jacobsen Kleven. Housing market responses to transaction taxes: Evidence from notches and stimulus in the u.k. *Review of Economic Studies*, 85(1):157–193, 2018. URL <https://EconPapers.repec.org/RePEc:oup:restud:v:85:y:2018:i:1:p:157-193>.

- Benjamin Born, Gernot J Müller, Moritz Schularick, and Petr Sedláček. The costs of economic nationalism: Evidence from the brexit experiment. *The Economic Journal*, 129(623), 2019. doi: 10.1093/ej/uez020.
- Kirill Borusyak and Peter Hull. Non-random exposure to exogenous shocks: Theory and applications. Working Paper 27845, National Bureau of Economic Research, September 2020. URL <http://www.nber.org/papers/w27845>.
- Kirill Borusyak, Peter Hull, and Xavier Jaravel. Quasi-Experimental Shift-Share Research Designs. *The Review of Economic Studies*, 89(1):181–213, 06 2021. ISSN 0034-6527. doi: 10.1093/restud/rdab030. URL <https://doi.org/10.1093/restud/rdab030>.
- Kirill Borusyak, Xavier Jaravel, and Jann Spiess. Revisiting event study designs: Robust and efficient estimation. *Review of Economic Studies*, forthcoming, 2023.
- Irene Botosaru and Bruno Ferman. On the role of covariates in the synthetic control method. *The Econometrics Journal*, 22(2):117–130, 01 2019. ISSN 1368-4221. doi: 10.1093/ectj/utz001. URL <https://doi.org/10.1093/ectj/utz001>.
- David E. Broockman. Black politicians are more intrinsically motivated to advance blacks’ interests: A field experiment manipulating political incentives. *American Journal of Political Science*, 57(3): 521–536, 2013. ISSN 00925853, 15405907. URL <http://www.jstor.org/stable/23496636>.
- Brantly Callaway and Pedro H. C. Sant’Anna. Difference-in-Differences with Multiple Time Periods. *Journal of Econometrics*, (225):200–230, 2021.
- David Card and Alan Krueger. Minimum wages and employment: A case study of the fast-food industry in new jersey and pennsylvania. *American Economic Review*, 84(4):772–93, 1994. URL <https://EconPapers.repec.org/RePEc:aea:aecrev:v:84:y:1994:i:4:p:772-93>.
- David Card, David S. Lee, Zhuan Pei, and Andrea Weber. Inference on causal effects in a generalized regression kink design. *Econometrica*, 83(6):2453–2483, 2015. doi: 10.3982/ECTA11224. URL <https://onlinelibrary.wiley.com/doi/abs/10.3982/ECTA11224>.
- David E. Card. Using geographic variation in college proximity to estimate the return to schooling. In L. Christofides, E. Kenneth Grant, and Robert Swindinsky, editors, *Aspects of Labour Economics: Essays in Honour of John Vanderkamp*, Toronto, Canada, 1995. University of Toronto Press.
- Christopher Carpenter and Carlos Dobkin. The effect of alcohol consumption on mortality: Regression discontinuity evidence from the minimum drinking age. *American Economic Journal: Applied Economics*, 1(1):164–82, January 2009. doi: 10.1257/app.1.1.164. URL <http://www.aeaweb.org/articles?id=10.1257/app.1.1.164>.
- Matias D. Cattaneo, Luke Keele, Rocío Titiunik, and Gonzalo Vazquez-Bare. Extrapolating treatment effects in multi-cutoff regression discontinuity designs. *Journal of the American Statistical Association*, 0(0):1–12, 2020. doi: 10.1080/01621459.2020.1751646. URL <https://doi.org/10.1080/01621459.2020.1751646>.
- Victor Chernozhukov, Christian Hansen, Nathan Kallus, Martin Spindler, and Vasilis Syrgkanis. *Applied Causal Inference Powered by ML and AI*. 2024. URL <https://www.causalm1-book.org/>. Free e-book.
- Raj Chetty, John N. Friedman, Tore Olsen, and Luigi Pistaferri. Adjustment Costs, Firm Responses, and Micro vs. Macro Labor Supply Elasticities: Evidence from Danish Tax Records. *The Quarterly Journal of Economics*, 126(2):749–804, 2011. URL <https://ideas.repec.org/a/oup/qjecon/v126y2011i2p749-804.html>.
- Raj Chetty, John N. Friedman, and Emmanuel Saez. Using differences in knowledge across neighborhoods to uncover the impacts of the eitc on earnings. 103(7):2683–2721, 2013.
- Patricia Cortés and Jessica Pan. Outsourcing household production: Foreign domestic workers and native labor supply in hong kong. *Journal of Labor Economics*, 31(2):327–371, 2013.
