POGO 750: Advanced Macroeconomic and Econometric Analysis for Public Policy Research

George Mason University
Schar School of Policy and Government

Draft Syllabus – May 2025

Fall 2025
Lectures: Tuesdays 4:30-7:10 pm, Van Metre Hall 479

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This course introduces PhD students (and other advanced students authorized by the instructor) to both long-run economic growth theory and econometric methods for policy evaluation and research. We will motivate the role of public policy – and institutions – to enhance economic performance using the theoretical framework of endogenous growth models pioneered by Paul Romer (2018 Nobel laureate in economics), and others.

Then, we will emphasize experimental design policy evaluations using randomization techniques of the type underlying the economic development research agenda of Abhijit Banerjee, Esther Duflo and Michael Kremer (2019 Nobel laureates in economics). Finally, we will study some cutting-edge analyses with quasi-experimental designs (QEDs) – including synthetic control methods, econometric applications of causal inference with machine learning algorithms, difference-in-differences with matching techniques, and econometric estimation based on rare-event data.

Seminal models will be presented and discussed to motivate the key task of economic analysis in policy: to furnish evidence using scientific methods that can be the base for policy design and formulation. After exploring the theoretical foundation from endogenous growth models about the key role of policy to shape market outcomes, we will study impact evaluation methods to assess causal effects of programs constituting public policy packages. Our learning objectives are (i) solidifying the understanding of channels whereby public policy

impinges on economic performance in the long-term, and (ii) harnessing the building blocks for program evaluation methodology to assemble a toolkit for causal inference.

The assignments for the course are designed not only to further understanding of diverse areas of advanced macroeconomic and econometric analysis for public policy research but also to develop students' quantitative methods toolkit. There are two research assignments: a referee report (with a possible replication component) and a term paper (that can include original data work). The referee report is a short critical review of an empirical economic policy paper describing its contributions (and shortfalls), as well as suggestions for further research.

One alternative for the term paper involves empirical analysis extending the results in the refereed paper – through replication and possible empirical extensions. Another possibility for the term paper is a detailed critical literature review of existing research on a specific policy issue – possibly followed by original empirical analysis exploring extensions of that literature. There will be an in-class presentations of the research prospectus (early in the semester) for the term-paper.

Assessments and Grades

For the overall grade, class participation counts for 15%, the referee report for 15%, the term-paper prospectus for 15%, the in-class presentation 15%, and the term paper for 40%.

The grading scale is: 100-97 (A+), 96-94 (A), 93-90 (A-), 89-87 (B+), 86-84 (B), 83-80 (B-), 79-77 (C+), 76-74 (C), 73-70 (C), 69-60 (D), <60 (F).

Outline of Topics

This list of topics (as well as the list of readings) is for general reference and we may not be able to cover all the materials over the semester. We will almost certainly cover all of topics 1-3, with partial coverage possible for topics 4-6 as time permits.

1) Public policy and long-run economic performance: Endogenous growth models
    a) New-classical and endogenous growth
    b) Convergence and catch-up growth: The role of economic policy
2) Experimental designs for program impact evaluations: Randomized Control Trials
    a) Mechanisms: structural econometrics, qualitative evaluations, mixed methods
    b) Horizon: short – vs. long–run effects
    c) Scaling-up criteria: Outcome space for cost-benefit analysis (CBA)

3) Synthetic methods: Approach, relevance and shortfalls
4) Optimized matching: Pros and cons across contexts of different techniques
5) Machine learning in econometrics: Potential applications and drawbacks
6) Selected topics on causal inference: Rare events, clustering, sampling, and statistical non-significance

Reading List

Selected General Reference Econometrics Textbooks

- Angrist, J., and S. Pischke, *Mostly Harmless Econometrics*, Princeton U. Press 2009.
- Wooldridge, J., *Econometric Analysis of Cross-Section and Panel Data*, 2nd Edition, 2010.
- Wooldridge, J., *Introductory Econometrics: A Modern Approach*, 7th Edition, 2019.

