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A METHODOLOGICAL COMMENT ON "ECONOMIC SEGMENTATION, WORKER POWER, AND INCOME INEQUALITY"

The recent paper by Kalleberg, Wallace, and Althauser ("Economic Segmentation, Worker Power, and Income Inequality," *AJS* 87 [November 1981]: 651–83) is likely to have a lasting impact on the study of social stratification in sociology. It represents the best extant attempt to combine traditional status-attainment questions with current insights from labor market, Marxist, and organizational approaches to stratification. Because this paper is likely to be important, some comment is necessary on a serious methodological flaw that weakens the authors' conclusions and threatens the future usefulness of "structural-level" stratification research.

Because Kalleberg et al. (1981) combine individual- and structural-level data within multiple regression models, serious problems arise in interpreting those models. The authors use two very different sources of information within one structural equation model. They combine aggregate industry-level data with self-reported income and personal and job characteristics. For stratification researchers like me, who are interested in incorporating structural properties into our explanation of individual phenomena, the appropriateness and interpretation of models such as Kalleberg, Wallace, and Althauser provide must be understood.

Primarily the authors' data come from survey instruments familiar to sociologists in which a sample of individuals are asked about their industry, income, occupation, and certain work characteristics. The authors supplement this information with aggregate data (familiar to economists) on industry averages for characteristics that are theoretically interesting. In addition, job skill characteristics from the Dictionary of Occupational Titles are appended to self-reported information on occupational characteristics. These are widely different levels of data collection. The authors admit (p. 655) that firm rather than industry data are more appropriate theoretically, but because only industry-level data are available, they opt for industrial averages for their measures of economic segmentation. The authors are in a theoretical bind. They want to prove that their structural model is superior to the individual-level analysis of traditional status-attainment models but do not have data on the actual institutional structures which affect the occupational experience of their sample of workers. They are forced to substitute industry averages for the actual firm- or establishment-level data that would directly reflect the individual's structural position.

The regression analyses are carried out on an individual rather than industry level of analysis. Individuals are assigned industry scores, and the familiar status-attainment models are run with industry segmentation

and worker power variables included. This means that, for any one individual, the industry segmentation values assigned will be industry averages rather than the actual value for the firm (or, better still, department: see Talbert and Bose [1977]) in which the person works. The problem within a regression model becomes one of comparability between individually accurate and industry average variables in terms of the meanings of their coefficients.

Because the aggregate industry variables are industry averages, we can expect that for any one individual the error between the industry score and the true score will be much larger than the error between self-reported scores and true scores. Thus, we can expect that the economic segmentation coefficient will be unstable because of unknown and nonsystematic error components, and that these variables may tend toward nonsignificance when in fact they should be significant. In fact, an inspection of table 2 in the Kalleberg et al. article reveals that the self-reported segmentation variable (establishment size) coefficients are consistently larger and more likely to be significant than the other segmentation variables.

In trying to interpret the relative importance of different variable effects within an equation, the researcher cannot, given the available data, distinguish among differences in effect. The authors' observation that worker power contributes a larger increment to explained variance (p. 699) and the consistently more significant and generally larger coefficients of the worker power versus economic segmentation variables must be understood within this context of noncomparability.

I shall propose two methods for dealing with this issue of interpreting coefficients.

The first allows the researcher to remain at an individual level of analysis but sacrifices much information. Given a model with noncomparable independent or predictor variables—in this case, caused by vast inconsistencies in the plausible error assumptions—no comparison of coefficients should be attempted, and the investigator should rely on the significance (or nonsignificance) of different variables and their direction of effect in testing theoretical propositions. This is then similar to a log-linear analysis in the amount of information the researcher can infer from the data. In the case of the Kalleberg et al. models, this will lead to conservative interpretations of the data because the economic segmentation variables will tend toward insignificance because of their "measurement distance" from the individual worker. Thus the very existence of a significant relationship in the predicted direction, given the limitations of the data, constitutes strong confirmation and suggests that, given appropriate data, the relationship might be even stronger. Conversely, negative findings should be viewed with suspicion because of the difficulties in interpreting the actual effect and the measurement error effect. The

likelihood of Type I error is minimized while the likelihood of Type II error is increased. The general implication of this observation is that existing research on labor market segmentation that has failed to find empirical confirmation for the theoretical propositions may be an artifact of mixed levels of analysis (see Baron and Bielby [1980] for some of these disconfirmations). In the absence of firm-level data, a thorough test of structural effects on the process of individual stratification proposed by labor market theory is not possible. Approximations of firm-level data with industry averages will produce unreliable results when combined with individually specific data.

An alternate approach to the measurement problem is to abandon individual-level statistical analysis. Using this approach, the authors could have substituted industry averages for all significant variables and then run their regressions on an industrial (rather than individual) level of analysis.[1] Some of these industry-level data are already available through various Department of Commerce sources. Other data would have to be estimated by aggregating existing individual-level data from, for example, the Census of Population, Current Population Survey, or specially tailored surveys such as the Quality of Employment Survey and the Survey of Working Conditions.

