PS2701
ADVANCED METHODOLOGY: LONGITUDINAL ANALYSIS
Fall Semester 2009: Tuesday 3-5:25 PM, 4500 Posvar Hall

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Course Description

These lectures aim to provide students with an overview of statistical methods appropriate for the analysis of longitudinal data, or data collected on multiple units (individuals, states, dyads, countries) at more than one point in time. The lectures will focus on models for the analysis of "panel data," which (by convention) is used to describe data with relatively large number of units and relatively few time points. Other kinds of longitudinal data will be mentioned briefly, including "time-series-cross-section data" (fewer units and many time points) and "event history analysis," which is used to model whether and when certain events occur (e.g. war, cabinet dissolution, Senate confirmation of Supreme Court justices).

The emphasis throughout will be on taking advantage of the benefits that longitudinal data provide the researcher in making inferences about causal dynamics, while at the same time being sensitive to the specific problems and complexities that emerge when conducting longitudinal analyses. On the benefits side, longitudinal data provides the researcher with increased ability to:

1) model directly individual-level change and growth in dependent variables;
2) test alternative lag structures and models of reciprocal causality between variables;
3) estimate causal effects after controlling for the confounding effects of measurement error;
4) estimate models that control for unmeasured unit-specific effects or "unobserved heterogeneity;"
5) estimate models that specify and account for variation in individual-level intercepts, slopes and/or rates of change over time

Obstacles in achieving these goals abound however, and are made more difficult by problems commonly found in longitudinal analyses, such as autocorrelated disturbances, missing data and panel attrition. We will consider all of these issues, some more briefly than others because of time constraints.

A note on the level of mathematical/statistical difficulty in the course: This is not formally a "statistics" class; that is, there will not be an emphasis on derivations of appropriate statistical estimators and so forth. Rather, the emphasis will be on grasping the underlying logic of the various models, understanding how, when and why to use them to achieve the goals specified above in your own research, and learning how to profit from, and to critique, published works in the discipline that make use of these techniques. There will be a reasonable amount of mathematics, formulas, etc. that will be needed to understand the various models and methods, but all of it will be presented in ways that, ideally, will help guide your own research endeavors. I am assuming only that you have had basic courses in regression and the linear model and that you have taken the summer "math camp" offered by the Department.

Texts

Finkel, Steven E. 1995. *Causal Analysis with Panel Data*. Thousand Oaks, Ca.: Sage Publications.

Rabe-Hesketh, Sophia, and Anders Skrondal. 2005. *Multilevel and Longitudinal Analysis with Stata.* College Station, Tx.: Stata Press.

Singer, Judith D. and John B. Willett. 2003. *Applied Longitudinal Data Analysis: Modeling Change and Event Occurrence*. New York: Oxford University Press.

Supplemental References:

Stata Press. 2007. *Longitudinal/Panel Data Reference Manual, Release 10*.

Kaplan, David. 2002. *Structural Equation Modeling: Foundations and Extensions*. Thousand Oaks, Ca.: Sage Publications.

Hedeker, Donald, and Robert D. Gibbons. 2006. *Longitudinal Data Analysis*. New York: Wiley-Interscience.

Woolridge, Jeffrey. 2002. *Econometric Analysis of Cross-Sectional and Panel Data*. Cambridge, Ma.: MIT Press.

Statistical Packages

We will use two statistical packages in the course. LISREL will be used in Unit 1 and Unit 3, Section 2, and STATA will be used for the other Units and Topics. Both of these packages are available in the Department's graduate student computer lab. If you want a personal copy of LISREL, go to http://www.ssicentral.com/ where there is information on purchases of the full version, rentals of the complete version for a shorter period of time, and a free downloadable "student version" which will be adequate for purposes of the class examples. If you want a personal copy of STATA 10.0, go to http://www.stata.com/order/educational.html# and click on the information under "GradPlans."