- Scott Cunningham. *Causal Inference: The Mixtape*. Yale University Press, 2020. URL <http://scunning.com>.

- Clement de Chaisemartin and Xavier D’Haultfoeuille. Two-way fixed effects estimators with heterogeneous treatment effects. *American Economic Review*, 110(9):2964–96, September 2020. doi: 10.1257/aer.20181169. URL <https://www.aeaweb.org/articles?id=10.1257/aer.20181169>.
- Rajeev H. Dehejia and Sadek Wahba. Causal effects in nonexperimental studies: Reevaluating the evaluation of training programs. *Journal of the American Statistical Association*, 94(448):1053–1062, 1999. ISSN 01621459. URL <http://www.jstor.org/stable/2669919>.
- John DiNardo, Nicole M. Fortin, and Thomas Lemieux. Labor market institutions and the distribution of wages, 1973-1992: A semiparametric approach. *Econometrica*, 64(5):1001–1044, 1996. ISSN 00129682, 14680262. URL <http://www.jstor.org/stable/2171954>.
- Arindrajit Dube, Daniele Girardi, Òscar Jordà, and Alan M Taylor. A local projections approach to difference-in-differences event studies. Working Paper 31184, National Bureau of Economic Research, April 2023. URL <http://www.nber.org/papers/w31184>.
- Esther Duflo. Schooling and labor market consequences of school construction in indonesia: Evidence from an unusual policy experiment. *American Economic Review*, 91(4):795–813, 02 2001.
- Simon Freyaldenhoven, Christian Hansen, and Jesse M. Shapiro. Pre-event trends in the panel event-study design. *American Economic Review*, 109(9):3307–38, September 2019. doi: 10.1257/aer.20180609. URL <http://www.aeaweb.org/articles?id=10.1257/aer.20180609>.
- Peter Ganong and Simon Jäger. A Permutation Test for the Regression Kink Design. *Journal of the American Statistical Association*, 113(522):494–504, April 2018. doi: 10.1080/01621459.2017.132. URL <https://ideas.repec.org/a/taf/jnlasa/v113y2018i522p494-504.html>.
- Luis Garicano, Claire Lelarge, and John Van Reenen. Firm size distortions and the productivity distribution: Evidence from france. *American Economic Review*, 106(11):3439–79, November 2016. doi: 10.1257/aer.20130232. URL <http://www.aeaweb.org/articles?id=10.1257/aer.20130232>.
- Andrew Gelman and Guido Imbens. Why high-order polynomials should not be used in regression discontinuity designs. *Journal of Business & Economic Statistics*, 37(3):447–456, 2019. doi: 10.1080/07350015.2017.1366909.
- Paul Goldsmith-Pinkham, Isaac Sorkin, and Henry Swift. Bartik instruments: What, when, why, and how. *American Economic Review*, 110(8):2586–2624, August 2020. doi: 10.1257/aer.20181047. URL <https://www.aeaweb.org/articles?id=10.1257/aer.20181047>.
- Paul Goldsmith-Pinkham, Peter Hull, and Michal Kolesár. Contamination bias in linear regressions, 2022.
- Andrew Goodman-Bacon. Difference-in-differences with variation in treatment timing. *Journal of Econometrics*, 225(2):254–277, 2021. ISSN 0304-4076. doi: <https://doi.org/10.1016/j.jeconom.2021.03.014>. URL <https://www.sciencedirect.com/science/article/pii/S0304407621001445>. Themed Issue: Treatment Effect 1.
- Donald P. Green, Terence Y. Leong, Holger L. Kern, Alan S. Gerber, and Christopher W. Larimer. Testing the accuracy of regression discontinuity analysis using experimental benchmarks. *Political Analysis*, 17(4):400–417, 2009. doi: 10.1093/pan/mpp018.
- Daniel E. Ho, Kosuke Imai, Gary King, and Elizabeth A. Stuart. Matching as nonparametric preprocessing for reducing model dependence in parametric causal inference. *Political Analysis*, 15(3):199–236, 2007. doi: 10.1093/pan/impl013.
- Martin Huber. *Causal Analysis: Impact Evaluation and Causal Machine Learning with Applications in R*. MIT Press, 2023.
- Nick Huntington-Klein. *The Effect: An Introduction to Research Design and Causality*. Chapman and Hall/CRC, 2022. URL <https://theeffectbook.net>.
- Hannah Illing, Johannes F Schmieder, and Simon Trenkle. The gender gap in earnings losses after job displacement. Working Paper 29251, National Bureau of Economic Research, September 2021. URL <http://www.nber.org/papers/w29251>.

- Guido Imbens and Karthik Kalyanaraman. Optimal bandwidth choice for the regression discontinuity estimator. *Review of Economic Studies*, 79:933–959, 01 2012.
