

Course Syllabus

ECON 82800 **Panel Econometrics**

City University of New York – Graduate Center
Spring 2019
R 9:30-11:30, Graduate Center, 365 5th Ave, Room 6421

Professor Contact Information

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Office hours: T 2:30-4:00 and by appointment

Course Pre-requisites, Co-requisites, and/or Other Restrictions

The prerequisite for this class is ECON 82100, Econometrics I. Students probably will benefit from having had ECON 82200 (Econometrics II), ECON 82300 (Applied Microeconometrics), and/or ECON 82400 (Applied Macroeconometrics), but those courses are not a pre- or corequisite. There are no other pre- or corequisites or other restrictions for enrollment in this course. Students are advised that the course may include discussions of mathematical micro- and macroeconomic models and econometric techniques that authors have used in their empirical models.

Course Description

This course provides a theoretical and empirical overview of econometric techniques that may be used when studying panel data. Panel data are pooled observations of a cross-section of units such as individuals, households, firms, states, or countries, over time. The number of pooled observations per unit does not have to be the same, but that case does present some further complications. When feasible, the theoretical discussion of econometric techniques will be illustrated with empirical studies that use those same techniques. The techniques can also be used when cross-sectional data consist of groups, for example by city, state, and so forth, rather than of pooled data over several years.

Student Learning Objectives/Outcomes

This course promotes student learning in various ways:

1. Understand the advantages and disadvantages of panel data as compared to other data structures
 2. Learn econometric techniques for panel data
 3. Study applications in various fields of economics
 4. Apply these techniques in appropriate data settings
 5. Explore statistical/econometric software in regard to panel-econometric techniques
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Assessment: Grading Policy, Assignments, and Exam Dates

The semester grade will be based on a midterm exam, a final exam, several homework assignments, and a project proposal. The weights of these are:

Midterm exam (March 21).....	35 %
Final exam (May 16).....	35 %
Homework assignments (various dates)	15 %
Project proposal	15 %

The midterm exam covers the more introductory material of the course and thus relates to learning objectives (1) and (2).

The final exam is not cumulative but rather covers material discussed in the second half of the semester (which, however, builds on the foundation laid in the first half). Thus, it covers the more advanced topics and relates to learning objectives (2), (3) and (4).

Homework assignments apply new techniques learned in this course to data that are available on the internet, some at the Wiley Publisher's website and others elsewhere. There will be approximately four homework assignments. The software that will be used in this course is Stata, but if you know how to complete the same assignment with another software package (e.g., EViews, SAS, Matlab, R), that is acceptable. The homework assignments relate to learning objectives (4) and (5).

The aim of the project proposal is to draft the outlines of a research project that utilizes panel econometrics techniques. A successful paper outlines the research question, the relevant background in economic theory, the reason for panel econometrics techniques, the nature of the data that are needed for this project (whether in existence or not), and the type of panel econometric model that can address the research question. This assignment relates to learning objectives (1) and (4).

If the circumstances so demand, these descriptions and timelines are subject to change at the discretion of the Professor.

Required Textbook

Badi H. Baltagi, Econometric Analysis of Panel Data, 4th ed., Chichester, UK: John Wiley & Sons, 2008; 5th ed., Wiley, 2013.

Journal articles may be added to the list of readings that is provided below.

Other Helpful Course Materials

The following texts may be useful to students of the econometrics of panel data. The reading list refers to some of these texts explicitly.

Greene, W., Econometric Analysis, 7th ed., Prentice Hall, 2012; 8th ed, Pearson, 2018.

Hsiao, C., Analysis of Panel Data, Cambridge University Press, 2nd ed, 2004; 3rd ed., 2014.

Pesaran, M.H., Time Series and Panel Data Econometrics. Oxford: Oxford Univ Press, 2015.

Baltagi, B., ed., The Oxford Handbook of Panel Data, New York: Oxford Univ Press, 2015.

Arellano, M., Panel Data Econometrics, Oxford Univ Press, 2003.

