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Note:
Citations for the remainder of this issue are online at:
http://www.nd.edu/~apsacp/backissues.html.

Strategies of Analysis for Multi-Country Individual-Level Data*

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Why do some citizens hold their governments accountable for economic performance more than others, and how is this affected by characteristics of the political system (Powell and Whitten 1993)? Which decision rules do voters employ when deciding how to cast their ballot and how is this affected by their institutional environment (Kedar 2004)? Why are some individuals more likely to turn out to vote than others, and how is turnout affected by characteristics of the party system (Jusko and Shively 2004)? These questions and others, asked by students of comparative politics, involve explanations that incorporate units of analysis nested within one another. Most of these explanations conceptualize individuals as nested within other units (e.g., polities, institutional mechanisms, particular elections) and therefore provide clear micro and macro components for constructing causal accounts.

The summer 2004 issue of *APSA-CP* called attention to the increasing availability of large collaboratively gathered cross-national datasets of individuals, such as the World Values Survey, the Comparative Study of Electoral Systems, and the various “Barometer” projects (Norris 2004). Typically, such collaborative data consist of thirty or so surveys, totaling more than 50,000 individual responses. They are excellent vehicles to address multi-level questions such as those noted above, that involve both analysis at the level of individual citizens of countries, and analysis across countries of the effects of macro-variables such as the economy or governmental institutions.

> “...[by] modeling the effects of macro-level variables across clusters, one moves beyond [...] an ad hoc examination of individual clusters, towards a more general understanding of political regularities.”

Below, we review various strategies to analyze these data sets, concluding that a two-step strategy that takes advantage of the special structure of such data is particularly promising. National surveys are constructed by aggregating clusters of individual data that are large enough to sustain independent analysis on their own. Although the motivation for this note is the analysis of nested sets of national surveys, and although for

purposes of presentation in this essay we provide examples from the analysis of cross-national individual-level data, the discussion that follows applies to any analysis of multi-level data in which micro-level clusters are large enough to sustain independent analysis. Therefore, when discussing research strategies below we use the more general terminology of micro- and macro-effects.[1]

Working in a Multi-Level World

There are two advantages to modeling such nested data systematically in some form of hierarchic analysis, rather than either approaching the different parts of the data set in an ad hoc way or sweeping them all together into an undifferentiated dataset. First, by systematically modeling the effects of macro-level variables across clusters, one moves beyond the idiosyncratic effects that might be imputed from an ad hoc examination of individual clusters, toward a more general understanding of political regularities. Second, from the other side, acknowledging the clustering of the data rather than sweepingly pooling the micro units allows for causal heterogeneity across macro units without much complication. For example, one can compare the effect of Basque origin on vote choice in Spain to that of Maori origin on vote choice in New Zealand. Furthermore, one can allow for differential effects; the effect of education on turnout in Finland can differ from that of education on turnout in Greece.

What should we desire in a hierarchic strategy for analysis of data such as these? It should be statistically efficient; that is, it should make full use of the information in the data, but without adding any unnecessary additional constraints that do not contribute to explanation of the dependent variable. It should do full justice to both individual-level processes and to macro-level processes. It should be flexible, allowing us to deal appropriately with complexities in relationships from one macro unit to another. Additionally, it is helpful if the procedures of analysis parallel as much as possible the way an analyst would explore the data: the more transparent the modeling procedure, the greater the possibilities for discovery.

> "In a hierarchical linear model, all relevant individual-level [and] macro-level relationships [...] are specified in a single model."

The data are often analyzed either by partitioning them or by pooling them. In a partitioned analysis, the relationship of interest is estimated separately for each macro unit, with the results compared across these units fairly casually (e.g., Tucker, Pacek, and Berinsky 2002).[2] The main disadvantage of a partitioning strategy is that it provides little basis for evaluating differences in patterns across macro units and does not allow for the incorporation of system-level variables. Also, if the number of countries becomes larger than five or six, it becomes difficult to eyeball the analyses in a useful way.

In a pooling strategy, the analyst pools all of the data into a huge individual-level data set and analyzes the relationship of interest across those individuals, often with some macro-variables included as contextual characteristics of the individuals. Hellwig (2001), for example, investigates the effects of trade openness on patterns of economic voting by estimating a single set of parameters for the effects of economic evaluations on support for incumbent parties and incorporating system-level variables as moderators of individual-level relationships. Pooling often assumes that the relationship does not vary in expectation across macro-level units – an assumption which is usually untenable.[3] Allowing for the possibility of causal heterogeneity, unless it is restricted to a very small number of variations from a standard relationship, may lead in some occasions to hundreds of parameters to be estimated. Imagine estimating a vote choice model across multiparty systems. Five parties, eight covariates variables, and ten countries will result in 4x9x10=360 parameters to be estimated. In extreme cases, where all coefficients are allowed to vary by macro unit, a pooling strategy is in essence analogous to a partitioning strategy where the relationship in each macro unit is estimated separately.

