

ECONOMICS 623
Econometrics III (Program Evaluation)
Syracuse University
Spring 2020

<p><u>Instructor:</u> Alfonso Flores-Lagunes 426 Eggers Hall Phone: 315-443-9045 E-mail: afloresl@maxwell.syr.edu</p> <p>Office hours: Tuesdays and Thursdays 11:00am-12:00pm, and by appointment.</p>	<p><u>Location and Time:</u> Lectures: Physics Building 104N, Tuesdays and Thursdays 9:30am – 10:50am</p> <p><u>Prerequisites:</u> ECN 620 and 621 and/or PhD level courses in mathematical statistics & econometrics that cover linear models at the level of e.g., Greene’s ‘Econometric Analysis.’</p>
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Course Objective:

The goal of the course is to expose PhD students to a number of econometric techniques to uncover causal effects. The course will employ the potential outcomes framework and the assignment mechanism as organizing principles. It will cover a balanced combination of the theoretical underpinnings that are necessary to obtain a solid grasp of the techniques and the competent use of these methodologies. The techniques to be covered are important tools in economics, public policy, and various other social sciences. Students are encouraged to actively participate in the discussions in class, particularly asking questions.

This class enrolls first-year economics Ph.D. students and economics students beyond their first-year. It also enrolls students from other Ph.D. programs around the University. For this reason, the grading policy is divided into two tiers. Tier 1 corresponds to students in the first year of their graduate program, who will take qualifying examinations. Tier 2 corresponds to students beyond the first year of their graduate program. The two grading policies are detailed below.

Tier 1 Grading Components (First-Year Students):

Computer Assignments	33%
Problem Sets	33%
Final Exam	33%

Tier 2 Grading Components (Students Beyond the First Year):

Computer Assignments	40%
Replication Project or Original Paper	40%
Referee Report	20%

Course Website:

The course website will be available through Syracuse University’s Blackboard system (<http://blackboard.syr.edu>). I will post on this website some of the readings for the course (including handouts and additional readings), the homework assignments, and solutions.

Computer Software:

There will be about four computer assignments throughout the course that ALL students will complete. These will consist on programming exercises about some of the topics covered. The recommended software for the assignments is **Stata**. Using this recommended software can simplify your experience considerably, since, while you are free to use any software of your choice (e.g., SAS, Matlab, Gauss, R, etc.), you will be responsible for any technical support you may need to complete the assignments in other software languages. In any event, keep in mind that, even if using Stata, you are ultimately responsible for the completion of your own assignment.

I understand that Stata is available in the university public computer labs and at the Maxwell PC lab. The following is additional information for you:

- You can order a copy of Stata for yourself at a mild discount by taking advantage of Syracuse's campus- wide grad-plan by accessing this site. If you do so, note that you need at least Stata-SE to use some of the data assigned in the problem sets. <http://www.stata.com/order/new/edu/gradplans/gp-campus.html>.
- Some resources for Stata programming can be found on-line at: <http://www.stata.com/links/resources1.html>.

Notes:

- 1) The assignments (both computer assignments and problem sets) will be announced in class and will be available for download through Blackboard. **Late answers cannot be accepted.** For the computer assignments, you will need to turn in a clean set of tables with results and a brief analysis. In addition, you will be required to turn in a stand-alone “master computer program” that can be run to (easily) reproduce your results, including any data manipulation you needed to undertake. Your grade may be determined based on this master program.
- 2) Collaboration in assignments (both computer assignments and problem sets) is perfectly fine and it is actually encouraged. However, please keep in mind that you are required to work out details by yourself. **Identical assignments (or computer programs) to those of other students or previous years' solutions are not allowed and will be penalized in accordance with Syracuse's Code of Academic Integrity.**
- 3) The final exam will consist on a combination of problem-set-like questions and questions about the intuition and good practice of the methods covered in class. The time and date, scheduled by the University is yet to be announced.
- 4) For the Replication Project, students will replicate a published paper (approved by the instructor by the end of February at the latest) that uses any of the econometric methods covered in class. After the replication of the paper, it is highly desirable (although not necessary to receive full credit in certain circumstances) to make at least one sensible extension to the paper. Students will turn in a short paper describing the replication exercise, professionally presenting the results, and briefly describing the extension undertaken. A file with the computer code must accompany the short paper. The students will be responsible for obtaining the data for this exercise. For this reason, you should make sure you can access all the required data for your replication paper as soon as possible (various journals encourage the posting of data of published papers for replication purposes).