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[1] An even more appropriate analysis theoretically would be on the establishment level: however, this type of data is scarce in the social sciences (but see Birch 1979; Talbert and Bose 1977; Baron and Bielby 1980).

STRUCTURAL EFFECTS ON INDIVIDUAL INEQUALITY: REPLY TO TOMASKOVIC-DEVEY

Ever since social scientists have sought to explain individual-level phenomena by using contextual measures, there have been those who have misperceived the intent or implications of cross-level models (see Cronbach 1976; Althauser, Smith, and Kalleberg 1982). In the latest recurrence of this confusion, Tomaskovic-Devey raises several issues concerning the relationship between structural properties and individual inequality. His

comments are directed at our paper (Kalleberg, Wallace, and Althauser, "Economic Segmentation, Worker Power, and Income Inequality," *AJS* 87 [November 1981]: 651–83) in which we estimated individual-level models of income inequality that incorporate concepts from market, class, and organizational explanations of stratification. Unfortunately, he confounds questions of theory or substance and methodology. These need to be clarified before any progress can be made in understanding structural sources of inequality.

Tomaskovic-Devey is mainly concerned with problems of interpreting regression coefficients in equations containing both individual and structural variables. He argues that "industry average" and "individually accurate" measures are "noncomparable" and differ in their "meanings." This is purportedly because there are greater differences between true and observed scores for industry- than for individual-level variables. As a result, the coefficients of the industry variables will be unstable because of "unknown and nonsystematic [*sic;* "systematic"?] error components." These "vast differences in the plausible error assumptions" also produce results which are "artifacts of mixed levels of analysis." He argues that our use of regression coefficients to assess relative effects of variables at multiple levels of analysis exhibits a "serious methodological flaw" which threatens not only the validity of our results but also the course of future "structural-level" stratification research.

If valid, these would indeed be serious criticisms. However, a careful consideration of the theoretical and substantive issues involved in our analysis sheds light on Tomaskovic-Devey's methodological confusion. His major theoretical error is that he assumes the "closer" a measure of structure is to the individual worker, the more appropriate it is as an explanation of income inequality. Thus, he argues that the firm is more appropriate than industry, though departments within firms, having less "measurement distance" from the worker, would be even better. We agree that firm- and department-levels of analysis are important for understanding structural sources of income inequality, and we regret that we could not measure more precisely some important firm-level concepts.[1] However, firms and departments are important because they represent structural locations within which income determination processes theoretically operate, not because they are "closer" to the worker than is industry in terms of "measurement distance." Further, firms and departments do not exhaust the range of structural sources of income inequality:

[1] We have collected such data, along with colleagues at Indiana University, as part of the 1982 Indianapolis/Tokyo Work Commitment Study. These data consist of questionnaires filled out by over 7,000 workers in almost 100 plants in seven manufacturing industries in the two countries. In addition, we collected detailed data on industry, firm, and departmental concepts through interviews with key informants in each plant. This data set will allow us to examine organizational and other structural determinants of work outcomes with much more precision than was possible in the past.

we argue that such structures operate at *many* different levels. Economic inequality is attributable not only to department and firm characteristics but to industrial, class, and occupational forces as well. These layers of structure need to be conceptualized in relation to one another and their structural effects on income analyzed accordingly.

Within our original framework, industry is conceptually distinct from "firm," and each has theoretically distinct effects on income inequality. High-wage firms may exist in low-wage industries and vice versa. While we would have preferred to measure *some* variables also at the firm level (profits, capital intensity, sales to the government), this does not detract from their utility as measures of industrial contexts. Moreover, other industrial variables (e.g., concentration) are defined *only* at the industry level because they refer to relations among firms and, therefore, have no analogue at the firm level. Hence, industry-level concepts are important in their own right and should be included in income determination models along with firm-level measures.

These theoretical considerations are needed to make sense out of the methodological issues raised. Tomaskovic-Devey's arguments regarding measurement error, for example, make sense only if we assume that measures of "distant" levels of structure are taken as proxies for "closer" levels, a point we rejected above. Further, we did not use or interpret industry measures as proxies for firm characteristics. Instead, we argued that they represent measures of industrial contexts themselves, which are conceptually distinct from firm properties.

These theoretical considerations aside, we still have problems with Tomaskovic-Devey's arguments regarding measurement bias in our models. While our industrial-level concepts are undoubtedly measured with some error, this can be said for *all* of our structural measures (or for almost all variables in the social sciences). Individual perceptions of establishment size, averages of occupational skill levels, and individual reports of class position are all contaminated by measurement error, as are even individuals' descriptions of their demographic characteristics. Tomaskovic-Devey's assertion that our measures of industry characteristics have greater (systematic) measurement error than our other variables simply has no factual basis. The industrial variables, being averages, may not describe precisely the detailed industrial contexts experienced by particular workers in our sample. But by the same token, the occupational skill measures used by us and others do not convey exactly the skill content of specific jobs. What, then, are the implications of measurement error for our analyses? Such errors will, of course, bias our results, as would be the case in any regression model. Nevertheless, it follows from this neither that the individual-level variables are measured without error ("individually accurate" measures) nor that industrial and individual variables are "noncomparable."