Assigned Papers by Topic

The lists below include assigned papers covered in class, designated by asterisk (*), and optional papers to expand your knowledge on issues especially germane to your research interests.

1. Public policy and long-run economic performance: Endogenous growth models

a) Neo-Classical and Endogenous Growth: OLG, Solow and Romer Models

* Kugler, M. (2018), "The Economics of Ideas: Paul Romer, former Berkeley Economics Professor, receives the 2018 Nobel Prize," Weblog at Department of Economics, UC Berkeley, 2018.

* The Committee for the Prize in Economic Sciences in Memory of Alfred Nobel, "Economic Growth, Technological Change and Climate Change," Scientific Background on the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel, 2018.

* Landes, D. (1990) "Why are we so Rich and They so Poor?", *American Economic Review*, Vol. 80, 1990.

Easterly, W. (2001) *The Elusive Quest for Growth: Economists Adventures and Misadventures in the Tropics,* Cambridge University Press, Chapter 2 and 3.

Diamond, P. (1965) "National Debt in a Neoclassical Growth Model", *American Economic Review,* Vol. 55, 5, December, pp. 1126-1150.

Feldstein, M. (1996) "The Missing Piece in Policy Analysis: Social Security Reform," *American Economic Review,* Vol. 86, No. 2, May, pp 1-14.

***** Romer P. (1989), "Capital Accumulation in the Theory of Long-Run Growth," in Robert Barro, ed. *Modern Business Cycle* Theory, Harvard University Press.

***** Lucas, R. (1990) "Why doesn't Capital Flow from Rich to Poor Countries," *American Economic Review*, Vol. 80, No. 2, May.

***** Kremer, Michael, Jack Willis and Yang You (2021). "Converging to Convergence," *NBER Macroeconomics Annual*, 2021, Vol. 36, Martin S. Eichenbaum and Erik Hurst (Eds.).

b) Convergence and Catch-up Growth: Theory, Evidence and Econometric Issues

***** Romer, P. (1990) "Endogenous Technological Change," *Journal of Political Economy*, Vol. 98, No. 5.

***** Kremer, M. (1993) "Population Growth and Technological Change One Million BC to 1990," *Quarterly Journal of Economics*, August.

***** Kremer, Michael, Jack Willis and Yang You (2021). "Converging to Convergence," *NBER Macroeconomics Annual*, 2021, Vol. 36, Martin S. Eichenbaum and Erik Hurst (Eds.).

***** Romer, P. (2019), "Nobel Lecture: On the Possibility of Progress," The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel, 2018.

***** Mankiw, G., D. Romer and D. Weil (1992) "A Contribution to the Empirics of Economic Growth," *The Quarterly Journal of Economics*, Vol. 107, No 2.

Sala-I-Martin X. (1997), "I Just Ran Two Million Regressions," *American Economic Review*.

Caselli, F., G. Esquivel and F. Lefort (1996), "Reopening the convergence debate: A new look at cross-country growth empirics," *Journal of Economic Growth*, V. 1, No. 3.

Kugler, M. (2006), "Spillovers from foreign direct investment: Within or between industries?" *Journal of Development Economics*, Volume 80, Issue 2, Pages 444-477

2. Experimental designs for program impact evaluations: Randomized Control Trials

* The Committee for the Prize in Economic Sciences in Memory of Alfred Nobel, "Understanding Development and Poverty Alleviation," Scientific Background on the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel, 2019.

a) Causal mechanisms and structural econometrics

* Athey S, Imbens GW, "Econometrics of randomized experiments," in *Handbook of Economic Field Experiments*, Vol. 1, ed. AV Banerjee, E Duflo, pp. 73–140. Amsterdam: North-Holland, 2017.

* Duflo, Esther, Rachel Glennerster, and Michael Kremer, "Using Randomization in Development Economics Research: A Toolkit," in T. Schultz and John Strauss, eds., *Handbook of Development Economics,* Vol. 4. Amsterdam and New York: North Holland, 2008.

