PSC 8185.10: MULTILEVEL MODELING
Department of Political Science, George Washington University

Semester: Spring 2011
Time: Mondays, 6:10-8:00pm
Location: Duques 359

Professor Brandon Bartels
Campus Address: 476 Monroe (2115 G Street NW)
Phone: 994-8403
E-mail: bartels@gwu.edu
Office hours: Open-door policy for graduate students

COURSE DESCRIPTION

In this course, you will master the foundations of a methodology consisting of a class of models falling under the "multilevel modeling" umbrella. Multilevel data structures consist of more than one level of analysis, with each level consisting of different units of analysis. In the most common multilevel structure, data are hierarchical and possess a nesting structure. In a two-level hierarchical structure, units of analysis from the lowest level (level one) are nested within units from level two (for example, voters [level-one units] nested within congressional districts [level-two units]). In a three-level model, a third level of analysis is present, within which level-two units are nested (e.g., voters nested within congressional districts nested within states [level-three units]).

Importantly, all varieties of multilevel models share common types of statistical and methodological issues, and moreover, they allow unique opportunities for modeling various types of political and behavioral processes. We will examine a wide range of multilevel modeling topics in this course.

COURSE PREREQUISITE(S)

A course in linear regression (OLS) is required. It would be very helpful to have taken a basic maximum likelihood estimation course.

REQUIRED AND RECOMMENDED BOOKS

The following book is required for the course. I will not place orders of this book at the University bookstore, as you will be much better off purchasing these online.

Rabe-Hesketh, Sophia, and Anders Skrondal. 2008. *Multilevel and Longitudinal Modeling Using Stata* (Second Edition). Stata Press. [Available for purchase at www.statapress.com]

We will occasionally draw on material from the following textbooks. These are also recommended readings.

Gelman, Andrew, and Jennifer Hill. 2007. *Data Analysis Using Regression and Multilevel/Hierarchical Models*. Cambridge University Press.

Raudenbush, Stephen, and Anthony Bryk. 2002. *Hierarchical Linear Modeling*. Sage.

Skrondal, Anders, and Sophia Rabe-Hesketh. 2004. *Generalized Latent Variable Modeling: Multilevel, Longitudinal, and Structural Equation Models*. Chapman & Hall/CRC.

In addition, we will read journal articles (including both technical and application articles) throughout the semester. I will hand out a list of articles (a mix of recommended and required readings) before our second meeting.

SOFTWARE

We'll rely on two software programs: *Stata* (preferably version 10 and after) and, to a lesser extent, *WinBUGS*. We will use Stata's built-in commands for estimating multilevel models (the "xt" family) as well as *GLLAMM*, which is an add-on package to Stata, that estimates multilevel models. All of the worked examples in the Rabe-Hesketh and Skrondal book use Stata. *WinBUGS*, which can be downloaded for free, estimates models via the Bayesian / MCMC approach (Gibbs sampling).

LEARNING OUTCOMES

As a result of completing this course, students will:

1. Possess a comprehensive understanding of the methodological issues surrounding multilevel data.
2. Be prudent methodological consumers and practitioners when it comes to interpreting and applying these types of models.
3. Be able to write a paper—using the methods discussed in class—capable of being published in a professional journal.
4. Be able to write a dissertation chapter using the methods discussed in class.

GRADING

1. Attendance and Class participation (50 points): Students are expected to complete all of the assigned readings, to attend each class, and to participate in class sessions.

2. Problem sets: Three problem sets (100 points each) will constitute a supermajority of your responsibilities. Each problem set will require you to demonstrate your understanding of the material and the ability to make appropriate interpretations. The due dates, also noted in the Course Outline section of the syllabus, are as follows:

Problem Set 1: Wed., Feb. 23 by 5:00pm
Problem Set 2: Thurs., Mar. 31 by 5:00pm
Problem Set 3: Friday, Apr. 29 by 5:00pm

Two notes on problem sets:

- Note that the problem sets are not due on Mondays. Please email (bartels@gwu.edu) your completed problem set to me by the deadline for each problem set. I will send you an email confirmation once I receive your problem set. *Consider your problem not yet handed in until you receive a confirmation email from me*. This guards against the old excuse of, "You mean you didn't receive my email?"
- Feel free to work with your classmates on the problem sets. Collaboration can be beneficial for mastering the material. However, ***you must do your own work***. That is, while you can work together, ***the final product that you hand in must be your own work***.

