

Syllabus for ECON 8182:  
Empirical Methods for Dynamic Economic Analysis  
Mini 3, Spring 2024

The goal of this course is to provide a foundation in empirical methods that you are most likely to find useful for conducting dynamic economic analysis. We are limited by what can be covered in a seven-week course, so I will prioritize methods: (i) that are the best-bang-for-your-buck (widely applicable and increasingly relevant without being excessively demanding to learn), (ii) that you cannot easily learn from a book yourself, (iii) that are well suited for studying questions in which heterogeneity plays a key role, (iv) that aim to establish causal relationships, (v) on which I have useful personal advice to share.

## Course Requirements

The only way to learn empirical tools is by using them. With that in mind, this will be a very applied class: There will be 4 or 5 homework assignments that will ask you to download and clean data, select samples, replicate some existing empirical papers, estimate various models, and conduct causal inference analysis.

To do the assignments, you will need to use a software package/programming language suitable for empirical analysis, such as Stata or R. If you are empirically inclined, you want to master Stata or R for your thesis, so this is the best time to start learning one or both. (Python is great for many applications, but it is a more general-purpose language. So, it covers a much broader set of tools but is less convenient for detailed empirical work.) If you are unfamiliar with any of these though, be prepared to work harder than others to catch up, especially in the first half of the course. A solid understanding of first-year macro and micro is required, too.

To get credit for this course, you must complete **all** the homework assignments. You will submit all assignments electronically. Your submissions should include both the code that you use as well as a clearly written report (not a log of your output or a Jupyter notebook-type summary) that explains what you did and discusses your findings. I will describe how to do this further in class.

## Contact information

Office: Hanson Hall 4-177.

Contact me: After class or via email at [guvenen@umn.edu](mailto:guvenen@umn.edu)

## Textbooks and Reading Materials

The lectures will partly draw on chapters from a PhD-level textbook I am currently writing on computational and empirical methods for heterogeneous-agent models. About one-third of the book covers topics included in this course. I will distribute chapters before each lecture.

Here is a list of some books that are complementary to my notes. They contain detailed and authoritative treatments of the subjects we will study in this course.

## Some Useful Books

- *Economics and Consumer Behavior*, by Angus Deaton and John Muellbauer, Cambridge University Press.
- *Time Series Analysis*, by James Hamilton, Princeton University Press.
- *Microeconometrics: Methods and Applications*, Cameron and Trivedi, Cambridge University Press.
- *Mostly Harmless Econometrics: An Empiricist's Companion*, Joshua D. Angrist and Jörn-Steffen Pischke, Princeton University Press.
- *Mastering 'Metrics: The Path from Cause to Effect*, Angrist and Pischke, Princeton University Press.
- *Causal Inference*, Scott Cunningham, Yale University Press.
- *A Practical Introduction to Regression Discontinuity Designs: Foundations*: Cattenao, Idrobo and Titunik, Cambridge University Press.
- *Machine Learning: A Probabilistic Perspective*, by Kevin Murphy, MIT Press.

## TENTATIVE SCHEDULE

### 1. Week 1: Issues in Model Specification

- Utility Functions: Preferences over consumption; over consumption and leisure. Preferences for households (with home production, love/bliss, children, etc.). More Exotic Preferences (Habit formation, External habit, GHH preferences, Epstein-Zin preferences, etc.)
- Production Functions: Brief discussion. More on this topic in the Macro/Labor course.
- Functional Forms for Balanced Growth; King et al (1988)'s Conditions. Non-homothetic utility and how to get short-run non-balanced growth.
- Some Issues in Calibration:
  - Introducing sources of uncertainty and fluctuations: Stochastic driving processes for labor income, idiosyncratic firm productivity, wealth shocks, health shocks, etc.
  - Three key parameters in Macro: Risk aversion, EIS, and Frisch elasticity. What do we know about their values? When do they matter? When do they not?

### Reading:

- King, Plosser, Rebelo (JME, 2002): Technical Appendix to “*Production, Growth, and Business Cycles I: The Basic Neoclassical Model*,” JME.
- De Giorgio, Frederiksen, and Pistaferri (ReStud, 2020): “*Consumption Network Effects*” <https://web.stanford.edu/~pista/MS23898manuscript.pdf>
- Chetty and Szeidl (ECMA, 2016): “*Consumption Commitments and Habit Formation*” (A bit harder).
- Chetty and Szeidl (QJE 2007): “*Consumption Commitments and Risk Preferences*”, Vol 122, No 2.
- Epstein, Farhi, and Strzalecki (AER 2014): “*How Much Would You Pay to Resolve Long-Run Risk?*” <https://scholar.harvard.edu/files/farhi/files/epstein-farhi-strzalecki.pdf>
- Ljungqvist and Uhlig (AER 2000): “*Tax Policy and Aggregate Demand Management under Catching Up with the Joneses*”, Vol 90, No 3.