Some students may prefer to do an Original (econometric) Paper instead of the Replication Project. This term paper will consist, in most cases, in a literature review and a detailed plan of action including hypothesis, approach or data to be used, and the theoretical or empirical strategy to be employed. The paper can also include preliminary results.

For either of the two formats available (replication or original paper), the page limit is 20 pages (including references and tables). The deadline to turn in your paper is the last day of classes. Please note that no late projects will be accepted and no extensions will be given.

- 5) The Referee Report will be on either: (i) a paper from the reading list or (ii) a program evaluation paper of your choosing. This report will be a traditional “referee report”, of no more than 1000 words. Your goal should be to discuss the quality and relevance of the paper, including what makes it a good or bad paper and, more importantly, how the paper can be improved. You may read relevant literature pertaining to the paper to best inform your opinions. You require the instructor’s approval of the paper for your referee report. A guide to writing good referee reports is posted on Blackboard. You may submit your referee report at any time during the semester but no later than our last class.
- 6) Students must keep up with the readings assigned for each topic as we move along.

Textbooks:

We will be using the following textbook for most of the semester:

[IR] Imbens, G. and Rubin, D. (2015), *Causal Inference for Statistics, Social, and Biomedical Sciences: An Introduction*. Cambridge University Press.

I will be providing some lecture notes and we will also cover a number of journal articles. In addition, you may find useful to consult some topics in the following textbooks.

1. **[AP]** Angrist, J. and Pischke, J-S. (2009), *Mostly Harmless Econometrics*, Princeton U. Press.
2. **[W]** Wooldridge, J. (2010), *Econometric Analysis of Cross Section and Panel Data*, Second Edition. MIT Press.
3. **[CT]** Cameron, C. and P. Trivedi. (2005), *Microeconometrics*, Cambridge U. Press.
4. **[G]** Greene, W. (2008), *Econometric Analysis*, 6th edition, Prentice Hall.
5. **[HP]** Henderson, D. and C. Parmeter. (2015), *Applied Nonparametric Econometrics*, Cambridge U. Press.
6. Li, Q. and J. Racine. (2007), *Nonparametric Econometrics*, Princeton U. Press
7. Cameron, C. and P. Trivedi. (2010), *Microeconometrics Using Stata*, Stata Press, 2nd Edition.
8. Davidson R. and J. MacKinnon (2004) *Econometric Theory and Methods*, Oxford U. Press.
9. Shadish, William R., Thomas D. Cook, Donald T. Campbell (2002). *Experimental and Quasi- Experimental Designs for Generalized Causal Inference*. Houghton Mifflin.
10. Morgan, Stephen L. and Christopher Winship (2007). *Counterfactuals and Causal Inference: Methods and Principles for Social Research*. Cambridge University Press.

11. Cunningham, Scott (2018). *Causal Inference: The Mixtape*. Tufte-Latex.Googlecode.com (Available online free of charge).

There are other papers and resources that contain a number of the topics to be covered in class:

1. Heckman, James, Robert LaLonde and Jeffrey Smith. 1999. "The Economics and Econometrics of Active Labor Market Programs." In Orley Ashenfelter and David Card, eds., *Handbook of Labor Economics*, Volume 3A. Amsterdam: North-Holland, pp. 1865-2097.
2. Angrist, Joshua and Alan Krueger. 1999. "Empirical Strategies in Labor Economics." In Orley Ashenfelter and David Card, eds., *Handbook of Labor Economics*, Volume 3A. Amsterdam: North-Holland, pp. 1277-1366.
3. [IW] Imbens, G. and J. Wooldridge (2009), "Recent Developments in the Econometrics of Program Evaluation", *Journal of Economic Literature*, 47 (1), pp. 5-86.
4. Blundell, R. and M. Costa Dias (2009), "Alternative Approaches to Evaluation in Empirical Microeconomics", *Journal of Human Resources*, 44 (3), pp. 565-640.
5. Imbens, Guido and Jeffrey Wooldridge, "What's New in Econometrics?" NBER 2007 Summer Institute Notes: <http://www.nber.org/minicourse3.html>

Tentative Course Outline and Readings:

- * Denotes a required reading. You are encouraged to read as many references as you can. Note that I list many more references than we will actually cover in lectures. I will typically announce which material will be covered the following class.