Wooldridge, J., Econometric Analysis of Cross Section and Panel Data, MIT Press, 1999; 2nd ed., 2010.

Cameron, A.C., and P.K. Trivedi, Microeconometrics Using Stata. Stata Press, Revised edition., 2010.

Arellano, Manuel, and Bo Honore, "Panel data models: some recent developments." In J. Heckman and E. Leamer, eds., Handbook of Econometrics, Vol.5, Ch.53, North Holland, 2001.

Software References

Stata: www.stata.com

R: plm package: see <http://cran.r-project.org/web/packages/plm/>

Matlab: Panel Data Toolbox: see <http://www.paneldatatoolbox.com>

Course & Instructor Policies

Absence from any exam must be properly documented; otherwise a grade of 0 is assigned to a missed exam. Make-up exams are scheduled within the same week for those who missed an exam with proper documentation.

There is no extra credit work.

Homework assignments that are handed in after the due date are penalized 10% per business day.

Cellphones and pagers must be turned off. Recording the lecture is not permitted.

Reading Assignments

The following is a tentative calendar for this semester. Readings may be added at any time. References to specific books are given on p.2 above.

1. Introduction (31 Jan.)
 - Baltagi, Econometric Analysis of Panel Data, 5th ed., Ch.1
 - Hsiao, Analysis of Panel Data, 3rd ed., Ch. 1, 13
 - Greene, Econometric Analysis, 7th ed., Ch.11.1-2
2. One-way error component model (7 Feb. – 14 Feb.)
 - Baltagi, Econometric Analysis of Panel Data, 5th ed., Ch.2
 - Hsiao, Analysis of Panel Data, 3rd ed., Ch.3.1-5
 - Pesaran, Time Series and Panel Data Econometrics, Ch.26.1-7
 - Greene, Econometric Analysis, 7th ed., Ch.11.3-5
 - Cameron & Trivedi, Microeconometrics Using Stata, Ch.8
 - Arellano, Panel Data Econometrics, Ch.2
3. Two-way error component model (21 Feb.)
 - Baltagi, Econometric Analysis of Panel Data, 5th ed., Ch.3
 - Hsiao, Analysis of Panel Data, 3rd ed., Ch.3.6
 - Greene, Econometric Analysis, 7th ed., Ch.11.3-5
 - Pesaran, Time Series and Panel Data Econometrics, Ch.26.8, 26.10
4. Hypothesis testing (28 Feb.)
 - Baltagi, Econometric Analysis of Panel Data, 5th ed., Ch.4
 - Pesaran, Time Series and Panel Data Econometrics, Ch.26.9
 - Greene, Econometric Analysis, 7th ed., Ch.11.5
 - Jielai Ma and Wim Vijverberg. “Five Diagnostic Tests for Unobserved Cluster Effects.” Communications in Statistics – Simulation and Computation, 2010, 39:6, 1212-1227.
5. Heteroskedasticity and serial correlation (7 Mar)
 - Baltagi, Econometric Analysis of Panel Data, 5th ed., Ch.5
 - Hsiao, Analysis of Panel Data, 3rd ed., Ch.3.7-8
 - Greene, Econometric Analysis, 7th ed., Ch.11.6
6. Other ways of modeling heterogeneity in panel data models (14 Mar.)
 - Fatih Guvenen. “An empirical investigation of labor income processes.” Review of Economic Dynamics, 2009, 12, 58-79.
 - Jerry Coakley, Ana-Maria Fuertes, and Ron Smith. “Unobserved heterogeneity in panel time series models.” Computational Statistics & Data Analysis, 2006, 50, 2361-2380.
 - M. Hashem Pesaran. “Estimation and inference in large heterogeneous panels with multifactor error structure.” Econometrica, July 2006, 74:4, 967-1012.