Requirements

Grades will be based on a 20-25 page research paper (40%), two homework exercises which relate to specific statistical methods and problems we will discuss (25% each), and an oral presentation (with Power Point and/or related materials) of your research paper on December 8 or December 10 (10%). The paper will be a quantitative analysis, using methods from this course, of longitudinal panel data that you will collect or access from social science archives or other sources. The paper should have some substantive interest to you or be relevant to your studies in the graduate program; ideally, you can think of it as the first draft of a convention paper or possible journal publication (see King, Gary. 2005. "Publication, Publication." *PS: Political Science and Politics*). The paper will discuss your basic theoretical framework, your hypotheses, statistical models, results, possible problems with the analysis and what you may have done to correct or account for these problems. It will conclude with a discussion of the relevance of your findings for the general topic and for future research. The paper will be due on December 8.

The homework exercises will be periodic problems or data to analyze and will illustrate aspects of the statistical techniques being covered in class. They will be due on October 20 and November 24.

Course Outline

The course is organized by units and then topics within units. We will maintain a certain amount of flexibility with the schedule, so that we can spend more time on some topics/units and scale back on others as circumstances warrant.

UNIT 1: Structural Equation Panel Models (September 1, 8, 15, 22)

1. Unidirectional and Reciprocal Causal Effects Models
Finkel, chapters 1-3 and Appendix.
Kaplan, David, *Structural Equation Modeling*, chapters 2, 6.

2. Measurement Error Models
Finkel, chapter 4.
Kaplan, David, *Structural Equation Modeling*, chapter 3.

Applications:
Paxton, Pamela. 2002. "Social Capital and Democracy: An Interdependent Relationship." *American Sociological Review* 67: 254-277.
Green, Donald and Bradley Palmquist. 1990. "Of Artifacts and Partisan Instability." *American Journal of Political Science* 34: 872-902.
Hakanen, Jari, Wilmar Schaufeli, and Kirsi Ahola. 2008. "The Job Demands-Resources Model: A Three-Year Cross-Lagged Study Of Burnout, Depression, Commitment, And Work Engagement", *Work and Stress* 22(3): 224-241.
Hetherington, Marc, and Suzanne Globetti. 2002. "Political Trust and Racial Policy Preferences", *American Journal of Political Science* 46(2): 253-275.
Bollen, Kenneth. 2009. Liberal Democracy Series I, 1972-1988: Definition, Measurement, and Trajectories", *Electoral Studies* 28: 368-374.

UNIT 2: Econometric Panel Models (for Continuous Dependent Variables)
(September 29, October 6, October 20, October 27, November 3)

1. Fixed Effects, First Differences, and Treatment Effects Models

Woolridge, Jeffrey. 2006. "Pooling Cross-Sections Across Time: Simple Panel Data Methods" and "Advanced Panel Data Methods." Chapters 13 and 14 in *Introductory Econometrics*. Thomson South-Western Publishers.

Rabe-Hesketh and Skrondal, *Multilevel and Longitudinal Modeling Using Stata*, ch. 2.

Allison, Paul D. 1994. "Using Panel Data to Estimate the Effect of Events", *Sociological Methods and Research* 23(2): 174-199.

Angrist, Joshua D. and Jőrn-Steffen Pischke, Chapters 2 and 5 in *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton University Press: 2009.

Stata Commands and Descriptions of: XT, XTSET, XTDES, XTREG

Application:

Green, Donald P., Soo Yeon Kim, and David H. Yoon. 2001. "Dirty Pool." *International Organization* 55: 441-468.

Beck, Nathaniel, and Jonathan Katz. 2001. "Throwing Out the Baby with the Bath Water: A Comment on Green, Kim and Yoon. *International Organization* 55: 487-495.

Gilligan, Daniel O., and John Hoddinott. 2007. "Is There Persistence in the Impact of Emergency Food Aid: Evidence on Consumption, Food Security, and Assets in Rural Ethiopia", *American Journal of Agricultural Economics* 89 (2): 225-242.

Finkel, Steven E., and Amy Erica Smith. 2009. "Civic Education, Political Discussion, and the Social Transmission of Democratic Knowledge and Values in a New Democracy: Kenya 2002," revised version of 2008 APSA paper.

HOMEWORK 1 HANDED OUT OCTOBER 6, DUE OCTOBER 20

2. Random Effects and "Compromise Models"

Plűmper, Thomas and Vera E. Troeger, 2007. "Efficient Estimation of Time-Invariant and Rarely Changing Variables in Finite Sample Panel Analyses with Unit Fixed Effects," *Political Analysis* 15: 124-139.