A. Overview: Causality and Research Designs

- * [IR] Chapters 1, 2, and 3.
- * [IW] Sections 1, 2, and 3.
- Holland, P., (1986) "Statistics and Causal Inference," *Journal of the American Statistical Association*, 81, 945–960.
- Heckman, J. (2008), "Econometric Causality", *International Statistical Review*, 76, 1-27.
- Rubin, D. (1986) "Statistics and Causal Inference: Comment: Which Ifs Have Causal Answers?," *Journal of the American Statistical Association*, 81, 961–962.

B. Review of Some Econometric Concepts: linear regression, binary choice models, simulation, nonparametric econometrics,

- * Lecture Notes (to be presented in class by instructor).
- [W] Chapters 4 and 15.
- [CT] Chapters 9, 11, 12, and 14.
- * [HP] Chapters 2, 3, 4, 5, 9.
- Mooney, C. (1997). *Monte Carlo Simulation*. Sage University Paper (Series: Quantitative Applications in the Social Sciences).
- Mooney, C., and Duval, R. (1993). *Bootstrapping: A Nonparametric Approach to Statistical Inference*. Sage University Paper (Series: Quantitative Applications in the Social Sciences).

C. Methods that Rely on Selection-on-Observables (Unconfoundedness)

a. Prelude: “If I only had an experiment”

- * [AP] Chapters 1 and 2.
- * [IW] Section 4
- * [IR] Chapter 4

b. Linear regression adjustment and methods that use the propensity score

- * Lecture Notes (to be presented in class by instructor).
- * [IR] Chapters 12 through 21
- * [AP] Chapter 3
- * [IW] Section 5
- Krueger, A., (1993) “How Computers Have Changed the Wage Structure: Evidence from Micro Data,” *Quarterly Journal of Economics*, 108, 33–60.
- DiNardo, J. and Pischke, J. (1997) “The Returns to Computer Use Revisited: Have Pencils Changed the Wage Structure Too?,” *Quarterly Journal of Economics*, 112, 291–303.
- Almond, D., Chay, K., and Lee, D. (2005) “The Costs of Low Birth Weight,” *Quarterly Journal of Economics*, pp. 1031-1083.
- Imbens, G., Rubin, D. and Sacerdote, B. (2001) “Estimating the Effect of Unearned Income on Labor Earnings, Savings, and Consumption: Evidence from a Survey of Lottery Players” *American Economic Review*, 91(4), 778-794.
- Caetano, C. (2015) “A Test of Exogeneity Without Instrumental Variables in Models with Bunching,” *Econometrica*, 83(4): 1581—1600.
- Imbens, G. W. (2004), "Nonparametric Estimation of Average Treatment Effects under Exogeneity: A Review." *Review of Economics and Statistics*, 84(1), 4-29.
- Flores-Lagunes, A., Gonzalez, A., and Neumann, T. (2010), “Learning but not Earning? The Impact of Job Corps Training on Hispanic Youth,” *Economic Inquiry*, 48, 651-667.
- M. Huber, M. Lechner, and C. Wunsch. (2013) "The Performance of Estimators Based on the Propensity Score", *Journal of Econometrics*, 175:1–21.
- Busso, M., DiNardo, J., and McCrary, J. (2014) “New Evidence on the Finite Sample Properties of Propensity Score Matching and Reweighting Estimators”, *Review of Economics and Statistics*, 96(5), 885—897.
- Bodory, H., Camponovo, L., Huber, M. and Lechner, M. (2020), “The Finite Sample Performance of Inference Methods for Propensity Score Matching and Weighting Estimators” *Journal of Business and Economic Statistics*, 38, 183-200.

c. The generalized propensity score

- * Lecture Notes (to be presented in class by instructor).
- * [IW] Section 7 (7.1 & 7.2)
- Imbens, G. (2000), "The Role of the Propensity Score in Estimating Dose-Response Functions", *Biometrika*, 87(3): 706–710.