- Jushan Bai. “Panel data models with interactive fixed effects.” Econometrica, July 2009, 77:4, 1229-1279.
- Pesaran, Time Series and Panel Data Econometrics, Ch.28:1-5
- Pesaran, Time Series and Panel Data Econometrics, Ch.29:1-4

Midterm Exam (21 March)

- Seemingly unrelated regression model (28 Mar.)
 - Baltagi, Econometric Analysis of Panel Data, 5th ed., Ch.6
 - Lei Zhang and Wim Vijverberg. “Seemingly Unrelated Regression with Panel Data: Mixed Effects and Hausman-Taylor Estimators.” Working Paper, UT-Dallas and CUNY, Apr 2011.
- Simultaneous equation model (4 Apr.)
 - Baltagi, Econometric Analysis of Panel Data, 5th ed., Ch.7
 - Hsiao, Analysis of Panel Data, 3rd ed., Ch.5
 - Greene, Econometric Analysis, 7th ed., Ch.11.8
 - Cameron & Trivedi, Microeconometrics Using Stata, Ch.9
- Dynamic panel data model (11 Apr.)
 - Baltagi, Econometric Analysis of Panel Data, 5th ed., Ch.8
 - Hsiao, Analysis of Panel Data, 3rd ed., Ch.4
 - Arellano, Panel Data Econometrics, Ch.7-8
 - Pesaran, Time Series and Panel Data Econometrics, Ch.27
 - Pesaran, Time Series and Panel Data Econometrics, Ch.28:6-11
 - Pesaran, Time Series and Panel Data Econometrics, Ch.29:5-8
 - Manuel Arellano and Bo Honore, “Panel data models: some recent developments.” In J. Heckman and E. Leamer, eds., Handbook of Econometrics, Vol.5, North Holland, 2001, Ch.53, Sec.2-3
 - Maurice J.G. Bun & Vasilis Sarafides, Oxford Handbook of Panel Data, Ch.3
 - Hyungsik Roger Moon, Benoit Perron, and Peter C.B. Phillips, Oxford Handbook of Panel Data, Ch.4
 - Jan F. Kiviet, Milan Pleus, and Rutger Poldermans. “Accuracy and efficiency of various GMM inference techniques in dynamic micro panel data models.” CESifo Working Paper 5189, January 2015.
 - William R. Hauk Jr. and Romain Wacziarg. “A Monte Carlo Study of Growth Regressions.” Journal of Economic Growth, June 2009, 14:2, 103-147.
- Models for unbalanced panel data (18 Apr.)
 - Baltagi, Econometric Analysis of Panel Data, 5th ed., Ch.9
 - Pesaran, Time Series and Panel Data Econometrics, Ch.26.12
 - Jushan Bai, Yuan Liao, and Jisheng Yang, Oxford Handbook of Panel Data, Ch.5
 - Tom Wansbeek and Arie Kapteijn. “Estimation of the error components model with incomplete panels.” Journal of Econometrics, 1989, 41, 341-361.
 - Peter Davis. “Estimating multi-way error components models with unbalanced data structures.” Journal of Econometrics, 2002, 106, 67-95.
 - Badi Baltagi. Seuck Heun Song, and Byoung Cheol Jung. “The unbalanced nested error component regression model.” Journal of Econometrics, April 2001, 101:2, 357-381.
 - Werner Antweiler. “Nested random effects estimation in unbalanced panel data.” Journal of Econometrics, April 2001, 101:2, 295-313.
- Limited dependent variable models (2 May)
 - Baltagi, Econometric Analysis of Panel Data, 5th ed., Ch.11
 - Manuel Arellano and Bo Honore, “Panel data models: some recent developments.” In J. Heckman and E. Leamer, eds., Handbook of Econometrics, Vol.5, North Holland, 2001, Ch.53, Sec.6-7

- Hsiao, Analysis of Panel Data, 3rd ed., Ch.7-8
- Pesaran, Time Series and Panel Data Econometrics, Ch.26.11
- William Greene, “Panel data models for discrete choice.” Oxford Handbook of Panel Data, Ch.6
- Myoung-jae Lee, “Panel conditional and multinomial logit models.” Oxford Handbook of Panel Data, Ch.7