His arguments concerning the "noncomparability" of industry averages and individual-level variables reflect considerable confusion about the analysis of multilevel data. We *can* "compare" coefficients of industrial measures to the others in the model, provided we keep in mind the implications of such comparisons. That is, regression coefficients are useful measures of effect within a properly specified model; and "models which include contextual variables neither require special advocacy nor bear any special burden of proof" (Farkas 1974, p. 357). We can conclude from our analysis, for example, that some economic segmentation variables, such as concentration, are more strongly related to income inequality than others. Any comparison of industry and other coefficients, however, must take into account the differences between them. Since the industry averages vary only among individuals who are members of different industry groups, they will generally have smaller effects than the individual-level variables, which vary both between and within industries. We reported in the paper that the industry categories account for a maximum of 11.1% of the total variation in (log) income for males and 14.1% for females. Thus, any particular scaling of these categories cannot exceed this between-industry variation in income. This tends to make the estimates of industry effects nonsignificant.[2] In addition, since industrial characteristics are the most "distant" structural concepts in our models, their effects may be mediated by firm and other intervening variables. Thus, the fact that our industry effects are relatively small does not imply they are unimportant or even "conservative." Instead, in addition to their direct effects, industry variables affect income indirectly by determining, in part, the occupational skill mix, union structure, and other labor market structures which, in turn, affect income. That many of our estimates of industry effects are significant despite these theoretical considerations only serves to bolster our argument regarding the importance of these dimensions of economic segmentation.

Tomaskovic-Devey also suggests that we aggregate all our measures to the industry level to make them "comparable," a suggestion which we explicitly reject. This technique is useful only for answering questions for which industry can be justified as the appropriate unit of analysis.[3] However, such an approach is seriously flawed for addressing the issues which motivated our analyses in the article in question. Theoretically, our con-

[2] We could, of course, increase the amount of between-industry variance in the sample if we used industry-level data assigned to a more detailed classification than two-digit SIC codes. Despite our advocacy of more detailed industry data (see Wallace and Kalleberg 1981), such data are not generally available for the entire economy.

[3] In an earlier paper (Wallace and Kalleberg 1981), two of us used an industry-level analysis to investigate interrelations between industrial characteristics and labor market structures. However, in that paper we were explicitly concerned with institutional processes which could theoretically be justified as operating at the industry level, and not directly with inequalities among individuals.

cern is the explanation of income inequality among *individuals,* and the arguments are specified at the individual level of analysis. To aggregate all variables to the industry level makes a heroic (but incorrect) theoretical assumption: that this is the level at which class, organizational, and market processes generate income inequality among individuals.

Aggregating our variables to the industry level of analysis would not only contradict Tomaskovic-Devey's own arguments regarding the theoretical primacy of firms and their structural effects, it would also go against much literature which warns against the perils of making theoretical inferences at incorrect levels of analysis. In addition to inviting problems of "aggregation bias" (see Hannan, Freeman, and Meyer 1976), such aggregation would also preclude our assessment of the economic effects of class, occupational, organizational, and individual variables *within* industries. That is, since many of our variables (e.g., sex, education, skills) exhibit greater within- than between-industry variation, the inclusion of these variables in an industry-level model of income inequality would be virtually meaningless. Hence, estimating models at the industrial level, as Tomaskovic-Devey suggests doing, implies that one is concerned with explaining that portion of the 11.1%–14.1% of the total variation that lies between industries and not the other 86%–89% that lies within.

We acknowledge that because of data limitations our empirical analysis of the theoretical questions we raise is not ideal. Our analyses were based on data collected through household surveys of the general working population, which are not as well suited to examining some questions as are data collected at the firm level. Rich firm-level data are not generally available, but researchers concerned with structuralist arguments are moving in the right direction (see, e.g., Baron and Bielby 1980; n. 1). If we had ideal data at multiple levels of analysis (e.g., industry, firm, department, work group, etc.), we would still use the same analytic framework we employed in our paper. Indeed, under such conditions the utility of our approach would be even more apparent. Although it is important to learn how much firm-specific processes affect individual inequality, for example, it is still necessary to ask whether these processes mediate industry-level ones. We would also want to assess effects on income inequality produced by occupational and class concepts. Such analyses require the use of multilevel models. The analytic tools for examining these questions are straightforward and, by now, well-known. What is needed, however, is a broader understanding of how unresolved theoretical issues are distinct from and often prior to methodological questions.

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