- * Hirano, K., and Imbens, G. (2004) “The Propensity Score with Continuous Treatments,” in A. Gelman and X. Meng (Eds.), *Applied Bayesian Modeling and Causal Inference from Incomplete-Data Perspectives* (Hoboken, NJ: Wiley).
- * Flores, C., A. Flores-Lagunes, A. Gonzalez and T. Neumann (2012), "Estimating the Effects of Length of Exposure to Instruction in a Training Program: The Case of Job Corps", *The Review of Economics and Statistics*, 94(1): 153–171.
- Imai, K., and van Dyk, D. (2004) “Causal Inference with General Treatment Regimes: Generalizing the Propensity Score,” *Journal of the American Statistical Association* 99, 854–866.
- Flores, C.A. and Mitnik, O. “Comparing Treatments Across Labor Markets: An Assessment of Nonexperimental Multiple-Treatment Strategies”, *The Review of Economics and Statistics*, 95(5), 1691-1707.
- Cattaneo, M., (2010) “Efficient Semiparametric Estimation of Multi-Valued Treatment Effects under Ignorability,” *Journal of Econometrics* 155:2, 138–154.
- Galvao, A. and Wang, L. (2015) “Uniformly Semiparametric Efficient Estimation of Treatment Effects with a Continuous Treatment,” *Journal of the American Statistical Association*, 110(512): 1528-1542.
- Cattaneo, M., Drukker, D. and Holland, A. (2013) “Estimation of Multivalued Treatment Effects under Conditional Independence” *Stata Journal*, 13(3): 407-450.
- Bia, M., Mattei, A., Flores, C., and A. Flores-Lagunes (2014), " A Stata Package for the Application of Semiparametric Estimators of Dose-Response Functions", *Stata Journal*, 14(3): 580-604.

d. Quantile regression [This topic may or may not be covered]

- * Lecture Notes (to be presented in class by instructor).
- * [AP] Chapter 7.
- * [IR] Chapter 21.
- Koenker, R. and Hallock, K. (2001) “Quantile Regression,” *Journal of Economic Perspectives*, 15, 143–156.
- Koenker, R. (2005). *Quantile Regression*. Cambridge University Press.
- Bitler, M., Gelbach, J. and Hoynes, H. (2006) “What Mean Impacts Miss: The Distributional Effects of Welfare Reform Experiments” *American Economic Review*, 96(4).
- Firpo, S. (2007), “Efficient Semiparametric Estimation of Quantile Treatment Effects”, *Econometrica*, 75, 259-276.
- Firpo, S., Fortin, N., and Lemieux, T. (2009). “Unconditional Quantile Regressions.” *Econometrica* 77(3):953–73.

D. Methods that Allow for Selection-on-Unobservables

a. Differences-in-differences

- * Lecture Notes (to be presented in class by instructor).
- * [AP] Chapter 5.
- * [IW] Section 6.5