12. Nonstationary data (9 May)

- Baltagi, Econometric Analysis of Panel Data, 5th ed., Ch.12
- Hsiao, Analysis of Panel Data, 3rd ed., Ch.10
- Cheng Hsiao. “Panel macroeconomic modeling.” USC-INET Research Paper 14-02, Sep 2014.
- In Choi, “Panel cointegration.” Oxford Handbook of Panel Data, Ch.2
- Pesaran, Time Series and Panel Data Econometrics, Ch.31

Review of Brownian motion and unit root data

- James D. Hamilton. Time Series Analysis. Princeton Univ Press 1994, Chs 17-19.
- Helmut Lutkepohl. New Introduction to Multiple Time Series Analysis. Springer 2006, App. C.8.
- Paul Hoel, Sidney C. Port, and Charles J. Stone. Introduction to Stochastic Processes. Waveland Press Inc., Long Grove, Ill., Chs. 4-5.

Spurious regression with panel data

- James D. Hamilton. Time Series Analysis, Princeton Univ Press 1994, Ch 18.3
- Peter C.B. Phillips and Hyunsik R. Moon. “Linear regression limit theory for nonstationary panel data.” Econometrica, Sept. 1999, 67:5, 1057-1111.
- Chihwa Kao. “Spurious regression and residual-based tests for cointegration in panel data.” Journal of Econometrics, 1999, 90:1, 1-44.
- Badi H. Baltagi, Chihwa Kao, and Long Liu. “Asymptotic properties of estimators for the linear panel regression model with random individual effects and serially correlated errors: the case of stationary and non-stationary regressors and residuals.” Econometrics Journal, 2008, 11, 554-572.
- Badi H. Baltagi, Chihwa Kao, and Sanggon Na. “Test of hypotheses in panel data models when the regressor and disturbances are possibly non-stationary.” Advances in Statistical Analysis, 2011, 95, 329-350.

Testing for stationarity in panel data

- Peter Pedroni. “Asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis.” Econometric Theory, June 2004, 20:3, 597-625.
- Jushan Bai and Serena Ng. “A PANIC attack on unit roots and cointegration.” Econometrica, July 2004, 72:4, 1127-1177.
- Jushan Bai and Serena Ng. “Panel unit root tests with cross-section dependence: a further investigation.” Econometric Theory, 2010, 26, 1088-1114.

Panel data models with factor structures

- Jushan Bai, Chihwa Kao, and Serena Ng. “Panel cointegration with global stochastic trends.” Journal of Econometrics, Apr. 2009, 149, 82-99.
- G. Kapetanios, M. Hashem Pesaran, and T. Yamagata. “Panels with non-stationary multifactor error structures.” Journal of Econometrics, Feb. 2011, 160, 326-348.

Monte Carlo evidence

- Jaroslava Hlouskova and Martin Wagner. “The performance of panel unit root and stationarity tests: results from a large scale simulation study.” Econometrics Reviews, January/February 2006, 25:1, 85-116.
- Martin Wagner and Jaroslava Hlouskova. “The performance of panel cointegration methods: results from a large scale simulation study.” Econometrics Reviews, March/April 2010, 29:2, 182-223.

13. Spatial data and panel econometrics (??)

- Baltagi, Econometric Analysis of Panel Data, 5th ed., Ch.13

- Hsiao, Analysis of Panel Data, 3rd ed., Ch.9-2
- Lung-fei Lee & Jihai Yu, “Spatial panel data models.” Oxford Handbook of Panel Data, Ch.12
- Pesaran, Time Series and Panel Data Econometrics, Ch.30

14. Attrition in Panel Data (??)

- Jerry Hausman and David R. Wise. “Attrition bias in experimental and panel data: the Gary Income Maintenance Experiment.” Econometrica, March 1979, 47:2, 455-473.
- Sean Beckett, William Gould, Lee Lillard, and Finish Welch. “The Panel Study of Income Dynamics after fourteen years.” Journal of Labor Economics, October 1988, 6:4, 472-492.
- John Fitzgerald, Peter Gottschalk, and Robert Moffitt. “An analysis of sample attrition in panel data.” Journal of Human Resources, Spring 1998, 33:2, 251-299.
- John Fitzgerald, Peter Gottschalk, and Robert Moffitt. “An analysis of the impact of sample attrition on the second generation of respondents in the Michigan Panel Study of Income Dynamics.” Journal of Human Resources, Spring 1998, 33:2, 300-344.
- Brahim Boudarbat and Lee Grenon. “Sample attrition in the Canadian Survey of Labor and Income Dynamics.” IZA Discussion Paper 7295, March 2013.