3. Final Paper (100 points): Due on our designated final exam date (TBA). For the final paper, you will use the skills you have learned throughout the class to analyze and write up results from a multilevel model (or models) using your own data. Importantly, the paper project is also intended to give you practice toward mastering the art of writing a research paper (in particular, discussing results and how they relate back to the substantive research question(s), the theory, and hypotheses). The paper should be roughly 15 pages (double-spaced) and it should resemble the second half of a journal article. The paper will be written as if the intro, assessment of relevant work, and theory sections have already been written. Use a small amount of space to give me a rough outline of the research question, literature assessment, and the theory. List the hypotheses to be tested, and then write up the data and results section as you would do for a journal article. I strongly encourage you to think about your research question very early in the semester and to make progress on the paper gradually throughout the semester. Students should touch base with me about their papers—particularly regarding the data they are interested in analyzing—sometime before the middle of the semester.

ACADEMIC INTEGRITY

I personally support the GW Code of Academic Integrity. It states: "Academic dishonesty is defined as cheating of any kind, including misrepresenting one's own work, taking credit for the work of others without crediting them and without appropriate authorization, and the fabrication of information." For the remainder of the code, see: http://www.gwu.edu/~ntegrity/code.html

SUPPORT FOR STUDENTS OUTSIDE THE CLASSROOM

DISABILITY SUPPORT SERVICES (DSS)

Any student who may need an accommodation based on the potential impact of a disability should contact the Disability Support Services office at 202-994-8250 in the Marvin Center, Suite 242, to establish eligibility and to coordinate reasonable accommodations. For additional information please refer to: http://gwired.gwu.edu/dss/

UNIVERSITY COUNSELING CENTER (UCC) ***202-994-5300***

The University Counseling Center (UCC) offers 24/7 assistance and referral to address students' personal, social, career, and study skills problems. Services for students include:

- crisis and emergency mental health consultations
- confidential assessment, counseling services (individual and small group), and referrals http://gwired.gwu.edu/counsel/CounselingServices/AcademicSupportServices

SECURITY

In the case of an emergency, if at all possible, the class should shelter in place. If the building that the class is in is affected, follow the evacuation procedures for the building. After evacuation, seek shelter at a predetermined rendezvous location.

SCHEDULE

Note: Below, I include the general topics that we'll cover for each session. I will announce readings the week before each topic.

1. **Jan. 10**: Course introduction and introduction to multilevel modeling

   [**Note**: No class on Jan. 17 – MLK Jr. Day.]

2. **Jan. 24**: Pooling, unobserved heterogeneity, and general model specification

3. **Jan. 31**: The random intercept model (aka, random effects) and alternatives (e.g., the fixed effects model); specification and estimation

4. **Feb. 7**: Random intercept model; assumptions and interpretations

5. **Feb. 14**: Estimation and interpretation of the random intercept model

   [**Note**: No class on Feb. 21 – Presidents' Day.]

   Problem Set 1 Due Wednesday, Feb. 23

6. **Feb. 28**: Random coefficient model; model specification and interpretation

7. **Mar. 7**: Estimation and interpretation of the random coefficient model

   [**Note**: No class on Mar. 14. Spring Break is March 14-19.]

8. **Mar. 21**: Model fit, model comparison, computing substantive quantities of interest

9. **Mar. 28**: Continue model fit, model comparison, computing substantive quantities of interest

   Problem Set 2 Due Thursday, March 31

10. **Apr. 4**: Bayesian approach to multilevel models using Markov Chain Monte Carlo (MCMC)

11. **Apr. 11**: Bayesian approach continued; multilevel models for binary dependent variables; general model specification

12. **Apr. 18**: Multilevel models for binary dependent variables; estimation, interpretation, and generating quantities of interest

13. **Apr. 25**: Multilevel models with three levels of analysis

14. **Apr 27 (Wed.)**: Multilevel models for other types of non-continuous dependent variables; additional topics (by popular demand)

    Problem Set 3 due Friday, Apr. 29
    Final Paper due on our designated final exam day (TBA)