- Card, D. (1990), “The Impact of the Mariel Boatlift on the Miami Labor Market”, *Industrial and Labor Relations Review*, 43(2), 245-257.
- 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, 487–496.
- Meyer, B. (1995), “Natural and Quasi-Experiments in Economics”, *Journal of Business and Economic Statistics*, 13(2): 151-161.
- Katz, L. (1996), “Wage Subsidies for the Disadvantaged” NBER Working Paper 5679.
- Currie, J., Hanushek, E., Kahn, M., Neidell, M. and Rivkin, S. "Does Pollution Increase School Absences?" *The Review of Economics and Statistics* 91 (4), 2009: 682-694.
- M. Bertrand, E. Duflo, and S. Mullainathan. 2004. "How Much Should We Trust Differences-in-Differences Estimates?" *Quarterly Journal of Economics*, 119: 249–275.
- Abadie, A. 2005. “Semiparametric Difference-in-Differences Estimators.” *Review of Economic Studies*, 72: 1-19.
- 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): 493-505.
- Athey, S., and Imbens, G. 2006. “Identification and Inference in Nonlinear Difference-in-Differences Models.” *Econometrica*, 74: 431-497.
- Bonhomme, S. and Sauder, U. 2011. “Recovering Distributions in Differences-in-differences Models: A Comparison of Selective and Comprehensive Schooling.” *Review of Economics and Statistics*, 93(2): 479-494.
- Athey, Susan, and Guido Imbens. 2018. “Design-Based Analysis in Difference-In-Differences Settings with Staggered Adoption.” <http://arxiv.org/abs/1808.05293>.
- Arkhangelsky, Dmitry, Susan Athey, David A Hirshberg, Guido W Imbens, and Stefan Wager. 2019. “Synthetic Difference in Differences.” <http://arxiv.org/abs/1812.09970>
- Ben-Michael, Eli, Avi Feller, and Jesse Rothstein. 2018. “The Augmented Synthetic Control Method,” November. <http://arxiv.org/abs/1811.04170>.
- Borusyak, Kirill, and Xavier Jaravel. 2017. “Revisiting Event Study Designs.” <https://doi.org/10.2139/ssrn.2826228>.
- Callaway, Brantly, and Pedro H C Sant’Anna. 2019. “Difference-in-Differences with Multiple Time Periods.”
- Chaisemartin, C. De, and X. D’Haultfoeuille. 2018. “Fuzzy Differences-in-Differences.” *Review of Economic Studies* 85 (2): 999–1028. <https://doi.org/10.1093/restud/rdx049>.
- Chaisemartin, Clement de, and Xavier D’Haultfoeuille. 2018. “Two-Way Fixed Effects Estimators with Heterogeneous Treatment Effects.” *Ssrn*. <https://doi.org/10.2139/ssrn.3148607>.
- Freyaldenhoven, Simon, Christian Hansen, and Jesse M Shapiro. 2019. “Pre-Event Trends in the Panel Event-Study Design.” *American Economic Review* 109 (9): 3307–38.
- Goodman-Bacon, Andrew. 2019. “Difference-in-Differences with Variation in Treatment Timing.”

b. Instrumental variables

- * Lecture Notes (to be presented in class by instructor).
- * [AP] Chapter 4.

- * [IR] Chapters 23 through 25
- * [IW] Section 6.3
- * Imbens, G. W. and J. D. Angrist, (1994), "Identification and Estimation of Local Average Treatment Effects." *Econometrica*, 62(2), 467-475.
- Angrist, J., Imbens, G., and Rubin, D. (1996), "Identification of Causal Effects Using Instrumental Variables"(with discussion), *Journal of the American Statistical Association*, 91, 444–472.
- Imbens, G., and Rubin, D. (1997), "Estimating Outcome Distributions for Compliers in Instrumental Variables Models", *Review of Economic Studies*, 64(3), 555—574.
- Currie, J. and E. Moretti (2003), "Mother's Education and the Intergenerational Transmission of Human Capital: Evidence from College Openings" *Quarterly Journal of Economics*, pp. 1495-1532.
- Abadie, A. (2003) "Semiparametric Instrumental Variable Estimation of Treatment Response Models," *Journal of Econometrics* 113:2, 231–263.
- Frolich, M. (2007), "Nonparametric IV Estimation of Local Average Treatment Effects with Covariates," *Journal of Econometrics*, 139, 35-75.
- Hong, H. and Nekipelov, D. (2010), "Semiparametric Efficiency in Nonlinear LATE Models," *Quantitative Economics*, 1: 279—304.
- Imbens, G., and Rubin, D. (1997), "Estimating Outcome Distributions for Compliers in Instrumental Variable Models," *Review of Economic Studies*, 64, 555-574.
- Abadie, A., J. Angrist, and G. Imbens, (2002) "Instrumental Variables Estimates of the Effect of Subsidized Training on the Quantiles of Trainee Earnings," *Econometrica* 70:1, 91– 117.
- Flores, C. A. and A. Flores-Lagunes, (2013), "Partial Identification of Local Average Treatment Effects with an Invalid Instrument," *Journal of Business and Economic Statistics* 31(4), 534-545.
- * Chen, X., Flores, C., and Flores-Lagunes, A. (2018) "Going Beyond LATE: Bounding Average Treatment Effects of Job Corps Training", *Journal of Human Resources* 53(4), 1050-99.
- Frumento, P., Mealli, F. Pacini, B., and Rubin, D. (2012), "Evaluating the Effect of Training on Wages in the Presence of Noncompliance, Nonemployment, and Missing Outcome Data," *Journal of the American Statistical Association*, 498: 450—466.
- Kitagawa, T. (2015), "A Test of Instrument Validity," *Econometrica*, 83(5): 2043—2063.
- Heckman, J.J., and Vytlacil, E. (2005) "Structural Equations, Treatment Effects, and Econometric Policy Evaluation," *Econometrica*, 73: 669—738.
- Florens, J.P., Heckman, J.J., Meguir, C., Vytlacil, E. (2008) "Identification of Treatment Effects Using Control Functions in Models with Continuous, Endogenous, Treatment and Heterogeneous Effects," *Econometrica*, 76: 1191—1206.
- Imbens, G. and Newey, W. (2009) "Identification and Estimation of Triangular Simultaneous Equations Models Without Additivity," *Econometrica*, 77: 1481—1512.
- Brinch, C., Mogstad, M, and Wiswall, M 2017. "Beyond LATE with a Discrete Instrument," *Journal of Political Economy*, 125(4), 985-1039.
- Mogstad, M., Santos, A., and Torgovitsky, A. 2018. "Using Instrumental Variables for Inference About Policy Relevant Treatment Parameters," *Econometrica*, 86(5), 1589-1619.