Recently, a number of scholars have begun using hierarchical linear models for these data sets. This is a major step forward. In a hierarchical linear model, all relevant individual-level relationships, macro-level relationships, and possible interactions are specified in a single model.

However, at a conference on multi-level analysis held at Princeton University in October, 2004, several scholars came to the conclusion that a two-step strategy is a compelling strategy for analysis in many cases. This deceptively simple strategy is actually a variant of hierarchical linear modeling, but because it breaks the analysis out into two steps it is more transparent and more flexible. Using this strategy the analyst first estimates the quantity of interest for each macro unit. Then, in a second step, she models the quantity of interest (e.g., estimated level, estimated slope) as a dependent variable

across the macro-units, predicted from macro-level variables such as political institutions of the countries.[4] This has several advantages:

• As compared with hierarchical linear modeling, it is possible to use different functional forms at the two steps; for instance, the analysis within countries could use a probit model, while the model at the macro-level could be linear.

• It may be possible to use different right-hand formulations from one macro-unit to another; for example, it might be wise to control for views on Chinese reunification in modeling a Taiwanese sample, but we would obviously not include that variable in other countries' formulations.

• Outlier cases are easily detectable at the second stage, and can then either be incorporated into the analysis or be treated as exceptional.

• While all of these things could be accommodated in a standard one-step hierarchical linear model, the effort quickly becomes very cumbersome.

• And most importantly for us, the two-step strategy is very intuitive and simple, and is therefore a good vehicle for discovery.

• Finally, in the case of cross-national analysis, the two-step strategy to at least some extent helps to bridge the two broad schools of comparative method: those who emphasize analysis of variation across countries, and those who emphasize internal relationships in particular countries.

None of these advantages might be worthwhile if the two-step strategy did not have the desirable properties of a single-equation model like pooling or hierarchical linear modeling, but as Jusko and Shively (2004) prove for at least one version of the two-step strategy, the two-step strategy estimates parameters without bias or loss of efficiency. This may be one of those rare instances in which the necessities of good statistical generalization and the necessities of careful observation converge. For these data sets there is no statistical loss in careful consideration of the varying nature of processes in different countries. While the two-step strategy certainly does not eliminate the contrast between large-N analysis and case-centered investigation, it does go some way to bridging the two approaches.

Nonetheless, there are two considerations that are worth mentioning. First, the dependent variable in the second step is not known with certainty. Rather, it is estimated in the first step, and therefore its estimation uncertainty must be incorporated into the analysis in the second step. Second, since in the first step of the two-step strategy a model is separately estimated for each macro unit, efficiency rests on an implicit assumption regarding independence of estimates across macro units conditional on the covariates included in each model in the first step. This is intuitive; estimating, say, a decision rule French voters employ separately from that of Japanese voters, probably bears no loss of information. Such a strategy might be costly, however, if one could take advantage of covariation among individual-level observations across polities.

On-going and Future Research: An Invitation

The question of approaches for the analysis of cross-national multi-level data has recently generated significant interest among comparativists and political methodologists. At the Princeton conference, the authors and several others presented comparative research in which we explicitly considered the question of how to analyze cross-national multilevel data-sets. We have invited others in the field (both comparativists and methodologists) to respond to our discussions, and their comments will be submitted with the original set of papers, as a special issue, to *Political Analysis*. Our discussions continued at the 2005 Midwest Political Science Association Annual Meetings with a roundtable discussion and a panel presentation. We hope that other students of comparative politics will join our conversation about the substantive potential in analyzing such multilevel data as well as the strategies for analyzing them.

Notes

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[1] Of course, the analysis can consist of more than two levels.

[2] In their "first cut," Tucker and his colleagues also pool the data across countries, and estimate a common individual-level model.

[3] Even if a "fixed-effects" model is chosen, in which a dummy variable is included in the analysis as a contextual variable for each individual's country, this only taps varying levels of the dependent variable from one country to another; it leaves intact the assumption that the relationship of interest is the same in all.

[4] The only slight complication is that because sample sizes may have been different there may be induced heteroskedasticity at the second step; this can be corrected either with the Huber-White correction or by using generalized least squares at the second step.