

**ECONOMICS 244
APPLIED ECONOMETRICS**

This course examines identification issues in empirical microeconomics. It supplements topics covered in Economics 240A/B, 241A, with a focus on the sensible application of econometric methods to empirical problems in economics and policy research – particularly labor and health economics. The course examines issues that arise when analyzing non-experimental data and provides a guide for tools that are useful for applied research. The course also emphasizes how a basic understanding of theory and institutions can help inform the analysis. By the end of the course, students should have a firm grasp of the types of research designs that can lead to convincing analysis and be comfortable working with large-scale data sets.

Course Time: Friday, 9-11:30 in 608-7 Evans

Home Page: TBA

Office Hours: Tuesday and Friday, 4-5, 657 Evans Hall

Required Background: Economics 240A and B

Suggested Background: Economics 241A

Course Requirements:

Students should read assigned readings and attend all lectures as some class material will not be in the readings. There will be 4 applied exercises. There will be no final exam.

Class handouts will be available at Janet Henry's office in 643 Evans Hall and on the course home page.

Course Grading:

80% 4 Problem Sets (Applied Exercises)

20% Class participation

Late problem sets will not be accepted.

Many of the readings covered in class will be made available on the course webpage.

We will not follow any particular text. The following books may be useful as references on the econometric tools covered.

Amemiya, Takeshi, *Advanced Econometrics*, Harvard University Press, 1985.

Ashenfelter, Orley and David Card, *Handbook of Labor Economics*, Volume 3A, North-Holland, 1999.

Cook, Thomas and Donald Campbell, *Quasi-Experimentation, Design & Analysis Issues for Field Settings*, Houghton Mifflin, 1979.

Hsiao, Cheng, *Analysis of Panel Data*, Cambridge University Press, 1986.

Johnston, Jack and John DiNardo, *Econometric Methods*, Fourth Edition, McGraw-Hill, 1997.

Part I: Econometric Methods/Models

1. Introduction – econometric models, the scientific method, and “credible” inference.
2. The linear regression model and regression analysis as a statistical tool. Measurement error, “omitted variables” bias, and the functional form of the conditional expectation. When does the tool of linear regression lead to “causal” inferences?
3. Selection on observables and program evaluation. The method of matching and propensity score approaches to dimensionality reduction.
4. The regression discontinuity design.
5. Selection on unobservables and the treatment evaluation problem. Instrumental variables and two-stage least squares. Latent variables representation, selection and control function approaches. The switching regression model.
6. Heterogeneous treatment effects, self-selection, and identification of average treatment effects.
7. Experimental and Quasi-experimental research designs.
8. Linear panel data models and program evaluation. Random effects, correlated random effects, and fixed effects models. Dynamic panel data models and the feedback problem.

Part II: Topics in Health and Labor

1. Human capital models and production functions. Health production functions.
2. Effects of education and schooling interventions on production function. Effects of training.
3. Impacts of smoking, air pollution and other “inputs” on health.
4. Relations between economic status and health and the directions of causality. Race, economic status, and health.
5. Role of birth weight and other markers in health and economics research.
6. Long-run and intergenerational linkages between health and economic status.

Rough outline of lectures and readings

Lectures 1 and 2: Overview and the linear regression model

- Freedman, David, “Statistical Models and Shoe Leather,” *Sociological Methodology*, 21, 1991, 291-313.
- Popper, Karl, “Science: Conjectures and Refutations,” in *Philosophy of Science: The Central Issues*, Martin Curd and J.A. Cover, eds., W.W. Norton and Company, pp. 3-10.
- Angrist, Joshua and Alan Krueger, “Empirical Strategies in Labor Economics,” in *Handbook of Labor Economics*, Volume 3A, North-Holland, 1999, Chapter 23.
- DiNardo, John, and Jorn-Steffen Pischke, “The Returns to Computer Use Revisited: Have Pencils Changed the Wage Structure Too?” *Quarterly Journal of Economics*, 112(1), February 1997, 291-303.
- Ashenfelter, Orley and Alan Krueger, “Estimates of the Economic Return to Schooling from a New Sample of Twins,” *American Economic Review*, 84(5), December 1994, 1157-1173.

Lectures 3, 4, 5: Selection on observables, propensity score and matching methods

- Rosenbaum, Paul and Donald Rubin, “Reducing Bias in Observational Studies Using Subclassification on the Propensity Score,” *Journal of the American Statistical Association*, 79, 1985, 516-524.
- Lalonde, Robert, “Evaluating Econometric Evaluations of Training Programs with Experimental Data,” *American Economic Review*, 76(4), September 1986, 604-620.
- Dehejia, Rajeev and Sadek Wahba, “Causal Effects in Non-Experimental Studies: Reevaluating the Evaluation of Training Programs,” *Journal of the American Statistical Association*, 94, 1999, 1053-1062.
- Jeffrey Smith, and Petra Todd, “Does Matching Overcome Lalonde’s Critique of Nonexperimental Methods?” *Journal of Econometrics*, Volume 125 (1-2), 2004, 305-353.