- De Chaisemartin, C. 2017. “Tolerating Defiance? Local Average Treatment Effects without Monotonicity,” *Quantitative Economics*, 8, 367–396.
- Dahl, C., Huber, M., and Mellace, G. 2019. “It's never too LATE: A New Look at Local Average Treatment Effects with or without Defiers”, Mimeo

c. Regression discontinuity design

- * Lecture Notes (to be presented in class by instructor).
- * [AP] Chapter 6.
- * [IW] Section 6.4
- * Lee, D., and Lemieux, T. (2010) “Regression Discontinuity Designs in Economics.” *Journal of Economic Literature*, 48: 281-355.
- Angrist, J., and Lavy, V. (1999) “Using Maimonides Rule to Estimate the Effect of Class Size on Scholastic Achievement.” *Quarterly Journal of Economics*, 114: 533-575.
- Hahn, J., P. Todd and W. Van der Klauww, (2001) “Identification and Estimation of Treatment Effects with a Regression-Discontinuity Design”, *Econometrica* 69 (1), pp. 201-09.
- Imbens, G. and T. Lemieux (2009), “Regression Discontinuity Designs: A Guide to Practice”, *Journal of Econometrics*, 142: 655-674.
- Clark, D. (2009) "The Performance and Competitive Effects of School Autonomy", *Journal of Political Economy*, 117(4), 745-783.
- Cellini, S., Ferreira, F., and Rothstein, J. (2010) “The Value of School Facility Investments: Evidence from a Dynamic Regression Discontinuity Design.” *Quarterly Journal of Economics*, 125: 215-261.
- Chay, K., McEwan, P., and Urquiola, M. (2005) “The Central Role of Noise in Evaluating Interventions that Use Test Scores to Rank Schools,” *American Economic Review*, 95(4): 1237—1258.
- Battistin, E., Brugiavini, A., Rettore, E., and Weber, G. (2009) “The Retirement Consumption Puzzle: Evidence from a Regression Discontinuity Approach,” *American Economic Review*, 99(5): 2209-2226
- Frandsen, B., Frolich, M., and Melly, B. 2012. “Quantile Treatment Effects in the Regression Discontinuity Design.” *Journal of Econometrics* 168, pp. 382-395.
- Angrist, J. and Rokkanen, M. (2014) “Wanna Get Away? Regression Discontinuity Estimation of Exam School Effects Away from the Cutoff” (with Discussion), *Journal of the American Statistical Association*, 110(512); 1331-1344.
- Battistin, E. and Rettore, E. (2008) “Inelegibles and Eligible Non-participants as a Double Comparison Group in Regression Discontinuity Designs,” *Journal of Econometrics*, 142: 715—730.
- Bertanha, M. and Imbens, G. (2014), “External Validity in Fuzzy Regression Discontinuity Designs,” NBER working paper No. 20773.
- Card, D., Lee, D., Pei, Z., and Weber, A. (2015) “Inference On Causal Effects In A Generalized Regression Kink Design,” *Econometrica*, 83(6): 2453–2483.
- Papay, J., Willet J., and Murnane, R. (2011), “Extending the Regression-Discontinuity Approach to Multiple Assignment Variables,” *Journal of Econometrics*, 161: 203—207.