Banerjee AV, Chassang S, Snowberg E., "Decision theoretic approaches to experiment design and external validity," in *Handbook of Economic Field Experiments,* Vol. 1, ed. AV Banerjee & E Duflo.

* Moffitt, Robert A., "New Developments in Econometric Methods for Labor Market Analysis." *Handbook of Labor Economics,* Vol. 3A, 1999.

Rosenzweig, Mark R., and Kenneth I. Wolpin, "Natural Natural Experiments in Economics." *Journal of Economic Literature,* Vol. 38, 827-874, December 2000.

* Angrist, Joshua, and Alan Krueger, "Empirical Strategies in Labor Economics." *Handbook of Labor Economics,* Vol. 3A, 1999, Sections 1-2.1

b) Horizon: short – vs. long–run effects

* Bouguen, A., Y. Huang, M. Kremer, and E. Miguel, "Using Randomized Controlled Trials to Estimate Long-Run Impacts in Development Economics," *Annual Review in Economics,* Vol. 11, pp. 523–61, May, 2019.

Deming, D., "Early Childhood Intervention and Life-Cycle Skill Development: Evidence from Head Start," *American Economic Journal: Applied Economics*, 1 (3): 111-34, 2009.

* Rothstein, J. and T. von Wachter, "Social Experiments in the Labor Market," *Handbook of Economic Field Experiments*, Vol. 2, ed. AV Banerjee & E. Duflo, 2017.

Angrist, A., E. Bettinger, E. Bloom, E. King, M. Kremer, "Vouchers for Private Schooling in Colombia: Evidence from a Randomized Natural Experiment," *American Economic Review,* 92 (5), pp. 1535-58, 2002.

* Angrist, A., E. Bettinger, M. Kremer, "Long-Term Educational Consequences of Secondary School Vouchers: Evidence from Administrative Records in Colombia," *American Economic Review,* Vol. 96, No. 3, pp. 847-862, 2006.

Bettinger, E., M. Kremer, M. Kugler, C. Medina, C. Posso and J. Saavedra, "School Vouchers, Labor Markets and Vocational Education," Working Paper, Stanford and Harvard Universities, 2019.

c) Scaling-up criteria: Outcome space for cost-benefit analysis (CBA)

Attanasio, O., A. Kugler, and C. Meghir, "Subsidizing Vocational Training for Disadvantaged Youth in Colombia: Evidence from a Randomized Trial," *American Economic Journal: Applied Economics*, Vol. 3(3), pp. 188-220, 2011.

Attanasio, O., A. Guarin, C. Medina and C. Meghir, "Vocational Training for Disadvantaged Youth in Colombia: A Long-Term Follow-Up," *American Economic Journal: Applied Economics,* 9(2), pp. 131-43, 2017.

* Kugler, A., M. Kugler, J. Saavedra and L. Herrera, "Long-Term Educational Consequences of Vocational Training in Colombia: Impacts on Young Trainees and Their Relatives," NBER Working Paper No. 21607, *Journal of Human Resources*, 2022.

3. Synthetic Methods

* Abadie, A. "Using Synthetic Controls: Feasibility, Data Requirements, and Methodological Aspects," *Journal of Economic Literature,* Vol. 59, No. 2, June 2021(pp. 391-425).

Abadie, A., Alexis Diamond and Jens Heinmuller, "Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California's Tobacco Control Program," *Journal of the American Statistical Association,* June 2010, 105(490), 493-505.

* Dmitry Arkhangelsky, Susan Athey, David A. Hirshberg, Guido W. Imbens, and Stefan Wager, "Synthetic Difference in Differences," *American Economic Review,* Vol. 111, No. 12, 2021

Abadie, A. and J. L'Hour, "A Penalized Synthetic Control Estimator for Disaggregated Data," *Journal of the American Statistical Association,* December 2021, 116(536), 1817–1834

4. Machine Learning in Econometrics

* Athey, S., "The Impact of Machine Learning on Economics," NBER Working Paper, 2018

* Athey, S. and G. Imbens, "Machine Learning Methods Economists Should Know About," *Annual Review of Economics,* Vol. 11:685-725, 2019.