- Guido W. Imbens. Matching methods in practice: Three examples. *Journal of Human Resources*, 50(2):373–419, 2015. ISSN 0022-166X. doi: 10.3368/jhr.50.2.373. URL <https://jhr.uwpress.org/content/50/2/373>.
- Guido W. Imbens. Potential outcome and directed acyclic graph approaches to causality: Relevance for empirical practice in economics. *Journal of Economic Literature*, 58(4):1129–79, December 2020. doi: 10.1257/jel.20191597. URL <https://www.aeaweb.org/articles?id=10.1257/jel.20191597>.
- Simon Jäger and Jörg Heining. How substitutable are workers? evidence from worker deaths. Working Paper 30629, National Bureau of Economic Research, November 2022. URL <http://www.nber.org/papers/w30629>.
- Ashok Kaul, Stefan Klößner, Gregor Pfeifer, and Manuel Schieler. Synthetic Control Methods: The Case of Using All Pre-Intervention Outcomes Together With Covariates. *Journal of Business and Economic Statistics*, (forthcoming), 2021.
- Henrik Jacobsen Kleven. Bunching. *Annual Review of Economics*, 8(1):435–464, 2016. doi: 10.1146/annurev-economics-080315-015234. URL <https://doi.org/10.1146/annurev-economics-080315-015234>.
- Jeffrey R. Kling, Jeffrey B. Liebman, and Lawrence F. Katz. Experimental analysis of neighborhood effects. *Econometrica*, 75(1):83–119, 2007.
- Dean Knox, Will Lowe, and Jonathan Mummolo. Administrative records mask racially biased policing. *American Political Science Review*, 114(3):619–637, 2020. doi: 10.1017/S0003055420000039.
- Alan B. Krueger. Experimental estimates of education production functions. *The Quarterly Journal of Economics*, 114(2):497–532, 1999. ISSN 00335533, 15314650. URL <http://www.jstor.org/stable/2587015>.
- Nicola Lacetera, Devin G. Pope, and Justin R. Sydnor. Heuristic thinking and limited attention in the car market. *American Economic Review*, 102(5):2206–36, May 2012. doi: 10.1257/aer.102.5.2206. URL <http://www.aeaweb.org/articles?id=10.1257/aer.102.5.2206>.
- Camille Landais. Assessing the welfare effects of unemployment benefits using the regression kink design. *American Economic Journal: Economic Policy*, 7(4):243–78, November 2015. doi: 10.1257/pol.20130248. URL <http://www.aeaweb.org/articles?id=10.1257/pol.20130248>.
- David S. Lee and Thomas Lemieux. Regression discontinuity design in economics. 48:281–355, 06 2010.
- David S. Lee, Justin McCrary, Marcelo J. Moreira, and Jack Porter. Valid t-ratio inference for iv. *American Economic Review*, 112(10):3260–90, October 2022. doi: 10.1257/aer.20211063. URL <https://www.aeaweb.org/articles?id=10.1257/aer.20211063>.
- Sarah Miller, Norman Johnson, and Laura R Wherry. Medicaid and Mortality: New Evidence From Linked Survey and Administrative Data*. *The Quarterly Journal of Economics*, 136(3):1783–1829, 01 2021. ISSN 0033-5533. doi: 10.1093/qje/qjab004. URL <https://doi.org/10.1093/qje/qjab004>.
- Magne Mogstad and Alexander Torgovitsky. Identification and extrapolation of causal effects with instrumental variables. *Annual Review of Economics*, 10(1):577–613, 2018. doi: 10.1146/annurev-economics-101617-041813. URL <https://doi.org/10.1146/annurev-economics-101617-041813>.
- Magne Mogstad, Andres Santos, and Alexander Torgovitsky. Using instrumental variables for inference about policy relevant treatment parameters. *Econometrica*, 86(5):1589–1619, 2018. doi: 10.3982/ECTA15463. URL <https://onlinelibrary.wiley.com/doi/abs/10.3982/ECTA15463>.
- Jacob M. Montgomery, Brendan Nyhan, and Michelle Torres. How conditioning on posttreatment variables can ruin your experiment and what to do about it. *American Journal of Political Science*, 62(3):760–775, 2018. doi: https://doi.org/10.1111/ajps.12357. URL <https://onlinelibrary.wiley.com/doi/abs/10.1111/ajps.12357>.

- José Luis Montiel Olea and Carolin Pflueger. A robust test for weak instruments. *Journal of Business & Economic Statistics*, 31(3):358–369, 2013. doi: 10.1080/00401706.2013.806694. URL <https://doi.org/10.1080/00401706.2013.806694>.