Lecture 5, 6: Regression discontinuity design approaches to omitted variables bias

- Ashenfelter, Orley and David Card, "Using the Longitudinal Structure of Earnings to Estimate the Effect of Training Programs," *Review of Economics and Statistics*, 1985, 648-660.
- Cook, Thomas and Donald Campbell, "The Regression-Discontinuity Design," in *Quasi-Experimentation, Design & Analysis Issues for Field Settings*, Houghton Mifflin, 1979, 137-146.
- Chay, Kenneth Y., Patrick McEwan, and Miguel Urquiola, "The Central Role of Noise in Evaluating Interventions that Use Test Scores to Rank Schools," *American Economic Review*, September 2005.

Lectures 7, 8, 9, 10: Selection on unobservables, instrumental variables, control functions, heterogeneous treatment effects and self-selection

- Angrist, Joshua, Guido Imbens, and Donald Rubin, "Identification of Causal Effects Using Instrumental Variables," *Journal of the American Statistical Association*, 91, 1996, 444-455.
- Wooldridge, Jeffrey, "On Two Stage Least Square Estimation of the Average Treatment Effect in a Random Coefficient Model," *Economics Letters*, 56, 1997, 129-133.
- Garen, John, "The Returns to Schooling: A Selectivity Bias Approach with a Continuous Choice Variable," *Econometrica*, 52, 1984, 1199-1218.
- Ahn, Hyungtaik and James Powell, "Semiparametric Estimation of Censored Selection Models with a Nonparametric Selection Mechanism," *Journal of Econometrics*, 58(1), 1993, pp. 3-29.
- Heckman, James, "Dummy Endogenous Variables in a Simultaneous Equations System," *Econometrica*, 46, 1978, pp. 931-959.
- Heckman, James, "Varieties of Selection Bias," *American Economic Review*, 80, 1990, 313-318.
- Heckman, James and Bo Honoré, "The Empirical Content of the Roy Model," *Econometrica*, 59, 1990, pp. 1121-1149.
- Card, David, "The Causal Effect of Education on Earnings," in *Handbook of Labor Economics*, Volume 3A, Chapter 30, North-Holland, 1999.
- Chay, Kenneth and Michael Greenstone, "Does Air Quality Matter? Evidence from the Housing Market," *Journal of Political Economy*, April 2005, pp. 376-424.

Lectures 10, 11, 12: Panel data (and siblings) models

- Chamberlain, Gary, "Panel Data," Chapter 22 in *Handbook of Econometrics*, Volume II, 1984, pp. 1247-1318.
- Baltagi, Badi, "Dynamic Panel Data Models," Chapter 8 in *Econometric Analysis of Panel Data*, Wiley, 1995, pp. 125-148.
- Jakubson, George, "Estimation and Testing of the Union Wage Effect Using Panel Data," *Review of Economic Studies*, 58, 1991, pp. 971-991.
- Almond, Douglas, Kenneth Chay, and David Lee, "The Costs of Low Birth Weight," *Quarterly Journal of Economics*, August 2005.

Lectures 12, 13, 14: Health Capital, Demand for Health, and Health Production Functions

Background papers

- Becker, Gary S., "A Theory of the Allocation of Time," *The Economic Journal*, LXXV (1965), 493-517.
- Grossman, Michael, "On the Concept of Health Capital and the Demand for Health," *Journal of Political Economy*, 80 (1972), 223-255.
- Becker, Gary S. and Nigel Tomes, "Child Endowments, and the Quantity and Quality of Children," *Journal of Political Economy*, 84 (1976), S143-S162.

Rosenzweig, Mark R., and T. Paul Schultz, "Estimating a Household Production Function: Heterogeneity and the Demand for Health Inputs, and Their Effects on Birth weight," *Journal of Political Economy*, XCI (1983), 723-746.

Behrman, Jere R., Mark R. Rosenzweig, and Paul Taubman, "Endowments and the Allocation of Schooling in the Family and in the Marriage Market: The Twins Experiment," *Journal of Political Economy*, CII (1994), 1131-1174.

Recent research

Sexton, Mary and J. Richard Hebel, "A Clinical Trial of Change in Maternal Smoking and Its Effect on Birth Weight," *Journal of the American Medical Association*, 251, 1984, pp. 911-915.

Chay, Kenneth and Michael Greenstone, "Air Quality, Infant Mortality, and the Clean Air Act of 1970," mimeograph, UC-Berkeley, October 2003.

Almond, Douglas, Kenneth Chay and Michael Greenstone, "Civil Rights, the War on Poverty, and Black-White Convergence in Infant Mortality in Mississippi," mimeograph, UC-Berkeley, November 2003.

Almond, Douglas and Kenneth Chay, "The Long-Run and Intergenerational Impact of Poor Infant Health: Evidence from Cohorts Born During the Civil Rights Era," mimeograph, UC-Berkeley, April 2003.