- Rokkanen, M. (2015), “Exam Schools, Ability and the Role of Affirmative Action: Latent Factor Extrapolation in the Regression Discontinuity Design,” mimeo, Columbia University.
- Calonico, S., Cattaneo, M., and Titiunik, R. (2014), “Robust Nonparametric Confidence Intervals For Regression-Discontinuity Designs,” *Econometrica*, 82(6): 2295–2326.
- Dong, Y. and Lewbel, A. (2015), “Identifying the Effect of Changing the Policy Threshold in Regression Discontinuity Models,” *The Review of Economics and Statistics*, 97(5): 1081–1092.
- Imbens, G. and Zajonc, T. 2009. “Regression Discontinuity Design with Multiple Forcing Variables,” Mimeo, <https://www.researchgate.net/publication/265317533>.
- Dong, Y. 2017. “Regression Discontinuity Designs With Sample Selection,” *Journal of Business & Economic Statistics*, DOI: 10.1080/07350015.2017.1302880
- Dong, Y., Lee, Y., and Gou, M. 2018. “Regression Discontinuity Designs with a Continuous Treatment,” Mimeo.
- Kolesar, M. and Rothe, C. 2018. “Inference in Regression Discontinuity Designs with a Discrete Running Variable,” *American Economic Review*, 108(8): 2277–2304.

d. Principal stratification [This topic may or may not be covered]

- * Lecture Notes (to be presented in class by instructor).
- * [AP] Chapter 4.
- * [IR] Chapters 23 through 25
- * [IW] Section 6.3
- Frangakis, C. and Rubin, D. (2002), “Principal Stratification in Causal Inference,” *Biometrics*, 58: 21—29.
- Mealli, F. and Mattei, A. (2012), “A Refreshing Account of Principal Stratification,” *International Journal of Biostatistics*, 8(1), 1-37.
- Mealli, F. and Pacini, B. (2013), “Using Secondary Outcomes to Sharpen Inference in Randomized Experiments with Noncompliance,” *Journal of the American Statistical Association*, 108(503), 1120—1131.
- VanderWeele, T.L. (2011), “Principal Stratification—Uses and Limitations,” *The International Journal of Biostatistics*, 7, Article 28.
- Li, F., Mattei, A., and Mealli, F. (2012), “Bayesian Inference for Causal Effects in Randomized Experiments with Noncompliance: The Role of Multivariate Outcomes,” *Proceedings of the 46th Scientific Meeting of the Italian Statistical Society, Rome, Italy*.
- Long, D. and Hudgens, M. (2013), “Sharpening Bounds on Principal Effects with Covariates,” *Biometrics*, 69: 812—819.

E. Introduction to Bounds for Treatment Effects

- * Lecture Notes (to be presented in class by instructor).
- * [IR] Chapter 22
- * Manski, C. (1990), “Nonparametric Bounds on Treatment Effects”, *American Economic Review* 80 (2), pp. 319-323
- * Blanco, G., Flores, C., and Flores-Lagunes, A. (2013), “Bounds on Average and Quantile Treatment Effects of Job Corps Training on Wages,” *Journal of Human Resources*, 48, 657-697.