## 2. **Week 2: Empirical Analysis: Some Essential Tools and Ideas**

- Data Visualization and Non-Parametric Tools:
  - Perils of relying too heavily on simple statistics (e.g., correlation!)
  - Examples of nonlinearities that are hard to anticipate but have crucial consequences.
- How to Describe and Measure Distributions:
  - Perils of using higher-order standardized moments (example: Kim and White 2004).
  - Robust statistics: Quantile based measures.
- Quantile Regression: Estimation and Applications.
  - Non-parametric decompositions, Constructing counterfactual distributions (Machado-Mata, Dinardo-Fortin-Lemieux nonparametric decompositions).

## 3. **Weeks 3-4: Estimation with Panel Data: Methods and Issues**

- Time, Cohort, and Age effects:
  - The inherent identification problem. Identification via restrictions. Interpretation of estimates.
  - Synthetic Panel: Construction and estimation.
- Moment-Based Estimation Methods:
  - Generalized Method of Moments, Minimum Distance Estimation (brief review)
  - Simulated Method of Moments: How many moments? Which moments to select? Small sample bias. How to choose a weighting matrix? Differentiability of moments in estimated parameters.
  - Indirect Inference: the quadratic “Wald” objective; the “likelihood” objective, small sample bias properties.

## 4. **Week 5: Two-Way Fixed Effect Models:**

- The AKM (Abowd-Kramarz-Margolis) method:
  - Identification and estimation
  - Small Sample Bias and Corrections
- Critiques of AKM and Alternative Methods.

### **Readings:**

- Abowd, Kramarz, Margolis (ECMA, 1999): “*High Wage Workers and High Wage Firms*,” Vol 67, No 2.
- Card, Heining, and Kleine (QJE, 2013): “*Workplace Heterogeneity and the Rise of West German Wage Inequality*,” Vol 128, No 3.
- Card, Cardoso, Kline (QJE, 2016): “*Bargaining, Sorting, and the Gender Wage Gap: Quantifying the Impact of Firms on the Relative Pay of Women*,” Vol 131, No 2.
- Sorkin (QJE, 2018): “*Ranking Firms Using Revealed Preference*,” Vol 133, No 3.
- Bloom, Guvenen, Smith, Song, von Wachter (AER PP 2018): “*The Disappearing Large-Firm Wage Premium*,” Vol 108, No 5.
- De Melo (JPE, 2018): “*Firm wage differentials and labor market sorting: Reconciling theory and evidence*,” Vol 126, No 1.
- Song, Price, Guvenen, Bloom, von Wachter (QJE, 2019): “*Firming Up Inequality*,” Vol 134, No 1.

- Kline, Saggio, and Sølvsten (ECMA, 2020): “Leave-Out Estimation of Variance Components.” *Vol* 88, No 5: 1859–98.
- Engbom and Moser (AER, 2022): “*Earnings Inequality and the Minimum Wage: Evidence from Brazil*,” *Vol* 112, No 12.
- Andrews, Schank, and Upward EL, (2012): “High Wage Workers Match with High Wage Firms: Clear Evidence of the Effects of Limited Mobility Bias,” *Vol* 117, 824–827.

## 5. Weeks 6-7: Regression Analysis and Causal Inference: From Simple to Complex

- Regression and Causality:
  - Treatment effects: Average Treatment Effect, Local Average Treatment Effects, and their interpretation.
  - Establishing causality: sources of endogeneity problem.
  - Instrumental variables: identification, fixed effects, lagged dependent variables.
- Event Study Design: Estimation at Group Level, Difference in Differences estimation
- Estimation via Synthetic Controls: A Clever Generalization of DiD Estimation.
- Regression Discontinuity Design (RDD):
  - Identification and Challenges.
  - Sharp RDD, Fuzzy RD
- Bunching Estimators: Applications

## Readings:

- **Surveys:**
  - Athey, Susan and Guido Imbens (2017): “The State of Applied Econometrics: Causality and Policy Evaluation,” *Journal of Economic Perspectives*.
  - Abadie, A. (2021): Using Synthetic Controls: Feasibility, Data Requirements, and Methodological Aspects, *Journal of Economic Literature*.
  - Cattaneo, Matias, and Rocio Titunik (2022): “Regression Discontinuity Designs,” *Annual Review of Economics*.
  - Imbens, Guido W (2014) “Instrumental Variables: An Econometrician’s Perspective.” *Statistical Science* 29(3): 323–58.
- **Difference in Differences:**
  - Roth, Sant’Anna, Bilinski, Poe (2022): What’s trending in difference-in-differences? A synthesis of the recent econometrics literature, *Journal of Economic Literature*.
  - Card, David (1992): “Using Regional Variation to Measure the Effect of the Federal Minimum Wage.” *Industrial and Labor Relations Review* 46, 22–37.
  - Angrist, Joshua, and William Evans (1998): “Children and Their Parents’ Labor Supply: Evidence from Exogenous Variation in Family Size.” *American Economic Review* 88, 450–477.
- **Bunching estimators:**
  - Saez (2010): “Do Taxpayers Bunch at Kink Points?” *AEJ: Economic Policy*.
  - Kleven (2016): “*Bunching*,” *Annual Review of Economics*.
  - Bunching with Panel Data: Garbinti, Goupille-Lebret, Munoz, Stantcheva, Zucman (2023): “*Tax Design, Information, and Elasticities: Evidence from the French Wealth Tax*,” NBER WP 31333.
- **Synthetic Controls:**