15. Other special topics (??)

- Baltagi, Econometric Analysis of Panel Data, 5th ed., Ch.10
- Hsiao, Analysis of Panel Data, 3rd ed., Ch.9, 11, 12
- Erik Meijer, Laura Spierdijk, and Tom Wansbeek, “Measurement error in panel data.” Oxford Handbook of Panel Data, Ch.11

Final Exam (May 16)

Datasets

The textbook author provides six datasets on the Wiley Publisher’s website.¹ To understand these data, when they get used in this course, the following papers should be read:

- B. Baltagi and J. Griffin (1983). “Gasoline demand in the OECD: an application of pooling and testing procedures.” *European Economic Review*, 22, 117-137.
- B. Baltagi, J. Griffin and W. Xiong (2000) “To pool or not to pool: Homogeneous versus heterogeneous estimators applied to cigarette demand.” *Review of Economics and Statistics*, 82 (1), 117-126.
- B. Baltagi and D. Levin (1992). “Cigarette taxation: raising revenues and reducing consumption.” *Structural Change and Economic Dynamics*, 3, 321-335.
- B. Baltagi and N. Pinnoi (1995). “Public capital stock and state productivity growth: further evidence for an error components model.” *Empirical Economics*, 20, 351-359.
- C. Cornwell and P. Rupert (1988). “Efficient estimation with panel data: an empirical comparison of instrumental variable estimators.” *Journal of Applied Econometrics*, 3, 149-155.
- D. Harrison and D. Rubinfeld (1978). “Hedonic housing prices and the demand for clean air.” *Journal of Environmental Economics and Management*, 5, 81-102.
- A. Munnell (1990). “Why has productivity declined? Productivity and public investment.” *New England Economic Review*, 3-22.

Academic Integrity

The faculty expects from its students a high level of responsibility and academic honesty. Because the value of an academic degree depends upon the absolute integrity of the work done by the student for that degree, it is imperative that a student demonstrate a high standard of individual honor in his or her scholastic work.

¹ See <http://bcs.wiley.com/he-bcs/Books?action=index&itemId=1118672321&bcsId=4338>, click on “Browse by Resources” and then on “Datasets”. You need to register to use these and other resources.

Scholastic dishonesty includes, but is not limited to, statements, acts or omissions related to applications for enrollment or the award of a degree, and/or the submission as one's own work or material that is not one's own. As a general rule, scholastic dishonesty involves one of the following acts: cheating, plagiarism, collusion and/or falsifying academic records. Students suspected of academic dishonesty are subject to disciplinary proceedings.

Plagiarism, especially from the web, from portions of papers for other classes, and from any other source is unacceptable and will be dealt with under the university's policy on plagiarism.

Email Use

I recognize the value and efficiency of communication between faculty/staff and students through electronic mail. At the same time, email raises some issues concerning security and the identity of each individual in an email exchange. For this reason, I will consider email from students official only if it originates from a "gradcenter" student account. This allows me to maintain a high degree of confidence in the identity of all individual corresponding and the security of the transmitted information.

Withdrawal from Class

The administration of this institution has set deadlines for withdrawal of any course. These dates and times are published in the academic calendar. Administration procedures must be followed. It is the student's responsibility to handle withdrawal requirements from any class. In other words, I cannot drop or withdraw any student. You must do the proper paperwork to ensure that you will not receive a final grade of "F" in a course if you choose not to attend the class once you are enrolled.