Bafumi, Joseph, and Andrew Gelman. 2006. "Fitting Multilevel Models When Predictors and Group Effects Correlate," Paper presented at the Midwest Political Science Association Meetings, Chicago, Illinois.

Application:

Alonso, Sonia, and Ruben Ruiz-Rufino. 2007. "Political Representation and Ethnic Conflict in New Democracies", *European Journal of Political Research* 46(2): 237-267.

2. Dynamic Panel Models and Endogenous Regressors

Wawro, Gregory. 2002. "Estimating Dynamic Panel Models in Political Science." *Political Analysis* 10: 25-48.

Halaby, Charles. 2004. Panel Models in Sociological Research: Theory into Practice. *Annual Review of Sociology* 30: 535-44.

Wilson, Sven, and Daniel Butler. 2007. "A Lot More to Do: The Sensitivity of Time Series Cross-Section Analyses to Simple Alternative Specifications", *Political Analysis* 15: 101-123.

Stata Commands and Descriptions of: XTABOND, XTIVREG, XTIVREG2, XTREGAR, XTDPD, XTDPSSYS

Applications:

Rajan, Raghuram, and Arvind Subramanian. 2005. "Aid and Growth: What Does the Cross-Country Evidence Really Show?" *International Monetary Fund Working Paper*.

Green, Donald P., and David Yoon. 2002. "Reconciling Individual and Aggregate Evidence Concerning Partisan Stability: Applying Time-Series Models to Panel Survey Data." *Political Analysis* 10: 1-24.

Kosack, Stephen. 2002. "Effective Aid: How Democracy Allows Development Aid to Improve the Quality of Life", *World Development* 31(1): 1-22.

UNIT 3: Multilevel Growth Models and Models for Non-Continuous Dependent Variables (November 10, 17, 24, December 1)

1. Longitudinal Mixed Effects and Growth Models
Singer, Judith D. and John B. Willett, *Applied Longitudinal Data Analysis*, chapters 1-7.
SPSS, Inc. 2005. *Linear Mixed-Effects Modeling in SPSS: An Introduction to the MIXED Procedure.*
Rabe-Hesketh and Skrondal, Chapter 1.
Hedeker, Donald, and Robert D. Gibbons. 2006. "Missing Data in Longitudinal Studies." Chapter 14 in *Longitudinal Data Analysis*. New York: John Wiley.
Stata Commands and Description: XTMIXED, XTLINE

Application:
Finkel, Steven E., Anibal Pérez-Liñán, and Mitchell A. Seligson, 'The Effects of U.S. Foreign Assistance on Democracy Building, 1990-2003," *World Politics* 59, April 2007.

2. Latent Curve Models
Singer and Willett, *Applied Longitudinal Data Analysis*, chapter 8.

Application:
Paxton, Pamela, Melanie M. Hughes and Matthew Painter. 2009. "The Difference Time Makes: Latent Growth Curve Models of Women's Political Representation," *European Journal of Political Research* 48 (forthcoming).

3. Multilevel Generalized Linear Models (for Non-Continuous Dependent Variables)
Rabe-Hesketh and Skrondal, Chapter 4, 5.
Agresti, Alan, James G. Booth, James P. Hobert, and Brian Caffo. 2000. "Random Effects Modeling of Categorical Response Data." *Sociological Methodology* 30: 27-80.
Stata Commands and Descriptions of: XTLOGIT, XTMELOGIT.

Application:
Plutzer, Eric. 2002. "On Becoming a Habitual Voter." *American Political Science Review* 96: 41-56.

4. Generalized Estimating Equations
Zorn, Christopher. 2001. "Generalized Estimating Equations for Correlated Data: A Review with Applications," *American Journal of Political Science* 45: 470-490.
Stata Commands and Descriptions of XTGEE, XTPROBIT

Application:
Whitby, Kenny J., and George A. Krause. 2001. "Race, Issue Heterogeneity, and Public Policy: The Republican Revolution in the 104th Congress and the Representation of African-American Policy Interests." *British Journal of Political Science* 31: 555-572.

HOMEWORK 2 HANDED OUT NOVEMBER 17, DUE NOVEMBER 24

December 8, 10: Paper Presentations

PAPERS DUE DECEMBER 8