- Abadie, A. and J. Gardeazabal (2003). The economic costs of conflict: A case study of the Basque Country. *American Economic Review* 93 (1), 113–132.
  - Abadie, A., A. Diamond, and J. Hainmueller (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.
  - Abadie, A. and J. L’Hour (2019). A penalized synthetic control estimator for disaggregated data. Working paper.
  - Karabarbounis, Lise, Nath (2023): [Minimum Wages and Labor Markets in the Twin Cities](#). Working Paper.
- Regression Discontinuity Design:
    - Lee, David (2008): “Randomized Experiments from Non-random Selection in U.S. House Elections.” *Journal of Econometrics* 142, 675–97.
    - Hahn, Jinyong, Petra Todd and Wilbur Van der Klaaw: “Identification and Estimation of Treatment Effects with a Regression-Discontinuity Design.” *Econometrica* 69, 201–9.
    - Angrist, Joshua, and Victor Lavy (2008): “The Effects of High Stakes High School Achievement Awards: Evidence from a Group-Randomized Trial.” *AER*.
  - Measurement error in micro data:
    - Measurement error in the right-hand side variable; in the left-hand side variable.
    - Is measurement error classical? (Brown, Bound, and Mathiowetz 2001)
    - Identification with measurement error (Blundell, et al 2008), correction for correlation, Heathcote et al (2010).
    - Identification (or lack thereof) without functional form assumptions in GMM

### **More Readings:**

Altonji, J.G., Segal, L.M., 1996. Small sample bias in GMM estimation of covariance structure. *Journal of Business and Economics Statistics* 109, 659–684.

Bound, J., C. Brown, and N. Mathiowetz (2001): “Measurement error in survey data,” in *Handbook of Econometrics*, ed. by J. Heckman, and E. Leamer, chap. 59, pp. 3705–3843. Elsevier.

Smith, Anthony, (1993): “Estimating Nonlinear Time-series Models Using Simulated Vector Autoregressions,” *Journal of Applied Econometrics*, December 1993, Vol. 8, S63–S84.

Gourieroux, C., A. Monfort, and E. Renault (1993), “Indirect Inference”, *Journal of Applied Econometrics* 8, S85-S118.

Gallant, R. and G. Tauchen (1996): “Which Moments to Match?”, *Econometric Theory* 12, 657-681.

Keane, M.P. (1994), “A Computationally Practical Simulation Estimator for Panel Data”, *Econometrica* 62, 95–116.

Nagypal, Eva (2007), “Learning-by-Doing Versus Learning about Match Quality: Can We Tell Them Apart?” *Review of Economic Studies*.

Guvenen, Fatih and A. Smith (2014): “Inferring Labor Income Risk and Partial Insurance from Economic Choices,” *Econometrica*.

Bruins, Duffy, Keane, and Smith (2018): “Generalized indirect inference for discrete choice models,” *Journal of Econometrics*.

Browning, M., L. P. Hansen, and J. J. Heckman (1999): “Micro data and general equilibrium models,” in *Handbook of Macroeconomics*, ed. by J. B. Taylor, and M. Woodford.

Blundell Richard, and Tom MaCurdy (1999): “Labor Supply: A Review of Alternative Approaches,” in *Handbook of Labor Economics*, vol. 3, North Holland

Domeij David, and Martin Floden (2006): “The Labor-Supply Elasticity and Borrowing Constraints: Why Estimates are Biased,” *Review of Economic Dynamics*

Imai S. and Micheal Keane (2004): “Intertemporal Labor Supply and Human Capital Accumulation,” *International Economic Review*.

Rogerson Richard, and Johanna Wallenius (2006): “Micro and Macro Elasticities in a Life Cycle Model with Taxes,” NBER wp 13017

Chang Yongsung and S. Kim (2006): “From Individual to Aggregate Labor Supply: A Quantitative Analysis Based on a Heterogeneous Agent Economy,” *International Economic Review*.

F. Guvenen (2007): “Reconciling Conflicting Evidence on the Elasticity of Intertemporal Substitution: A Macroeconomic Perspective,” *Journal of Monetary Economics*.

Rabin, Matthew (2000): “Risk Aversion and Expected-Utility Theory: A Calibration Theorem,” *Econometrica* 68(5), 1281-1292, September 2000.