Mullainathan S, and J. Spiess, "Machine learning: an applied econometric approach," *Journal of Economic Perspectives*, 31(2):87–106, 2017.

* Abadie A, and M. Kasy, "The risk of machine learning," *The Review of Economics and Statistics*, MIT Press, vol. 101(5), pages 743-762, December 2019.

Athey, S. and Imbens G., "Machine learning methods for estimating heterogeneous causal effects," Working Paper, Stanford University, Stanford, CA, 2017.

* Athey, S., "Machine Learning and causal Inference for Policy Evaluation," KDD '15: Proceedings of the 21th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, Pages 5–6, August 2015.

5. Optimized Matching Designs

Dehejia, R., S. Wahba, "Propensity score-matching methods for nonexperimental causal studies," *Review of Economics and Statistics,* 84 (1), 151-161, 2002.

Abadie, A. and G. Imbens, "On the Failure of the Bootstrap for Matching Estimators," *Econometrica*, 76(6), pp. 1537-1557, 2008

* S. Yang, G. Imbens, Z. Cui, D. Faries, Z. Kadziola, "Propensity Score Matching and Subclassification in Observational Studies with Multi-Level Treatments," *Biometrics,* Vol. 72, Issue 4, Pages 1055-1065, 2016.

* Abadie, A. and J. Spiess, "Robust Post-Matching Inference," *Journal of the American Statistical Association*, Vol. 117 - Issue 538, 2022

Abadie, A. and G. Imbens, "Matching on the Estimated Propensity Score," *Econometrica,* 84(2), pp. 781–807, 2016.

6. Selected Topics on Causal Inference

Abadie, A., M. Acevedo, M. Kugler, and J. Vargas, "Inside the War on Drugs: Effectiveness and Unintended Consequences of a Large Illicit Crops Eradication Program in Colombia," Working Paper, Kennedy School of Government, Harvard University, 2016.

* Abadie, A., S. Athey, G. Imbens, and J. Wooldridge, "When Should You Adjust Standard Errors for Clustering?" *Quarterly Journal of Economics,* October 2022.

Abadie, A., S. Athey, G. Imbens, and J. Wooldridge, "Sampling-based vs. Design-based Uncertainty in Regression Analysis," *Econometrica,* Vol. 88, No. 1, January 2020, 265–296

* Abadie, A., "Statistical Non-Significance in Empirical Economics," *American Economic Review: Insights,* vol. 2(2), pages 193-208, June 2020.

Key Dates – Fall 2025

August 26th: Neo-Classical Growth Model and Conditional Convergence

September 2nd: Endogenous Growth Theory and Sustainability

September 9th: Catch-up Growth and Divergence

September 16th: Ramsey Model and Over-Lapping Generations

September 23rd: Econometrics of RCTs and External Validity

* September 25th: Deadline for approval of topic for Term Paper

September 30th: Scaling up of Experiments and Cost Effectiveness Analysis

* October 6th: Oral presentations of Research Prospectus for Term Paper

10 min + 5 min Q&A, with 5-page draft for feedback

October 13th: Machine Learning (Applications) in Econometric

* October 20th: Matching Designs

Deadline for approval of paper selection for Referee Report

October 27th: Selected Topics on Causal Inference

November 3th: Selected Topics on Causal Inference

*November 10th: Synthetic Methods

Referee report is due before midnight (submission via email)

November 17th: Selected Topics on Causal Inference

November 24th: Thanksgiving Week

December 1st: Selected Topics on Causal Inference

*December 16th: No final exam – Term Paper due before midnight (submission via email)

Academic Standards

Academic Standards exist to promote authentic scholarship, support the institution's goal of maintaining high standards of academic excellence, and encourage continued ethical behavior of faculty and students to cultivate an educational community which values integrity and produces graduates who carry this commitment forward into professional practice.