- Judea Pearl. *Causality: Models, Reasoning and Inference*. Cambridge University Press, New York, NY, USA, 2nd edition, 2009. ISBN 052189560X, 9780521895606.
- Zhuan Pei, Jörn-Steffen Pischke, and Hannes Schwandt. Poorly measured confounders are more useful on the left than on the right. *Journal of Business & Economic Statistics*, 37(2):205–216, 2019. doi: 10.1080/07350015.2018.1462710. URL <https://doi.org/10.1080/07350015.2018.1462710>.
- Julio J. Rotemberg. Instrumental variable estimation of misspecified models. *MIT Sloan Working Paper*, 83(1508), 1983.
- Jonathan Roth. Pretest with caution: Event-study estimates after testing for parallel trends. *American Economic Review: Insights*, 4(3):305–22, September 2022. doi: 10.1257/aeri.20210236. URL <https://www.aeaweb.org/articles?id=10.1257/aeri.20210236>.
- Jonathan Roth, Pedro H.C. Sant’Anna, Alyssa Bilinski, and John Poe. What’s trending in difference-in-differences? a synthesis of the recent econometrics literature. *Journal of Econometrics*, 235(2): 2218–2244, 2023. ISSN 0304-4076. doi: <https://doi.org/10.1016/j.jeconom.2023.03.008>. URL <https://www.sciencedirect.com/science/article/pii/S0304407623001318>.
- Emmanuel Saez. Do taxpayers bunch at kink points? *American Economic Journal: Economic Policy*, 2(3):180–205, 2010.
- Kurt Schmidheiny and Sebastian Siegloch. On event studies and distributed-lags in two-way fixed effects models: Identification, equivalence, and generalization. *Journal of Applied Econometrics*, 38(5):695–713, 2023. doi: <https://doi.org/10.1002/jae.2971>. URL <https://onlinelibrary.wiley.com/doi/abs/10.1002/jae.2971>.
- Eric B. Schneider. Collider bias in economic history research. *Explorations in Economic History*, 78: 101356, 2020. ISSN 0014-4983. doi: <https://doi.org/10.1016/j.eeh.2020.101356>. URL <http://www.sciencedirect.com/science/article/pii/S0014498320300516>.
- Marianne Simonsen, Lars Skipper, and Niels Skipper. Price sensitivity of demand for prescription drugs: Exploiting a regression kink design. *Journal of Applied Econometrics*, 31(2):320–337, 2016. doi: 10.1002/jae.2436. URL <https://onlinelibrary.wiley.com/doi/abs/10.1002/jae.2436>.
- Jörg L. Spenkuch, Edoardo Teso, and Guo Xu. Ideology and performance in public organizations. *Econometrica*, 91(4):1171–1203, 2023. doi: <https://doi.org/10.3982/ECTA20355>. URL <https://onlinelibrary.wiley.com/doi/abs/10.3982/ECTA20355>.
- Betsey Stevenson and Justin Wolfers. Bargaining in the Shadow of the Law: Divorce Laws and Family Distress*. *The Quarterly Journal of Economics*, 121(1):267–288, 02 2006. ISSN 0033-5533. doi: 10.1093/qje/121.1.267. URL <https://doi.org/10.1093/qje/121.1.267>.
- James H. Stock, Jonathan H. Wright, and Motohiro Yogo. A survey of weak instruments and weak identification in generalized method of moments. *Journal of Business & Economic Statistics*, 20(4): 518–529, 2002.
- Liyang Sun and Sarah Abraham. Estimating dynamic treatment effects in event studies with heterogeneous treatment effects. *Journal of Econometrics*, 225(2):175–199, 2021. doi: 10.2139/ssrn.3158747.
- Tymon Słoczyński. Interpreting OLS Estimands When Treatment Effects Are Heterogeneous: Smaller Groups Get Larger Weights. *The Review of Economics and Statistics*, 104(3):501–509, 05 2022. ISSN 0034-6535. doi: 10.1162/rest_a_00953. URL https://doi.org/10.1162/rest_a_00953.
- Jeffrey M. Wooldridge. Wooldridge, jeffrey m., two-way fixed effects, the two-way mundlak regression, and difference-in-differences estimators. *Michigan State University*, mimeo, 2021.
- Yiqing Xu. Generalized synthetic control method: Causal inference with interactive fixed effects models. *Political Analysis*, 25(01):57–76, 2017. URL https://EconPapers.repec.org/RePEc:cup:polals:v:25:y:2017:i:01:p:57-76_00.

Alwyn Young. Consistency without inference: Instrumental variables in practical application. *European Economic Review*, 147:104112, 2022. ISSN 0014-2921. doi: <https://doi.org/10.1016/j.euroecorev.2022.104112>. URL <https://www.sciencedirect.com/science/article/pii/S001429212200054X>.