- Ichino, A., Mealli, F., and Nannicini, T. (2008), “From Temporary Help Jobs to Permanent Employment: What Can We Learn From Matching Estimators and Their Sensitivity?”, *Journal of Applied Econometrics*, 23: 305-327.
- Blundell, R., Gosling, A., Ichimura, H., and Meghir, C. (2007) “Changes in the Distribution of Male and Female Wages Accounting for Employment Composition Using Bounds.” *Econometrica* 75(2):323–63.
- Horowitz, J., and Manski, C. (1995), “Identification and Robustness with Contaminated and Corrupted Data,” *Econometrica*, 63, 281-302.
- Manski, C. (1997), “Monotone Treatment Response”, *Econometrica*, 65, 1311—1334.
- Manski, C., and Pepper, J. (2000), “Monotone Instrumental Variables: With an Application to the Returns to Schooling”, *Econometrica*, 68, 997-1010.
- Chen, X., Flores, C., and Flores-Lagunes, A. “Bounds on Average Treatment Effects with an Invalid Instrument, with an application to the Oregon Health Insurance Experiment”, mimeo, Syracuse University.
- Flores, C. and Flores-Lagunes, A. “Nonparametric Partial Identification of Causal Net and Mechanism Average Treatment Effects”, mimeo, 2010, California Polytechnic State University.
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F. Causal Mediation—An Introduction [This topic may or may not be covered]

- * Lecture Notes (to be presented in class by instructor).
- * Flores, C.A. and Flores-Lagunes, A. (2009) “Identification and Estimation of Causal Mechanisms and Net Effects of a Treatment under Unconfoundedness,” IZA Discussion Paper No. 4237.
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- Imai, K., L. Keele, and T. Yamamoto (2010): “Identification, Inference and Sensitivity Analysis for Causal Mediation Effects,” *Statistical Science*, 25, 51–71.

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IMPORTANT POLICIES:

Academic Integrity

Syracuse University's Academic Integrity Policy reflects the high value that we, as a university community, place on honesty in academic work. The policy defines our expectations for academic honesty and holds students accountable for the integrity of all work they submit. Students should understand that it is their responsibility to learn about course-specific expectations, as well as about university-wide academic integrity expectations. The policy governs appropriate citation and use of sources, the integrity of work submitted in exams and assignments, and the veracity of signatures on attendance sheets and other verification of participation in class activities. The policy also prohibits students from submitting the same work in more than one class without receiving written authorization in advance from both instructors. Under the policy, students found in violation are subject to grade sanctions determined by the course instructor and non-grade sanctions determined by the School or College where the course is offered as described in the Violation and Sanction Classification Rubric. SU students are required to read an online summary of the University's academic integrity expectations and provide an electronic signature agreeing to abide by them twice a year during pre-term check-in on MySlice. For more information about the policy, see <http://academicintegrity.syr.edu>.

The Violation and Sanction Classification Rubric establishes recommended guidelines for the determination of grade penalties by faculty and instructors, while also giving them discretion to select the grade penalty they believe most suitable, including course failure, regardless of violation level. Any established violation in this course may result in course failure regardless of violation level.

In accordance with the S.U. academic-integrity policy, the following are course-specific rules:

- ***Homework Policy***— *I encourage students to work together on homework assignments; however, students are responsible to hand in separate assignments using their own procedures and explanations. No two assignments should be identical.*

Any violation of the above rules will result in serious course sanctions (up to and including failure of the course). In addition, all violations will be reported to the Academic Integrity Office.

Religious Observances

SU's religious observances policy is at http://supolicies.syr.edu/emp_ben/religious_observance.htm

Disability Accommodations

Our community values diversity and seeks to promote meaningful access to educational opportunities for all students. Syracuse University is committed to your success and to supporting Section 504 of the Rehabilitation Act of 1973 as amended and the Americans with Disabilities Act (1990). This means that in general no individual who is otherwise qualified shall be excluded from participation in, be denied benefits of, or be subjected to discrimination under any program or activity, solely by reason of having a disability.

If you believe that you need accommodations for a disability, please contact the Office of Disability Services (ODS), <http://disabilityservices.syr.edu>, located at 804 University Avenue (room 309), or call (315) 443-4498 for an appointment to discuss your needs and the process for requesting accommodations. ODS is responsible for coordinating disability-related accommodations and will issue students with documented disabilities "Accommodation Authorization Letters", as appropriate. Since accommodations may require early planning and generally are not provided retroactively, please contact ODS as soon as possible. You are also welcome to contact me privately to discuss your academic needs although I cannot arrange for disability-related accommodations.