As members of the George Mason University community, we are committed to fostering an environment of trust, respect, and scholarly excellence. Our academic standards are the foundation of this commitment, guiding our behavior and interactions within this academic community. The practices for implementing these standards adapt to modern practices, disciplinary contexts, and technological advancements. Our standards are embodied in our courses, policies, and scholarship, and are upheld in the following principles:

- Honesty: Providing accurate information in all academic endeavors, including communications, assignments, and examinations.
- Acknowledgement: Giving proper credit for all contributions to one's work. This involves the use of accurate citations and references for any ideas, words, or materials created by others in the style appropriate to the discipline. It also includes acknowledging shared authorship in group projects, coauthored pieces, and project reports.
- Uniqueness of Work: Ensuring that all submitted work is the result of one's own effort and is original, including free from self-plagiarism. This principle extends to written assignments, code, presentations, exams, and all other forms of academic work.

Violations of these standards—including but not limited to plagiarism, fabrication, and cheating—are taken seriously and will be addressed in accordance with university policies. The process for reporting, investigating, and adjudicating violations is outlined in the university's procedures here. Consequences of violations may include academic sanctions, disciplinary actions, and other measures necessary to uphold the integrity of our academic community.

The principles outlined in these academic standards reflect our collective commitment to upholding the highest standards of honesty, acknowledgement, and uniqueness of work. By adhering to these principles, we ensure the continued excellence and integrity of George Mason University's academic community.

Student responsibility: Students are responsible for understanding how these general expectations regarding academic standards apply to each course, assignment, or exam they participate in; students should ask their instructor for clarification on any aspect that is not clear to them.

Accommodations for Students with Disabilities

Disability Services at George Mason University is committed to upholding the letter and spirit of the laws that ensure equal treatment of people with disabilities. Under the administration

of University Life, Disability Services implements and coordinates reasonable accommodations and disability-related services that afford equal access to university programs and activities. Students can begin the registration process with Disability Services at any time during their enrollment at George Mason University. If you are seeking accommodations, please visit the Disability Services website for detailed information about the Disability Services registration process. Disability Services is located in Student Union Building I (SUB I), Suite 2500. Email: ods@gmu.edu. Phone: (703) 993-2474.

Student responsibility: Students are responsible for registering with Disability Services and communicating about their approved accommodations with their instructor in advance of any relevant class meeting, assignment, or exam.

FERPA and Use of GMU Email Addresses for Course Communication

The Family Educational Rights and Privacy Act (FERPA) governs the disclosure of education records for eligible students and is an essential aspect of any course. **Students must use their GMU email account** to receive important University information, including communications related to this class. Instructors will not respond to messages sent from or send messages regarding course content to a non-GMU email address.

Student responsibility: Students are responsible for checking their GMU email regularly for course-related information, and/or ensuring that GMU email messages are forwarded to an account they do check.

Title IX Resources and Required Reporting

As a part of George Mason University's commitment to providing a safe and non-discriminatory learning, living, and working environment for all members of the University community, the University does not discriminate on the basis of sex or gender in any of its education or employment programs and activities. Accordingly, **all non-confidential employees, including your faculty member, have a legal requirement to report to the Title IX Coordinator, all relevant details obtained directly or indirectly about any incident of Prohibited Conduct** (such as sexual harassment, sexual assault, gender-based stalking, dating/domestic violence). Upon notifying the Title IX Coordinator of possible Prohibited Conduct, the Title IX Coordinator will assess the report and determine if outreach is required. If outreach is required, the individual the report is about (the "Complainant") will receive a communication, likely in the form of an email, offering that person the option to meet with a representative of the Title IX office.

For more information about non-confidential employees, resources, and Prohibited Conduct, please see University Policy 1202: Sexual and Gender-Based Misconduct and Other Forms of Interpersonal Violence. Questions regarding Title IX can be directed to the Title IX Coordinator via email to TitleIX@gmu.edu, by phone at 703-993-8730, or in person on the Fairfax campus in Aquia 373.

Student opportunity: If you prefer to speak to someone confidentially, please contact one of Mason's confidential employees in Student Support & Advocacy (SSAC), Counseling and

Psychological Services (CAPS), Student Health Services (SHS), and/or the Office of the University Ombudsperson.